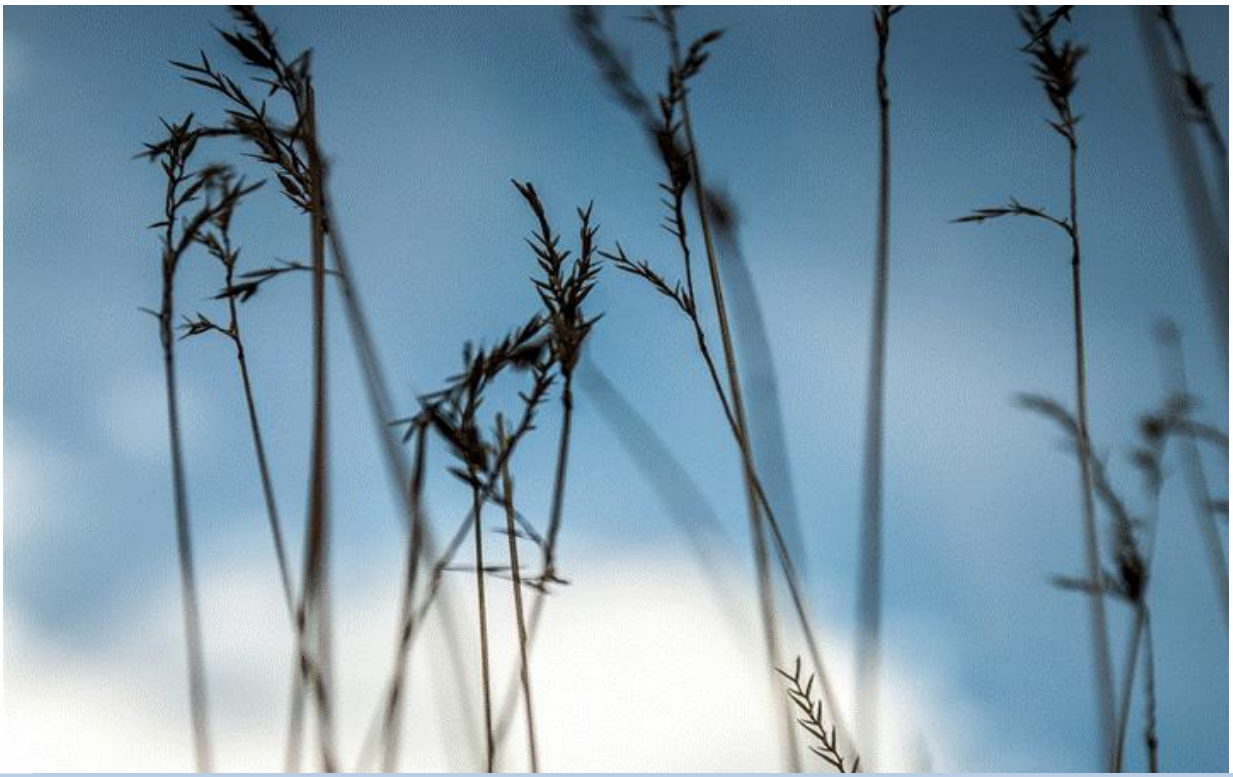

EVALUATION OF THE IMPACT OF FEUERSTEIN INSTRUMENTAL ENRICHMENT PROGRAMS FOR CHILDREN WITH SPECIAL EDUCATIONAL NEEDS

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1. INTRODUCTION TO THE FEUERSTEIN METHOD

The fundamental assumption of the program, based on professor Feuerstein's theory of Structural Cognitive Modifiability (SMC) and Mediated Learning Experience (MLE) is that intelligence is dynamic and modifiable. Not static or fixed (Feuerstein R, Feuerstein RS, Falik L, Rand Y, 2006).

Reuven Feuerstein, an Israeli clinical, developmental, and cognitive psychologist, was the Founder and Chairman of the Feuerstein Institute. R.Feuerstein is recognized for his theory of intelligence which states "it is not 'fixed', but rather modifiable". Human beings have a unique propensity to change or be modified in the structure of their cognitive functioning. Human beings are viewed as open systems, accessible to change throughout their life spans, and responsive to conditions of remediation, providing that the intervention is appropriately directed (in quantity and quality) to the individual's need.

Feuerstein developed theories and applied systems of structural cognitive modifiability (SCM), mediated learning experience (MLE), cognitive map, deficient cognitive functions, learning propensity assessment device (LPAD) and instrumental enrichment programs (FIE). These interlocked practices provide educators with the skills and tools to systematically develop students' cognitive functions and operations to build meta-cognition.

Feuerstein was the founder and director of the International Center for the Enhancement of Learning Potential (ICELP) in Jerusalem, Israel. For more than 50 years, Feuerstein's theories and applied systems have been implemented in both clinical and classroom settings internationally.

1.1. Mediated Learning Experience (MLE)

MLE describes a special quality of interaction between a learner and a person. Those interactions are considered as the proximal factor that explains cognitive modifiability. MLE interactions are defined as an interactional process in which educators interpose themselves between a set of stimuli and the human organism and modify the stimuli for the developing child (Tzuriel D, 2011).

Therefore, it is the mediator's responsibility and goal to find the right mediation process for every individual, with any kind of special needs, in order to contribute to the process of intelligence-modifiability. The goal of any intervention based on MLE is always to restore a pattern

of development and the improvement of the individual's quality of life as normal as possible. The goal is to change the cognitive structure of the learner and to transform him/her into an autonomous, independent thinker, capable of initiating and elaborating ideas (Feuerstein R, Feuerstein RS, Falik L, Rand Y, 2006).

