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Original Article

Dynamic Assessment (DA) and Evaluation of Problem-solving Skills in Childeren

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Abstract

Introduction:
The term dynamic assessment (DA) refers to an assessment, by an active teaching process, of a child's perception, learning, thinking, and problem solving. The process is aimed at modifying an individual's cognitive functioning and observing subsequent changes in learning and problem-solving patterns within the testing situation. DA has been advocated as an alternative and/or supplemental approach to traditional standardized testing with children who are culturally and linguistically diverse (CLD).

Materials and Methods:
This study was a causal-comparative with 58 children (6 to 6.5 year-old) of 5 kindergartens of Mashhad, and children were elected with available sampling. Kindergartens were selected of areas (1,2,4,5,6) of Mashhad-Iran. Variable of intelligence in children, was controlled by the Raven's IQ test.

Results:
Eight children were perceived process at the level of symbolic, eighteen children in the visual-image (visual) and thirty-two children were perceived process at the level of visual-motor (functional representation). Results showed children were perceived process at the level of symbolic, only 50% of them were used these method in practice. These results for children in the visual-image was 66.6% and for children were perceived process at the level of visual-motor was 68.7%.

Conclusion:
Dynamic assessment is a method of education and according to methods of teacher (symbolic, visual, functional representation), children also, often engage in the same level of performance and problem solving.

Keywords: Children, Dynamic assessment, Problem-solving, ZPD.

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Introduction

Dynamic assessment (DA) is a kind of interactive assessment used in education. Dynamic assessment is a product of the research conducted by developmental psychologist Lev Vygotsky. The term dynamic assessment refers to an assessment, by an active teaching process, of a child's perception, learning, thinking, and problem solving. The process is aimed at modifying an individual's cognitive functioning and observing subsequent changes in learning and problem-solving patterns within the testing situation. The goals of the DA are to: (a) assess the capacity of the child to grasp the principle underlying an initial problem and to solve it, (b) assess the nature and amount of investment (teaching) that is required to teach a child a given rule or principle, and (c) identify the specific deficient cognitive functions (i.e., systematic exploratory behavior) and non-intellective factors (i.e., need for mastery) that are responsible for failure in performance and how modifiable they are as a result of teaching. In contrast, the term static test (ST) generally refers to a standardized testing procedure in which an examiner presents items to an examinees without any attempt to intervene to change, guide, or improve the child's performance. A static test usually has graduated levels of difficulty, with the tester merely recording and scoring the responses. DA is usually administered to children who demonstrate some learning disability, low scores on standardized tests, or some emotional or personality disturbance. Very frequently it is given to children coming from a low socioeconomic or culturally different background. The differences between the ST and DA approaches derive from different philosophical perspectives: ST is related to passive acceptance (acceptance of a child's disability and accommodation of the environment to fit these disabilities), while DA is based on active modification (active efforts to modify the child's disabilities by intensive mediation and the establishment of relatively high cognitive goals).

DA development has been motivated by the inadequacy of standardized tests. The inadequacy can be summarized in the following points: (1) Static tests do not provide crucial information about learning processes, deficient cognitive functions that are responsible for learning difficulties, and mediational strategies that facilitate learning; (2) The manifested low performance level of many children, as revealed in ST, very frequently falls short of revealing their learning potential, especially of those identified as coming from disadvantaged social backgrounds, or as having some sort of learning difficulty. Many children fail in static tests because of lack of opportunities for learning experiences, cultural differences, specific learning difficulties, or traumatic life experiences; (3) In many static tests children are described in general terms, mostly in relation to their relative position of their peer group, but they do not provide clear descriptions of the processes involved in learning and recommendations for prescriptive teaching and remedial learning strategies; (4) Static tests do not relate to non-intellective factors that can influence individuals' cognitive performance, sometimes more than the "pure" cognitive factors. Non-intellective factors i.e., intrinsic motivation, need for mastery, locus of control, anxiety, frustration, tolerance, self-confidence, and accessibility to mediation) are no less important in determining children's intellectual achievements than are the "pure" cognitive factors. This is especially true with individuals whose emotional or motivational problems interfere with their cognitive performance. In comparison with ST, DA is designed to provide accurate information about: (a) an individual's current learning ability and learning processes; (b) specific cognitive factors (i.e., impulsivity, planning behavior)

responsible for problem-solving ability and academic success or failure; (c) efficient teaching strategies for the child being studied; and (d) motivational, emotional, and personality factors that affect cognitive processes.

