Applying multiple-intelligence approach to education and analyzing its impact on cognitive development of pre-school children

Yalda Delgoshaeia,*, Neda Delavaria

*Islamic Azad University, Central Tehran Branch, Iran

Abstract

This study aimed to find out multiple-intelligence (MI) approach for education’s impact on cognitive maturity of pre-school children. Research methodology was quasi-experimental with post-test and pre-test design. In this study, independent variable was a plan written based on MI approach and dependent variable was the rate of cognitive development which was evaluated by Venita Kaul test. Forty female, pre-school students constituted the experimental and control groups. For statistical analysis, we used descriptive data processing and inferential statistics such as: independent and correlated t tests. Applying MI approach in the classroom as a educational method results increasing in all five domains of pre-school children’s cognitive development with 99% significance.

Key words: Multiple intelligences; sequential thinking; problem solving; cognitive development; five senses

1. Introduction

Human being has a very complex, sophisticated nature and all theoretical standpoints such as behaviourism, structuralism and cognitive science, which emerge one after another according to scientific advancements, attempt to shed light on this nature. There are, hence, different points of view on what intelligence is and how it functions. Modern theories of intelligence regard the traditional notion of intelligence as the competence of adaptation to environment to be problematic. Howard Gardner's cognitive theory, for example, emphasizes on different abilities which human beings acquire in diverse cultural contexts and introduces the concept of "multiple intelligences." Gardner, Csikszentmihalyi, and Damon (2001) in a comparison called "three aspects of intelligence" mentions that "the domination of psychometrics over intelligence has been severely challenged within the past two decades.” Since 1975, there have been attempts to make high quality care and education programs approved as a priority for young children and educators who have to determine what is meant by high quality care and education if they want this approach to be approved and accommodated (Weikart, 2000). Considering the importance of high quality, early childhood programs, Gardner's theory of intelligence and its illuminating applications to provide a model for early childhood programming, and, finally, the importance of cognitive development as one of the most decisive, significant goals of pre-school education, this study tries to examine how a Gardner-based curriculum can achieve this goal.

* Corresponding author. Tel: +98 912 5858651; fax:+0-000-000-0000
E-mail address: yaldadelgoshaei@gmail.com
1.1. Issue Definition

Pre-school education is principally a process with a developmental-based system, but the status quo signifies the fact that in many, not all, cases it has been transformed to a way of developing only primary schools, permitting us to argue that its essence and particular methodology are ignored to a large extent. Children need to be provided in pre-school settings with richly contented activities, for any judgment about the importance and necessity of this period depends upon the quality of its programming, activities, and contents.

It is necessary to create a setting with rich programs and developmentally appropriate practices in accordance to the very philosophy of preschool education which is viewed as the all-dimensional development (especially cognitive development). The need to effective models to create such settings is obviously self-evident. And this gives rise to the question: what / which is the developmentally appropriate curriculum to promote cognitive abilities?

There are many other questions that one can pose in the context of early childhood education, for example: what are the effective educational and developmental methods of this period? How can we assess the efficiency of programs performed? What is the difference, or what are the differences, between the children provided with such education and other children? What standards are there to design and assess early childhood education? (Weicart, 2000)

The fundamental question to be answered by education systems is: which conception or view of intelligence should be the guiding basis for curriculum and the process of education? The answer to this question can be derived from the educational orientations and can be judged about. It should be noted, from the multiple-intelligences perspective, that it is unfortunately an incomplete, distorted conception of the essence and abilities of human intelligence that guide and aspire most of the educational programs (Mehr-Mohammadi, 2005).

Introducing a new conception of intelligence as having different types and forms and emphasizing the fact that individuals have various intelligence profiles, Gardner prepared a new way of understanding the cognitive faculty of human being and thus provoked new theoretical and practical movements in some educational systems (Mehr-Mohammadi, 2005).

Taking into account the Gardnerian categorization of intelligence and admitting the significance of cognitive development as one of the most important dimensions of development in early childhood education, and viewing childhood as an influential decisive periods for mental development, this paper aims to answer to the question whether the multiple-intelligences-based curriculum in preschool period is an effective model to motivate and promote cognitive development or, put it another way, whether we can influence children cognitive abilities through those educational methods based on multiple-intelligences approach.

1.2. Multiple-Intelligence Based Curriculum

Gardner holds that intelligence is neither a "thing" nor a "determined state" in brain but rather "a potential faculty whose existence brings into play the intellectual types appropriate to the specific situation" (Gardner, 1991).

Gardner identified nine intelligences and believed that they are independent of each other and function in terms of their own rules just like separate systems: linguistic, musical, mathematical-logical, visual-spatial, bodily-kinaesthetic, intrapersonal, interpersonal, naturalist, and existentialist intelligences.