MLE is the primary mechanism for the achievement of structural cognitive modifiability and the process by which human learning and development is modified.

The human being interactions with the environment through two modalities: as a direct learning experience, immediately consequent to direct exposure to stimulation, and through a mediated learning experience that requires the presence and activity of a human being to filter.

MLE overcomes and "mediates" the effect of the distal determinants.

Developmentally, inadequate MLE leads to cognitive functions at the input, elaboration, or output phases of the mental act that are undeveloped, impaired, or fragile in their presence and contribution to learning and cognitive behavior.

Feuerstein's method involves teaching 'metacognition', that is, teaching the learners to think about their own thinking, and to act upon what they conclude in this thinking. Non specific skills are taught, but the generic skills or thinking skills required to gather information, and then use it to do something useful, and then to express this solution to others.

This is not to teach the metacognitive skills directly by explaining 'how to do it'. Instead, a guided discovery approach where students had to construct for themselves the higher level thinking required is used. The procedure is:

1. **Set Real Tasks:** students are asked to do something real, that required information, planning, doing, and explaining your solution etc.

2. **Require Reflection on Metacognitive Strategies.** When the task is done, the students asked to reflect on how they did it. What had made them successful? What hindered them or caused difficulty?

3. **Establish Learning Points in the Students Own Language.** Students are asked for very general advice on how to succeed with such tasks. This includes asking the students to name the strategies they used. The teacher then uses the students' names for these strategies.

4. **Bridging**: Students are then asked to 'bridge' from this learning to other applications. That is, they were asked 'where else might you be able to apply this principle?' The learners are

encouraged to see the application of the thinking processes that they have just described and named, in other contexts.

This is called 'mediation'. Learners often lack the ability to 'see the wood for the trees', they are swamped by the detail of the immediate experience, and need help to extract general principles from concrete experience. Then they need to be encouraged to see where else these same principles apply. The four part cycle above follows Kolb's learning cycle: do, review, learn, apply. Can this same four-step strategy be used to help students to develop their own thinking skills in your subject? It would require making the metacognitive processes involved in doing work in your subject explicit. The 'icedip' and 'diacase' or 'ideas sac' processes could be taught in this way rather than explicitly.

Mediated learning experience according to Feuerstein (1979) is a "prerequisite to effective, independent and autonomous use of environmental stimuli by the child".

1.2. Cognitive functions

Cognitive functions are the mental conditions essential to the existence of thinking operations and any other behavioural function (Feuerstein R, Feuerstein RS, Falik L, Rand Y, 2006, pag. 131). They are categorized into the input, elaboration and output levels. The three separate levels were conceived so as to bring some order into the array of impaired cognitive functions seen in the culturally deprived learners. There is an interaction occurring between and among the levels, which is of vital significance in understanding the extent and pervasiveness of cognitive impairment (Feuerstein R, Feuerstein RS, Falik L, Rand Y, 2006).

The list of impaired cognitive functions by each level according to Feuerstein Theory (The Feuerstein Institute, 2014) follows.

Impaired cognitive functions affecting the **input level** include those impairments concerning the quantity and quality of data gathered by the individual as he is confronted by a given problem, object, or experience. They include:

1. blurred and sweeping perception;
2. unplanned, impulsive, and unsystematic exploratory behavior;
3. lack of or impaired receptive verbal tools which affect discrimination (objects, events, relationships, etc. do not have appropriate labels;

4. lack of or impaired spatial orientation, the lack of stable systems of reference impairs the establishment of topological and Euclidean organization of space;
5. lack of or impaired temporal concepts;
6. lack of or impaired conservation of constancies (size, shape, quantity, orientation) across variation in these factors;
7. lack of or deficient need for precision and accuracy in data gathering;
8. lack of capacity for considering two or more source of information at once; this is reflected in dealing with data in a piecemeal fashion, rather than as a unit of organized facts.

Impaired cognitive functions affecting the **elaboration level** include those factors which impede the efficient use of available data and existing cues. They include:

1. inadequacy in the perception of the existence and definition of an actual problem/ability to identify and define the problem;
2. inability to select relevant vs. non-relevant cues in defining a problem;
3. lack of spontaneous comparative behavior or limitation of its application by a restricted need system;
4. narrowness of the psychic field;
5. episodic grasp of reality;
6. lack of or impaired need for pursuing logical evidence;
7. lack of or impaired internalization;
8. lack of or impaired inferental (hypothetical) thinking;
9. lack of or impaired strategies for hypothesis testing;
10. lack of or impaired summative behavior;
11. lack of or impaired planning behavior;
12. non-elaboration of certain cognitive categories because the verbal concepts are not a part of the individual's verbal inventory on a receptive level, or they are not mobilized at the expressive level.

Impaired cognitive functions on the **output level** include those factors that lead to an inadequate of final solutions. They include:

1. egocentric communicational modalities;
2. difficulties in projecting virtual relationships;
3. blocking;

4. Impulsive, acting-out behavior, trail-and error responses;
5. lack of impaired tools for communicating adequately elaborated responses;
6. deficiency of visual transport.

1.3. Instrumental Enrichment Program

Instrumental enrichment (IE) is a series of tasks aimed to heighten learning skills through different cognitive exercises. Throughout the solving of tasks we enhance the individuals‘ learning and thinking strategies. IE as a classroom curriculum is aimed at enhancing students' cognitive functions necessary for academic learning and achievement. The IE program seeks to correct the deficiencies in fundamental thinking skills, provides pupils with the concepts, skills, strategies, operations and techniques necessary to function as independent learners, increase their motivation, develop metacognition - in short, to "learn how to learn" (Feuerstein R, Feuerstein RS, Falik L, Rand Y, 2006).