Lev Vygotsky's concept of a zone of proximal development (ZPD) and Reuben Feuerstein's theory of mediated learning experience (MLE) served as the main conceptual bases for most of the DA elaboration. The ZPD is defined as the difference between a child's "actual developmental level as determined by independent problem solving" and the higher level of "potential development as determined through problem solving under adult guidance or in collaboration with more capable peers". MLE interactions are defined as a process in which parents or experienced adults interpose themselves between a set of stimuli and a child and modify the stimuli for the developing child. In a DA context, the examiner mediates the rules and strategies for solving specific problems on an individual basis, and assesses the level of internalization (i.e., deep understanding) of these rules and strategies as well as their transfer value to other problems of increased level of complexity, novelty, and abstraction.

Social Development Theory

The major theme of Vygotsky's theoretical framework is that social interaction plays a fundamental role in the development of cognition. Vygotsky (1978) states: "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals."(Figure.1).

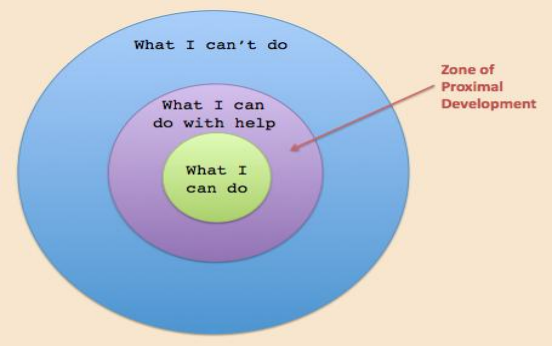

Fig 1: Zone of proximal development

A second aspect of Vygotsky's theory is the idea that the potential for cognitive development depends upon the "zone of proximal development" (ZPD): a level of development attained when children engage in social behavior. Full development of the ZPD depends upon full social interaction. The range of skill that can be developed with adult guidance or peer collaboration exceeds what can be attained alone.

Vygotsky's theory was an attempt to explain consciousness as the end product of socialization. For example, in the learning of language, our first utterances with peers or adults are for the purpose of communication but once mastered they become internalized and allow "inner speech".

Vygotsky's theory is complementary to Bandura's work on social learning and a key component of situated learning theory as well. Because Vygotsky's focus was on cognitive development, it is interesting to compare his views with those a constructivist (Bruner) and a genetic epistemologist (Piaget).

The Nature of Dynamic Assessment

DA is meant to be a complement to standardized testing, not a substitute for it. It is presented as a broad approach, not as a particular test. Different criteria of change are used in DA: pre-to post-teaching gains, amount and type of teaching required, and the degree of transfer of learning. The choice to use

change criteria to predict future cognitive performance (as well as predicted outcome of intervention programs) is based on the belief that measures of change are more closely related to teaching processes (by which the child is taught how to process information), than they are to conventional measures of intelligence.

Using DA: Clinical experience has shown that it is most useful to use DA when standardized tests yield low scores; when standardized tests hover around margins of adequacy in cognitive functioning; when there are serious discrepancies between a child's test scores and academic performance; when a child comes from a low socioeconomic or culturally or linguistically different background; or when a child shows some emotional disturbance, personality disorder, or learning disability.

Reliability of DA: One of the objectives of DA is to change an individual's cognitive functioning within the testing context so as to produce *unreliability* among test items (i.e., lack of consistency between repeated responses). DA reliability is usually assessed by interrater agreement (two or more observers rate the child's behavior) regarding the child's cognitive performance, mediation (teaching) strategies required to change the child's functioning, cognitive functions (i.e., level of impulsivity, planning behavior) that affect performance, and motivational-emotional factors. Such test reliability has been demonstrated with learning disabled and educable mentally retarded (EMR) children. Overall inter-rater agreement for the type of intervention (mediation) required to change a child's performance for deficient cognitive functions, such as impulsivity, lack of planning, and lack of systematic behavior, has been shown to be about 89 percent. For different cognitive tasks, different profiles of deficient cognitive functions have been observed and different types of teaching can be applied.