This theory opens up new educational methods easily performable in classrooms. Any school which follows a curriculum based on this theory would develop a deep understanding and knowledge in students according to basic rules and disciplines. Making proper use of their understanding and knowledge, the students raised in such schools would be able to analyze and solve their problems and accomplish the real tasks they take over in society. The teachers working in those schools too would be encouraged to create a unique mixture of different intelligences and apply them to the curriculum and ground their assessment methods thereupon (Gardner, 1991). An instance of multiple-intelligence-based curriculum would be a setting created in Takrim Cognitive School† in Tehran for an experimental group as an independent variable.

† - www.takrimcog.org
1.3. Cognitive Development

This refers to the development of those fundamental skills which help us to know and understand our surrounding (Kaul, 1991). Children develop a good body of understanding and thinking about the world at the early stages of life. The process of thinking and cognizing, called knowledge, including: intentionality, perception, interpretation, classification, retrieving previous data, creating and analyzing concepts, inferring rules, and deducing principles, or representation of possibilities/probabilities, creation of strategies, and imagination (Kaul, 1991).

Three- to six-years-old Children start the cognitive development stage when:
- Their thought is directed by their perception, e.g., by seeing what can be seen in their surroundings.
- They have an egocentric way of thinking, i.e., they consider everything from an I-perspective and cannot take the others' perspectives.
- They are not yet prepared for logical thinking, for they do not have basic concepts.
- They are not ready to think abstractly and for argumentation.
- They are taught direct instructions through objective concrete experiences. Therefore, play and activity are the main elements in the setting. Since experiences determine their understanding and knowledge, it is necessary to provide frequent opportunities for them to experience and experiment the world to unfold their cognitive skills (Kaul, 1991).

Cognitive development, taken as a dependent variable in this research, is a quantitative index divided into primary and secondary items which are used here to assess the cognitive skills of students. The cognitive score is the one gained through test and worked out by the researcher. The test, encompassing the assessment of cognitive development of children from Venita Kaul, assesses the sequential thinking, problem solving, formation of the basic concepts in mind, memory and observation development, and the five senses.

1.4. The Main Goal

The main goal of this research is to examine the impact of multiple-intelligences-based curriculum on the cognitive development of preschool children in order to give some practical suggestions to improve early childhood education.

1.5. Main Hypotheses
- A multiple-intelligences-based curriculum does have impacts on the cognitive development of preschool children

1.6. Sub- Hypotheses
- A multiple-intelligence-based curriculum influences the sequential thinking of preschool children
- A multiple-intelligence-based curriculum influences the problem solving skills of preschool children
- A multiple-intelligence-based curriculum influences the formation of basic concepts in the mind of preschool children
- A multiple-intelligence-based curriculum influences the memory and observation skills of preschool children
- A multiple-intelligence-based curriculum influences the five senses of preschool children

2. Method

Considering the characteristics of same-experimental researches, the present study is a pre test-post test with an experimental and control group which attempts to examine the impact of independent variable on dependent one in both experimental and control group. Since there was not the possibility to choose the groups we tried to match them randomly. At the beginning of the educational year, both experimental group and control group were tested on cognitive development and were situated in a learning setting based on multiple-intelligences approach. The control group was left by itself. At the end of the year, the cognitive development was tested again.
2.1. Selection and Statistical Sampling
Since it was not possibility to choose the students randomly and to change the normal conditions of classes we took 20 students of Takrim School, the only cognitive school in Tehran which is based on multiple intelligences, as experimental group and 20 students of A'in-Roshan Preschool, which is operating as a normal, non-cognitive based school, as control group. Both groups were matched in terms of age, sex, region of education, region of living, tuitions, educational equipments and facilities, and class population.

2.2. Data Collecting Tools
Pre-established questionnaire is used here as the data collecting tool. The questionnaire contained 69 items, appropriately designed developmentally, to assess the cognitive development of preschool children. Since the constituting elements of questionnaire such as: problem solving, basic concepts, the five senses, memory, and sequential thinking, were not matched and the same, and since it was impossible to match them by designing more questions, then we did scaling operation to homogenize the questions in terms of weight. There were five main items assessed by the questionnaire including: sequential thinking, problem solving, basic concepts formation, the five senses, and memory and observation, each of which had sub-items (indexes of item assessment).

2.3. Reliability and Validity
The reliability of assessment tool is acknowledged by scholars and experts, and as the validity, we used Cronbach's alpha coefficient. The calculated alpha coefficient in the questionnaire was 0.8.