There are Instrumental enrichment Standard program and Instrumental enrichment Basic program. Basic IE activities are designed for younger primary school pupils, whereas the Standard activities are aimed for older primary and secondary pupils.

For individuals with special needs, IE is used as a remediation program. For higher functioning learners, IE is an enrichment tool.

Deliberately free of specific subject matter, the IE tasks are intended to be more readily transferable to all educational and everyday life situations.

FIE is designed to enhance an individual's learning and thinking strategies. There are two sets of Instrumental Enrichment programs: FIE Basic program for young children and low-functioning individuals and FIE Standard program, which is used with older children, high-school students, and adult learners of all ages.

During the FIE sessions, a trained Feuerstein mediator leads learners, either one-on-one or in a classroom, through increasingly complex cognitive tasks and works with them on how to analyze a problem and how to solve it systematically. FIE utilizes a style of teaching called ,,mediation‘‘. Mediation means to teach information to the learner in a way that is meaningfulto them, so that they understand the lesson and are able to apply it in other contexts.

IE Basic

IE Basic consists of a set of playful learning activities that develop basic concepts and thinking skills of younger children and low-functioning individuals. Through a series of increasingly complex tasks, learners explore the operations of comparison, orientation in space, analysis of geometric shapes, numerical skills, empathy for others and the like – all with the help of a mediator who guides the learner to develop strategies for problem solving and analytic thinking.IE Basic can be used in a classroom setting, with small groups of targeted learners, and as a one-to-one therapeutic intervention. It may also be preparation for the IE Standard program, which takes students to higher levels of mental processing and cognitive functioning. IE Basic consists of 11 Instruments.

FIE Standard

IE Standard is a series of structured paper-and-pencil exercises that gradually increase in levels of difficulty and abstraction.The materials are organized into workbooks called “instruments” and each instrument focuses on a specific cognitive area such as analytic perception, comparison, classification, orientation in space and time and so on.They may include verbal, mathematical, logical and even emotional skills, depending upon the needs of the learner.Learners are guided through the tasks by a mediator who helps them develop strategies for problem solving and analytic thinking that they can then carry on into the rest of their lives.IE Standard can be used in a classroom or workplace setting, with small groups of targeted learners, and as a one-to-one therapeutic intervention. IE Standard consists of 14 instruments.

Feuerstein's Instrumental Enrichment (FIE) is a successful course designed to enhance the cognitive functions necessary for academic learning and achievement. The fundamental assumption of the program, is that intelligence is dynamic and modifiable, and if intelligence can be taught and learned, education has a much greater role than might have been previously imagined. Feuerstein believed that cognitive deficiencies could be corrected. Once cognitive skills are taught and cultural experiences are enriched, even the "retarded" individuals can extend their intellectual powers dramatically. Instrumental Enrichment is an intervention program designed by Feuerstein to enhance the cognitive skills necessary for independent thinking. The goal of the FIE program is to shape the cognitive structure of the individual and to produce and set in motion his further development. Thus, the program seeks to correct deficiencies in fundamental thinking skills, provide students with the concepts, skills, strategies, operations, and techniques necessary to function as independent learners, to diagnose and, and to help students learn how to learn. Designed to be presented as a two - or three-year program in three levels, FIE consists of fourteen instruments

and accompanying teacher's guides. The materials used in the program are free of specific subject matter, yet are intended to be bridged to academic school subjects and life skills. FIE is used with a variety of age groups and populations, culturally diverse, gifted students, and the learning disabled, as well as regular students in upper elementary through college levels and beyond.

Much of the value of the FIE program comes from the mediational role of the trained teacher. Feuerstein's theory of Structural Cognitive Modifiability explains deficient learning as a result of a lack of sufficient Mediated Learning Experiences prior to school years. He observed that the resulting deficiencies in cognitive development can be corrected at any later time by providing mediated learning experiences by well-trained teachers in combination with specially designed instruments emphasizing cognitive developments. When the student is appropriately guided through the exercises in a particular instrument, he or she develops the capacity and ability to apply the principles learned to other problems or situations where it is appropriate. As a result of the cognitive and motivational growth stimulated by Instrumental Enrichment, students change from a passive recipients of information to confident, active learners eager to master increasingly challenging academic tasks.

The FIE instruments are a carefully designed collection of tasks that impact on, and improve cognitive functions, which have been categorised and relate to three stages of a learning act: the input, elaboration and output phases. The instrument tasks develop in complexity and in difficulty. The work is intensive and gains traction through repetition with variations. The mind is taught to be ordered and flexible. A mind that knows its own working is much more efficient than one that responds impulsively. The mediator’s role does not end when the learner has undertaken tasks with a specific instrument. A key aspect of the Feuerstein methodology is to transcend the current learning space and time, and to enable the learners to project themselves into other situations in which the learning and processes will be relevant. This virtual transport of the general principles involved in thinking and learning is part of what makes the Feuerstein programs successful at transforming the brain and by extension, behaviour and learning.

FIE materials are organised into a series of 14 workbooks, called "instruments". The instruments are free of subject matters, they comprise paper and pencil tasks, and each instrument focuses on a specific cognitive function. The tasks gradually increase in difficulty level and abstraction. By using these tasks students develop strategies to solve problems which they can apply to life.

Feuerstein’s Instrumental Enrichment requires special training for a teacher to use.