Current Research:

In several studies DA was found to verify the distinction between cultural deprivation and cultural difference. Tzuriel, following Feuerstein, differentiated between those who function poorly as a result of cultural differences and those who have experienced cultural deprivation. The DA approach, in this respect, offers a solution not only for its differential diagnostic value, but also for its potential prescriptive remediation of deficiencies and its enhancement of learning processes. For certain DA measures, significant positive correlations have been found between the level of difficulty of an item and the level of improvement on that item, and DA post-teaching scores have been shown to be better predictors of academic achievement than static scores. In addition, a higher prediction value was found among children with high learning potential than among children with average learning potential. Findings of many studies raise heavy doubts, especially with low functioning groups, about the ability of ST scores to represent accurately an individual's ability and to serve as indicators for future intervention and change (1-15).

Materials and Methods

This study was a causal-comparative with 58 children (6 to 6.5 year-old) of 5 kindergartens of Mashhad, and children were elected with available sampling. Kindergartens were selected of areas (1,2,4,5,6) of Mashhad-Iran. Variable of intelligence in children, was controlled by the Raven's IQ test.

Tools and Methods:

Trained the children the use of deductive reasoning in problem solving trained. To investigate the process of problem solving and how the assimilation of Problem solving, they were trained too.

What is Deductive Reasoning?

Deductive reasoning is one of the two basic forms of valid reasoning, the other one being inductive reasoning. The main difference between these two types of reasoning is that, inductive reasoning argues from a specific to a general base, whereas deductive reasoning goes from a general to a specific instance. Also, deductive reasoning, unlike inductive reasoning, is something that is based on a premise and then follows accordingly. Inductive and deductive arguments differ with regard to the standards of evaluation that are applicable to them. Thus, deductive reasoning is the method by which, conclusions are drawn on the basis of proofs, and not merely by assuming or thinking about a predetermined clause. The basic principle on which deductive reasoning is based, is a well-known mathematical formula; If, 1=2 (premise); and 2=3 (premise); then, 1=3 (conclusion).

Examples of Deductive Reasoning:

All oranges are fruits; All fruits grow on trees; Therefore, all oranges grow on trees.

Association: It was in the shape of an artificial concept. For example the concept of wheel, was shown with square that in the middle of it was a circle. The child should elected that Which shape is the most different from other shapes.

Design Dynamic Assesment Pretest:

The purpose of the pretest is understand the fact that whether the child is able to do the process of deductive reasoning at its simplest level, visual-motor. Three shapes was shown to child. First, ordinal numbers and Supplementary shapes (Figure.2).

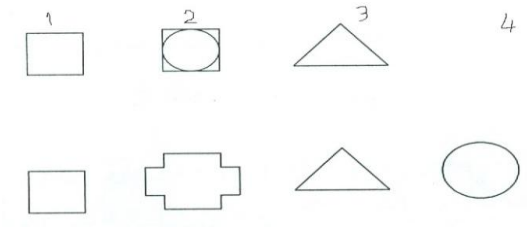

Fig.2: The shapes for pretest

Then asked the child to construct shape 4 of supplementary shapes, in a way that it should be difference from the shapes (1,2 and 3). If the child solved the problem (triangles of the complementary shapes, placed under the number 4 and plased circle on the triangle), the pretest will be repeated with another shapes. If the child again solved the problem, he is able to do deductive reasoning and dynamic assessment process can not be done about this process. If the child could not solved the problem, we conclude that he is unable to perform the simplest form of deductive reasoning, visual-motor and measuring the dynamic it can be done.

Dynamic assessment process

The aim of dynamic assessment is the finding the highest level (symbol-concept-visual and visual-motor) that the child is able to do deductive reasoning after understanding the way to solve it.

The process includes the following steps:

1) Problem solving method taught to children. If the child did not understand the problem solving method, step one is repeated again.

2) The child is asked to perform deductive reasoning at a symbolic level. If the child's response was correct, the result is that the child is the symbol of the problem solving and the dynamic assessment is finished. If the child failed to solve the problem, the third phase of dynamic assessment begins.

3) The child is asked to do a process of deductive reasoning in the image-motion. If the child's response was correct, the result is that the child is the image-motion of the problem solving and the dynamic assessment is finished. If the child failed to solve the problem, the fourth phase of dynamic assessment begins (Figure.3).

4) The child is asked to do a process of deductive reasoning in the visual-motor. If the child's response was correct, the result is that the child is the visual-motor of the

problem solving and the dynamic assessment is finished. If the child failed to solve the problem, the dynamic assessment process begins again.

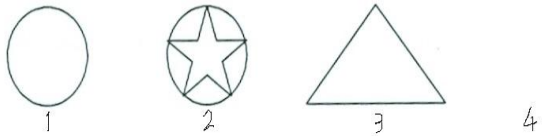

Fig.3: The shapes for stage 3

Results

Eight children were perceived process at the level of symbolic; eighteen children in the visual-image (visual) and thirty-two children were perceived process at the level of visual-motor (functional representation).