<table>
<thead>
<tr>
<th>Items of Cog. Development</th>
<th>Questions</th>
<th>Alpha coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential thinking</td>
<td>1-5</td>
<td>0.759</td>
</tr>
<tr>
<td>Problem solving skill</td>
<td>6-10</td>
<td>0.760</td>
</tr>
<tr>
<td>Basic concept formation</td>
<td>11-48</td>
<td>0.768</td>
</tr>
<tr>
<td>Memory and observation</td>
<td>49-50</td>
<td>0.918</td>
</tr>
<tr>
<td>The five senses</td>
<td>51-69</td>
<td>0.764</td>
</tr>
<tr>
<td>Total</td>
<td>1-69</td>
<td>0.80</td>
</tr>
</tbody>
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2.4. Statistical Method
Descriptive statistics and inferential statistical method were used to analyze the findings. Making use of Kolmogorov–Smirnov test (K–S test) test, to be sure about the being parametric of data, statistical parametric tests such as dependant and independent $t$ (the comparison of difference between the means) were used to examine whether variances and comparison graphs are equal. The mean difference of pre-test/post-test of each item (in both groups) was calculated and it revealed the fact that the mean difference of scores in experiential group for all items of cognitive development is higher than that in control group. Levin's test approved the equality of variances too.

3. Results
- First hypothesis (i.e., the MI-based curriculum affects the sequential thinking of preschool children), the calculated $t$ with 42 df, and the meaningfulness level of $p = 0.01$ all show that there is a meaningful difference between the mean score of two groups in terms of sequential thinking
- Second hypothesis (i.e., the MI-based curriculum affects the problem solving skill of preschool children), the calculated $t$ with 42 df, and the meaningful level of $p = 0.01$ all show that there is a meaningful difference between the mean score of two groups in terms of problem solving
- Third hypothesis (i.e., the MI-based curriculum affects the basic concepts formation in preschool children mind), the calculated $t$ with 42 df, and the meaningful level of $p = 0.01$ all show that there is a significant difference between the mean score of the two groups in terms of basic concepts formation.
• Forth hypothesis (i.e., the MI-based curriculum affects the memory and observation ability of preschool children), the calculated $t$ with 42 $df$, and the meaningful level of $p = 0.01$ all show that there is a significant difference between the mean score of two groups in terms of memory and observation ability.

• Fifth hypothesis (i.e., the MI-based curriculum affects the five senses of preschool children), the calculated $t$ with 42 $df$, and the meaningful level of $p = 0.01$ all show that there is a significant difference between the mean score of two groups in terms of the five senses.

It seems, as a matter of fact, that the findings of this study correspond to the findings of Pasha Sharifi (2006), Haji Hosseyni Nejad (2003), Strahan, Summey, and Bowles (1996), and Campbell and Campbell (1999).

4. Discussion

With the decline of behaviourist psychology and the emergence of cognitive psychology and specially structuralism, students are not any more viewed as mere receivers of inputs, but as constructors of their cognitive structures. Having received data, they process and organize them by connecting them to their previous experiences in order to be able to solve problems and difficulties which appear in new situations (Prawat & Folklen, 1994). Accordingly, any curriculum has to deal with cognitive development of children or, to put it in another way, with ways in which children know and interpret relations between things and events in their surroundings (Lay-Dopyera & Dopyera, 1992). Most of the efforts should be concentrated on active learning, language, experience, classification, sorting, numbers, and spatial-temporal relations (Giles, 2005).

Actually, it is necessary to create, on a regular basis, problems for children and instead of giving them the solution, to give them enough time to examine and explore the problems on their own. And since formation of basic concepts in children’s minds is of great significance to cognize the world, where observation and classification ability depends on transition from concept-dependant argumentation to logical argumentation, it is thus absolutely crucial to pay attention to cognitive development.

Memory development leads to a level of ability which is of great importance in early education and it is only through this development that observation and perception abilities and, consequently, problem solving and thinking develop. Using the senses properly is the basis for any knowledge, and children learn many things through the senses. Thus, more diversity of sensual experiences of the child leads them to acquire a more expansive and solid basis for their judgements and believe about the world.

By providing appropriate opportunities for the development of various abilities, cognitive education paves the way for deep learning and knowing. In other words, cognitive models have had, and still have, applications in preschool education. Through the introduction of the cognitive notion of "multiple intelligences," Gardner has provided the possibility of using MI-based cognitive methods in teaching and learning. By viewing and introducing concepts from different perspectives and intelligences, they can be more fully examined and remain less unknown (Kumbar, 2006). Cognitive approaches and MI-based curricula attempt to provoke and produce deeper understanding, to increase the ability of concept application, the ability of exploring, discovering learning, and creativity. They do not suggest mere and abstract concept application and one-dimensional testing (Gardner, 1999). Doing the practices of sequential thinking would help children to realize the sequence of numbers and enhance the ability of problem solving.

It is therefore possible to promote the potentials of education in schools by giving some insightful, performable suggestions. Writing books and designing curriculums on the basis of MI approach would provide teachers with the possibility to improve the process of teaching-learning. In case of testing, it is advisable, then, to take into consideration all aspects of intelligence and promote the prominent intelligence in each student for a better learning. In the final analysis, it can be submitted that making use of cognitive education could enhance children’s abilities, hence, development of societies.

References