1.4. Research Studies on the Effects of FIE on Academic Achievement

Due to its long history, FIE has been studied extensively by researchers around the world. There are over a thousand related publications, hundreds of which report empirical analyses on the efficacy of FIE in various settings with diverse populations. Feuerstein's Instrumental Enrichment (FIE) program effect on academic achievement must be studied with caution. Studies also vary in duration, intensity of FIE application and tools of efficiency assesmement. They might be conducted in urban, suburban, or rural areas, and with regular and various special student populations and different size of groups. There have been several attempts to synthesize the results of the many studies (See Savell, Towhig, Douglas, 1986: Burden, 1987: Adams 1989).

In Alberta, Canada, a two-year FIE project involved a population of nine hundred students that started the program in the fourth or seventh grade. The report indicates that the fourth grade FIE students' achievement ecxeled the achievement of the controls on the Mathematics Concepts and Applications subtest of the Canadian Achievement Test (CAT). The seventh (initial) grade FIE students outperformed the control group significantly on the Mathematics computation and Mathematics Concepts and Applications subtests. The differences in reading achievement as measured by CAT in this study were not reported to be significant (Mulcahy, 1994).

Leander, Texas, school district has been involved in a pilot study of FIE. Sixty-six pairs of students, matched by academic performance (by the Texas Learning Index) and age were assigned either to FIE or a control group. The experimental group received 90 minutes of FIE per week during the first year (fourth grade) and 135 minutes per week in the second year (fifth grade). The control group received the traditional curriculum. The students' academic achievement was measured by the Texas Assessment of Academic Skills (TAAS) battery at the end of each academic year and by district measures based on local curriculum at the beginning, middle, and end of each academic year. The evaluators indicate a growing advantage of the FIE group over the controls on all measures of academic achievement.

The three-year pilot study with sixth grade classes in Taunton, Massachusetts, attempted to measure the effect of FIE on reading comprehension. The Stanford Achievement Test for Reading

(SAT-R) was administered to the two groups at the beginning of the study and at the end of every year of the program. The report indicates that the SAT-R Total and the Comprehension subtest mean scores showed an increasing gap between the groups, favoring FIE (William and Kopp, 1994). At the end of the third year of reseach, the FIE mean Comprehension subset scores increased by 42 percent, as compared to only 2 percent for the control group.

Learners with learning difficulties are of concern because their learning problems appear difficult to "remedy" within a mainstream classroom using normal teaching methods (Yuen, Westwood & Wong, 2004). As a result, it is commonly accepted that these learners require intensive remedial intervention from a trained specialist educator if they are to make progress (Pikulski, 1994; Pinnell, 1997).

Seabi and Amod (2009) conducted a study in which the effects of a mediated intervention programme on a sample of grade five learners in a remedial school were explored. The purpose of the study was to compare the effects of one-to-one mediation in comparison to group mediation.
It was proposed that participants within the Individual Mediation group (n=10) would perform significantly better than those within the Group Mediation group (n=10). Mediation tools/instruments (i.e. Set Variations B-8 to B-12 from Feuerstein's Learning Potential Assessment Device) served as a vehicle for mediating cognitive deficiencies. Results revealed a significant improvement in scores only within the Individual Mediation group. The current study therefore investigated the effects of mediation in improving performance on nonverbal intelligence assessment, using Raven's Coloured Progressive Matrices. This Raven's test was chosen in order to follow up Seabi and Amod's (2009) study on remedial school learners. It was hypothesized that following the MLE intervention, the experimental group would perform significantly better than the control group on the Raven's Coloured Progressive Matrices scores.

The research conducted in Romania (Todor, 2014) on a total of 100 children with mental limit deficiencies, students, with ages between 8 and 10 years, enrolled in mainstream schools in Braşov. Subjects were divided into an experimental group (50 subjects) and a control group (50 subjects). The experiment was conducted over a period of 2 years and 6 months, as follows: the period of initial assessment, performed using the Nepsy Instrument, of 6 months, followed by the period of intervention with IEP, on an 18 month period and concluded with the final assessment period of 6 months. Intervention with IEP tools was conducted in two weekly sessions of 1 hour and 30 minutes each. After application of IEP for two years the following conclusions were established:

- the practice of mediation criteria in the teaching activity led to increased involvement of children in the superordinate activities;

- after teaching analytic notions and coding, the children developed the ability to select relevant and systematic work stimuli for Instrumental Enrichment Program aims at systematic use of cognitive functions, as prerequisites of specific problem-solving and real coping.

David Martin studied the FIE program with hearing impaired students. The experimental group received FIE twice a week as part of the time allocated for their mathematics and English classes. The scores on the Math-Concepts, Math-Applications, and Reading-Comprehension subtests of the Stanford Achievement Test for the Hearing-Impaired (SAT-HI) were used to measure the dependent variables. The report indicates that after two years of FIE, the experimental group achievement gains were significantly in favor of the FIE group in all three SAT-HI subtests (Martin, 1984).

Generally, the reports indicate strong positive results in a variety of academic and nonacademic areas. Though the program materials are designed so that mere exposure to them may have a positive effect on students, the essence of the program still lies in the combination of the materials and what Feuerstein refers to as "mediation"- that is, the quality of teaching. Studies of teacher improvement as a result of FIE training using various scales and interviews demonstrate significant changes in the teachers' beliefs about the modifiability of students' learning abilities, significant improvement in their sense of autonomy and creative self-perception, and improvement of their teaching skills. Data and teacher reports indicate that the FIE experience impacts teacher-student relationships (see Seavell et.al, 1986). Even where the improvement of teaching was not directly studied, reports on the efficacy of FIE have always included critical comments regarding the importance of the quality of teacher preparation for the program to the results.