Results showed children were perceived process at the level of symbolic, only (n=4), 50% of them were used these method in practice. These results for children in the visual-image was (n=12) 66.6% and for children were perceived process at the level of visual-motor was (n=22) 68.7%. Distribution of problem solving according to sex is in (Tables.1,2 and 3).

Table 1: Frequency of problem solving in children in step A at symbol level

Area / Sex	1	2	4	5	6
Girl	2	0	2	0	2
Son	0	1	0	0	1
Total	2	1	2	0	3

Table 2: Frequency of problem solving in children in step A at visual level

Area / Sex	1	2	4	5	6
Girl	5	3	2	2	1
Son	1	0	2	0	2
Total	6	3	4	2	3

Table 3: Frequency of problem solving in children in step A at practical representatio level

Area / Sex	1	2	4	5	6
Girl	4	3	2	5	0
Son	6	1	4	5	2
Total	10	4	6	10	2

The performance of the children in the next step were: 4 child of 8 children were symbolic level, they operate also at the level of symbol. Of 18 children of visual level, 12 of them could solve the problems at visual-conceptual level. Of 32 children of visual-motor, 25 of them could solve the problems in the practical representation. Distribution of problem solving according to sex is in (Tables 4,5 and 6).

Table 4: Frequency of problem solving in children in step B at practical representatio level

Area / Sex	1	2	4	5	6
Girl	1	0	1	0	1
Son	0	0	0	0	1
Total	1	0	1	0	2

Table 5: Frequency of problem solving in children in step B at visual level

Area / Sex	1	2	4	5	6
Girl	2	3	1	1	1
Son	1	0	2	0	1
Total	3	3	3	1	2

Table 6: Frequency of problem solving in children in step B at practical representatio level

Area / Sex	1	2	4	5	6
Girl	3	3	2	4	0
Son	5	1	3	2	2
Total	8	4	5	6	2

Discussion

The purpose of DA is to determine a child's learning potential (1991). DA is an unbiased assessment and intervention method developed in response to concerns about using normative-standardized tests to assess cognitive development of children who are culturally and linguistically diverse (2009) and of students who are low-achieving (1979). It consists of a pretest-mediate-posttest format to determine children's learning potential by examining their level of

modifiability through a method called mediated learning experiences(MLE) (1979;1991). During MLE, students are guided through a problem-solving task by a mediator who adjusts his or her degree of assistance to solve the task. Learning potential is determined by pre- and post-test differences and modifications given (2000).

DA is based on Vygotsky's notions of the zone of proximal development, defined as the difference between a student's independent performance and the level of performance when assisted by a more knowledgeable partner. Vygotsky's 1934 text (translated by Hanfmann and Vakar in 1962) presented a concept formation assessment task later described by Hanfmann and Kasanin (1937) to investigate thinking in adolescents and adults. The task examined classification problem-solving, with nonsense words used as cues to solve the task (1980). The mediated task examined frequency of cues, frequency and quality of responses, and subjects' explanation of the solution, indicating their level of reasoning abilities. DA is appropriate for a student who continually does not respond to regular/normal/typical teaching of subject matter, not when "...the solution is merely to simplify the task or to provide more practice" (1991).

Bruner also, observes that the process of constructing knowledge of the world is not done in isolation but rather within a social context. The child is a social being and, through social life, acquires a framework for interpreting experiences (1987). Bruner (1966) also notes that "there is no unique sequence for all learners, and the optimum in any particular case will depend upon a variety of factors, including past learning, stage of development, nature of the material, and individual differences". Effective curriculum then, must provide many opportunities and choices for children (1993). Within the multiage setting, opportunities exist for children to make choices about their learning experiences. In addition, the variety of teaching methods used in the multi-age classroom provides opportunities for children to construct knowledge in a multitude of ways (1-19).

Conclusion

Assessment of dynamic contrast traditional and static measurements, emphasizes the power of the people and their capacity of them in utilizing of education and teaching and insists on the cooperating teacher and the learner. Assessment and teaching dynamic with an emphasis on active intervention, not only is the content of thought, but also to change its structure is concerned. The use of dynamic assessment and dynamic teaching, children can understand the process of deductive reasoning and problem solving. According to the theories of Bruner, we can help by educating children to understand the various concepts at a younger age.

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