Studies indicate the following effects of FIE on academic achievement. First, FIE may be effective in the enhancement of academic achievement in every academic area. Second, FIE produces statistically significant effects with various student populations. Third, FIE produces larger academic gains than those resulting from remedial classes. Fourth, the longer and more complete the intervention, the more general the effects of FIE. Fifth, the best results in academic achievement are reported when teachers are trained to see the connection of specific academic curricula with FIE.

1.5. Research of the impact on the SEN pupils reviews

Because deafness is considered to be a "low-incidence disability" due to its relative rarity in most populations, *the data on implementation* of the FIE program for the needs of deaf learners have necessarily been more limited than for many other populations, e.g., typically-developing learners, learning-disabled learners, and developmentally challenged learners, to name only some. However, a number of empirical studies since the late 1970's have documented the positive effects of the program on this special population. An important factor is that more than 90% of deaf learners are born to hearing families and thus grow in their early years without benefit of any language. The profoundly or severely deaf child cannot hear and thus is blocked from auditory input, and the great majority of hearing parents of deaf children until recently did not learn sign language to use with their deaf child, i.e., these children have not had an opportunity to develop another modality of expressive and receptive language, i.e., visual instead of auditory, until and unless they have entered a formal school program which uses sign languag. Why, then, has the adoption of FIE been relatively inconsistent in deaf education? According to D. S. Martin, two reasons may be found: first, it is not surprising that the training and implementation of FIE among classroom teachers for deaf students requires an unusual commitment in order to be willing to "sacrifice" valuable literacy- development time for a focus on thinking strategies in the classroom. The fact is, that the faithful implementation of FIE among deaf learners actually provides the cognitive prerequisites necessary for literacy, although not in an obvious way at first; for example, the development through the FIE program of such thinking skills as precision, comparison, analysis, systematic approaches to problem-solving, and decoding (among others) has a direct positive relationship to the process of becoming literate. Therefore, adoption of FIE by teachers of deaf students requires some initial risk-taking in order to "make time" for a cognitive-strategy focus. A second reason for inconsistent adoption of FIE is found in nearly all potential FIE classrooms (regardless of the students' special needs) – how to "justify" taking classroom time for cognitive intervention when a program such as FIE does not clearly appear to "fit" the subject matter of the curriculum in any obvious way—its content is not history, science, social studies, literacy, etc. FIE is deliberately designed to be generally content-free. It is not clear at first, then, to the uninitiated classroom teacher how cognitive strategies can possibly assist with any learning since the effects are indirect and not immediate. For nearly all classroom teachers, then, adopting FIE after the required extra training as a mediator is a kind of "act of faith" by teachers. And in many cases teacher's evaluation is linked to student performance on annual examinations, thus putting more

pressure on teachers to avoid deviating from the regular curriculum. For both of these reasons, then, it is understandable that the implementations of FIE in classrooms with deaf students has been somewhat limited.

Different authors report the 'failings' of deaf children in many different areas. These areas include, cognitive deficits (Firth 1966), poor language development (van den Berg, 1971; Tomlinson-Keasey and Kelly, 1978), and suggestions of poorer underlying intelligence (Pinter, Eisenson and Stantoni, 1941; Markschark, 1993). In addition, other areas, such as lower empathy (Meadow-Orlans, 1990), reduced self-esteem (Moss, 1987; Sussman, 1966) and disruptive behaviour (Cowan, Pederson and Babigon, 1973) have been reported. Both cognitive aspects, such as a shorter memory span (Koh, Vernon and Bailey, 1971) and broader issues concerning inflexible personality types have also been noted (Liben, 1979). Koh, Vernon and Bailey (1971) found that deaf students had poorer recall than their hearing counterparts with both related and unrelated word lists. Although it can be argued that using words in investigations provide an unfair advantage for the hearing students, even with recall of line drawings (Liben, 1979), deaf students recall performance was poorer than that of the hearing students. Deaf children rely on concrete visual cues when learning, rather than the abstract world. Also, deaf children do not have the opportunity within the family environment to explore open ended or undirected responses (Bonvillian and Orlansky, 1983) due to their restricted communication with hearing parents. In addition, deaf children, both at home (Bonvillian, Charrow and Nelson, 1973) and at school (Wood, 1982), experience limited conversational contexts. These are either teacher/parent initiated conversations that are often in the form of concrete direct questions or task information questions that requires only a brief response from the child. Therefore, as Arnold and Walter (1979) found, it is no wonder that deaf students were significantly inferior to hearing students on tests of abstract, mechanical and verbal reasoning as deaf children would not have been given the opportunity to extend or explore responses in their past learning experience whether at home or school.

Bartlett (1958) suggests that thinking process and styles can be altered by the surrounding environment and changes that occur within it. The author further suggests that the result of changing the environment in which thinking is occurring in would depend, to a large extent, on the nature of the task at hand, its difficulty and familiarity. It would also depend on the child's underlying psychological environment and training. This may relate to their age. However, Werner (1965) has suggested that we may not be able to identify stages of reasoning simply in terms of

chronological ages. Rather we may need to examine how thought develops and is created by the use of appropriate environments. This implies that the earlier such a process begins (through interventions making it possible) the more likely thinking is to progress. However, we need first to understand the current situation the deaf child finds itself in and how this may have informed the reports of 'failings' mentioned earlier.

A psychologist (Furth, 1964; 1973) published an important paper in which he stated that the problem was not with deaf persons' performance, but rather was due to the tests that were being used to assess them—correctly putting his finger on one of the critical problems in the field. Shortly afterward, another highly regarded scholar in the field of deaf education (Vernon, 1968) carried out a meta-analysis of a group of research studies that had been done earlier on particular cognitive skills in deaf learners; he concluded that, when considered together, the body of research now showed that deaf learners have the same cognitive potential as hearing learners, even though they demonstrate some different strengths and learning styles from their hearing peers. The key word here is "potential"—meaning that deaf learners could achieve on a par with hearing learners, but that certain actions had to be taken in order to achieve that equity. This finding laid the foundational rationale for adopting the Feuerstein view of intelligence as dynamic, not static, in deaf education as in all other realms of education.

In the matter of learning styles, it has been inferred (Marschark & Wauters, 2003) that deaf learners are not simply hearing learners who cannot hear. The use of a visual language, such as Sign Language, "wires" the brain in a different way, such that many deaf learners have a relative strength compared to hearing learners in simultaneous processing, because the brain needs to process visual communication in a simultaneous manner. On the other hand, hearing learners who use an auditory language tend to be more adept than deaf learners in sequential processing because one processes an auditory language sequentially.

The powerful conclusion that deaf learners have a full range of cognitive potential has still not completely permeated the field of deaf education, but specific attempts were then made during the latter 1970's and beyond to carry out pro-active cognitive interventions with deaf learners as means of providing the cognitive strategies that they were missing, so that their potential could indeed be realized. FIE has been one of the primary tools in a number of those interventions. Those efforts continue at the present time and represent a most hopeful trend in deaf education.

These considerations highlight the need to give deaf children the opportunity to explore and apply their knowledge within different systems. As shown by Liben (1979) in context of memory training, deaf children can learn appropriate strategies, if given the opportunity. Poorer memory and application might therefore be remediated by the methodology employed by teachers; where this is not done the experiences of deaf children could be contributing to their inflexibility and poor memory performance. A priority for working with a deaf child has to be an emphasis on extending and carrying forward information previously learnt.

R. Feuerstein in his reserach concluded that children, with low IQ, were in fact suffering from „cognitive deficiencies“ and it was this that impeded their learning and suggested that these children had ‘blocks’ (The Guardian, 1983). These blocks resulted in impulsivity, an inability to make comparisons between different objects and events (particularly over any period of time), poor spatial orientation to materials, an inability to follow or give directions (whether in a classroom exercise or in the outside world), and a complete failure to link with any degree of sophistication, cause and effect. Significantly, these ‘blocks’ (with the exception of spatial orientation) are very similar to ‘failings’ associated with the educational performance of Deaf children previously discussed. Feuerstein (1989) further linked the underdevelopment of cognitive functioning with family background. He suggested that, because the parents (mediators) were unable to appreciate or give meaning (or order) to their experiences, the foundations, rules and values that children need to make sense of the world were missing. Again, these observations might be applied to the deaf child within a hearing family. With the previously highlighted restricted, concrete based mediation, from parents (and further the school), similar links and conclusions could be made.

Deaf cognition has been subjected to many years of empirical study. But with the establishment of the principle that deaf learners have the same range of cognitive potential as hearing learners (e.g., Furth, 1964; Vernon, 1968; Meadow, 1980), a number of studies occurred during the 1980’s and 1990’s in relation to the enhancement of cognitive development in the deaf learner.

The studies have involved the use of several different programs of cognitive-strategy instruction, a number of which used the FIE Program, to investigate the effect of explicit and systematic classroom focus on the teaching of higher-order cognitive strategies and their application to school subject matter. In one of these studies (Berchin, 1991), eighth-grade students at the Lexington School for the Deaf in New York City used the FIE program over a period of four years. It was found that FIE students on the Stanford Achievement Test for Reading and Mathematics

Problem-Solving, after using FIE, showed the following increases when compared to national data that indicate an average growth of about 3 months per year without using FIE: 22% of the students increased 3 or more grade levels in Reading Comprehension, 14% increased 2 grade levels, and 33% increased one grade level; on Mathematical Problem-Solving, 36% of the students increased 3 or more grade levels,17% increased 2 grade levels, and 19% increased 1 grade level.

A study with high-school age deaf students (Martin & Jonas, 1986) was designed to examine the effects of intervention using FIE methods and materials. At the Model Secondary School for the Deaf (MSSD) in Washington, D.C., six FIE instruments (analytic perception, comparison, projection of visual relationships, spatial relations, instructions and classification) were used over a two-year period with an experimental group of secondary-level deaf//hard of hearing students by contrast with a similar group of control-group students. The specially trained teachers at least twice a week incorporated a series of visual, verbal, and geometric activities into regular subject matter, helped students solve these problems, conducted metacognitive discussions and then discussed how the students' mental strategies within these problems would be used in subject matter.

- The gain by the FIE group on the Raven's Standard Progressive Matrices (Raven, 1960) exceeded that of the control group at a .02 level of statistical significance.
- The results of the Reading Comprehension subtest of the Stanford Achievement Test for the Hearing-Impaired (SAT-HI) indicated that the experimental group exceeded the control group at a significance level of $p<.05$; FIE students improved by 15.6 scaled points. This significant improvement in reading comprehension can be explained by the added focus through FIE on the prerequisite literacy skills of comparison and projection of relationships.
- The FIE instructional emphases on precision, taking time to think (restraint of impulsivity), and checking one's own work would further explain this important gain in the FIE group of students.
- Scores of experimental subjects on the SAT-HI mathematical computation and concepts subtests indicated a statistically significant difference demonstrating greater progress by FIE students in the acquisition of math concepts by the end of the experimental period as compared to the control group.
- Finally, teachers other than the FIE teachers were asked to rate all experimental and control group students' cognitive behavior before the beginning of the experimental period and again near the end of the project, using a five-point scale of behaviors. The rating of experimental group students found the following trends in experimental students:

- a tendency to move directly to expected tasks;
- giving relevant and complete answers;
- increased willingness to help others in class;
- an increase in working well with others in a group;
- an increase in "consideration of others' feelings" and increase in "listening" behavior;
- a decrease in impulsivity;
- a reduction in involvement in non-productive arguments.

A cross-cultural international comparative study using the FIE Program was then devised, involving cohorts of deaf students in the United Kingdom and the People's Republic of China (Martin, Craft, & Zhang, 2001). The main objective of this investigation was determining the degree to which the positive effects of cognitive-strategy instruction for deaf learners are international or cross-cultural, given similar conditions of teacher training, application of methodologies, and application of specific material. Cognitive strategies in this study followed the Feuerstein methods of specific practice in particular thinking skills (e.g., comparison, categorization, etc.) in which the learner first uses content-free paper-and-pencil exercises to learn about and rehearse the strategy, followed by metacognitive discussion about the process just used, and practice in applying that particular strategy to some aspect of subject matter study within the regular curriculum. The procedure in this study first established a teacher-training sequence which included a theoretical knowledges about cognitive modifiability and the role of teacher as cognitive mediator. The materials and teaching procedures which the teachers used with the experimental classes consisted of some non-verbal paper-and-pencil exercises, some discussion-prompter topics, some group investigation tasks involving the solving of a problem or the creation of an innovative idea. FIE activities formed the majority of the classroom activities by these FIE-trained teachers. In each implementation for each country, teachers were asked to incorporate planned explicit thinking activities (problem-solving/critical and creative) over a 6-month period between two and three times per week, with an average of 30 minutes on each occasion devoted to explicit thinking-skill activities. The results of this international comparative study were:

- the lack of difference between the two groups—England (presumed to reflect a cultural base that is similar to the USA) and China—in reasoning skills, seems to indicate that although the style of problem-solving may be different, the outcomes are similar.

- in both the China and England groups, as evidenced by both teacher reports and classroom observations, the cognitive activities appear to have resulted in heightened student interest;

- while the study did not intend to compare deaf and hearing learners within the same sample groups, nonetheless an artifact of seeking participating teachers in the England cohort resulted in a combination of deaf and hearing learners in those groups. Their pre- and post-test data were analyzed both as a combined group, and separately (deaf vs. hearing). A striking result is that there were no measurable differences in the outcomes for deaf vs. hearing learners. This outcome is particularly encouraging inasmuch as it adds to the evidence that deaf learners have a potential which is similar to hearing learners.

Similarly, the research design had posited that the view of the learner might affect the outcomes of cognitive-strategy instruction; it had been previously established through observation that teachers in England (and in the earlier study in the USA) approached instruction with a fundamentally constructivist viewpoint, seeing the learner as participatory and fostering significant student-student and student-teacher interaction, while in China the dominant style had been didactic with the teacher being the source of knowledge and the learner as the recipient. However, it was noticed by the outside observers (using the Classroom Observation Scale) that during the experimental period, the China teachers adopted a significantly more participatory style (Winocur, 1991).

Another research, conducted by Tzuriel and Kaufman (1999) among the children who had undergone cultural change explored the relation between MLE and cognitive modifiability. Before the mediation intervention, a group of Ethiopian children ($n = 29$) was compared with a group of Israeli-born children ($n = 23$) on the Coloured Progressive Matrices (CPM) and on two prie-school dynamic assessment measures of learning potential, namely, the Children's Inferential Thinking Modifiability test (CITM) and the Children's Analogical Cognitive Modifiability test (CATM). The results demonstrated initial significant differences ($p < 0.01$) on all the three measurements in favour of the Israeli-born children. After a short period of exposure to intensive mediation, the Ethiopian group had improved significantly and performed at the same level as their counterparts.

The above mentioned studies with FIE, demonstrate that classroom intervention with appropriately re-trained teachers, use of appropriate methodology, and use of specially designed materials, result in measurable positive effects on specific cognitive skills in learners when compared to students who do not have this classroom experience.

The overall conclusion from all of these cognitive intervention accounts is that not only is it clear that all students have cognitive potential which can be realized, but also that the FIE program is one of the prime methods of intervention which has led to these educational successes.

2. RESEARCH

2.1. INTRODUCTION

Feuerstein method is poorly known in Slovene educational system. Hearing and Speech Correction Centre Portorož as the only Slovenian institution with trained professionals is committed for the spread and dissemination of the method within Slovenian school system.

The aim of the project was to test ways in which the method can be implemented in our school system as well as researching its impact on pupils. For this purpose, 10 mediators and 32 pupils were involved in the project. In order to determine the impact of the one-year training with FIE four hypothesis were set and tested. The progress of the pupils was monitored, initial and final evaluation was carried out with standardized subtests of Wechsler Intelligence Scale for Children as well as with questionnaires developed especially for the project.

Hearing and Speech Correction Centre Portorož

The Hearing and Speech Correction Centre Portorož (CKSG) is a specialized institution for children with special needs mainly those with speech and hearing impairments. Although they have difficulties in communication, speech and hearing they also have learning disabilities and behavioural problems. We can also say that our pupils are at risk for social exclusion and joining the project gave as an opportunity to test additional options for helping them in improving their everyday life.

The mission of CKSG is oriented into encouraging the pupils to acquire knowledge, especially towards independent learning with critical assessment of new findings and into acquiring values such as respect, consistency, responsibility, and cooperation. Our mission is also endeavouring for the development of the features of individuals (teachers and students) needed for work in today's society such as creativity, independence, responsibility and cooperation with others.

Activities carried out by CKSG consist of work in the fields of education, instruction and rehabilitation. The activities of the Centre are the education and training of deaf and hard-of-hearing, children with speech and language disorders and multiply handicapped children from the time of

detection to the end of compulsory schooling, providing care and accommodation for the children, audio logical and audio pedagogical treatment for children and adults, speech therapy for children and adults. At the moment in the CKSG there are children with hearing impairments, children with speech and language disorders, children with learning disabilities, children with combined disorders, children with autism etc.

Within CKSG there are 4 different educational programs – 2 preschool programs (adapted educational program for preschool children and educational program for children with autism) and 2 school programs (adapted educational program with the equivalent standard and adapted educational program with the lower standard).

Within Slovenia, CKSG represents part of the network designed for the education and training of children with communication, speech and language problems, deaf and hard-of hearing children and those with multiple handicaps for the whole Littoral region, part of the network for the treatment of adults with speech and language problems for the Littoral and Karts region.

In the development vision CKSG strives toward the implementation of the objective to become an educational, diagnostic, research and counselling rehabilitation centre that develops its own methods, techniques of work, and educational programmes with preventive, compensation, correction, and social integration tasks both in Primorska and outside the national borders.

2.2. Problem and objective

In Slovenia Feuerstein method is not known by educational experts and therefore it is not yet implemented. The only institution in Slovenia which has trained professionals (mediators) certificated by Feuerstein Institute is the CKSG. Besides the work with the method, CKSG takes care for the spread and dissemination of the method within Slovenia school system.

As we believe the Feuerstein method has a potential to help children under our care (mainly children with communication, speech and language problems) the project was an opportunity to implement the method for one school year. We used this opportunity to find and test ways in which the method can be implemented in our school system as well as researching its impact on pupils.

Mediators chose pupils according to their competences, prepared protocols for the training as well as individual programs and conducted the training once a week for one school year (2015-2016).

The progress of the pupils was monitored, initial and final evaluation was carried out with standardized test and questionnaires based on Feuerstein Cognitive Function Theory developed especially for the project.

In the following sections, research goals and objectives as well as hypothesis are presented.

2.3. Goals and objective of the research

The main objective of the project is to implement Feuerstein Instrumental Enrichment (FIE) programs in Slovene schools/centres and evaluate its impact on the functioning of children with special educational needs. The institution involved in the project is a centre who primarily provides help for people with communication, speech, language and hearing problems thereby our main purpose was to study the impact of FIE on pupils under our treatment with special focus on their verbal abilities.

2.4. Hypothesis

To determine the effect of the one school-year implementation of FIE on selected pupils four hypothesis were set:

H1: Pupils show progress in verbal comprehension.

H2: Pupils progress is observed on the input level.

H3: Pupils progress is observed on the elaboration level.

H4: Pupils progress is observed on the output level.

3. METHODS

All pupils were exposed to Feuerstein IE (Basic or Standard) program once a week from 7 September 2015 to 19 June 2016. 10 mediators participated in the administration of FIE, 1 male and 9 females. Their working experiences varied from 4 years to 35 years and 9 months with the mean of 14,9 years of working experiences.

Table 1: Mediators

	mediator	working experiences in years and months	gender
1	A.Š.	10,01	female
2	A.S.	8,11	female
3	K.F.	14,04	female
4	T.V.	7,08	female
5	M.S.	16,03	male
6	B.R.	4,00	female
7	T.I.	4,00	female
8	I.B.J.	35,09	female
9	M.K.	30,00	female
10	J.S.	17,08	female

3.1 Description of the sample

For the research, 32 pupils with special educational needs were selected. During the project 3 pupils dropped out and did not complete the training. The remaining 29 pupils were included in the research. They were 22 males and 7 females ranging in age from 8 years to 15 years and 7 months. The mean age of the participants were 10,4 years. Information about the pupils are presented in Table 2.

Table 2: Description of the sample

Number	Participants	Chronological age in years and months	Gender
1	N D	8	male
2	N C	13,08	male
3	L J	10,04	female
4	B P	10,05	female
5	L M	9	female
6	A B	7,09	female
7	T S	8,05	male

8	A S	8,02	male
9	A M	12,01	female
10	P M	9,04	male
11	L P	9,01	female
12	A Š	8	female
13	AS	9	male
14	J L	8,06	male
15	J D	8,09	male
16	A O	8,06	male
17	D K	8,06	male
18	B P	13,01	male
19	M P	11,11	male
20	A N	13,07	male
21	L P	10,1	male
22	L B	12,05	male
23	A N	11,06	male
24	P R	10,06	male
25	D R	15,07	male
26	N M	12,02	male
27	N D	12,06	male
28	A D	10,09	male
29	B V	10,07	male

3.2. Description of instruments

Quantitative research methodology was applied. All the pupils involved in the research were tested with standardized subtest of Wechsler Intelligence Scale for Children (WISC-3 SI) (Wechsler, 2001) as well as with questionnaires for the assessment of cognitive functions.

Four subtests from WISC-3 Verbal Comprehension Index were selected to access verbal comprehension ability – general knowledge, similarities, vocabulary and comprehension.

For the assessment of cognitive functions three questionnaires based on the description of cognitive function according Feuerstein method were developed. One questionnaire was designed for pupils, one for parents and one for teachers and mediators. The number of items differed among

the 3 versions of questionnaires. The questionnaires for parents, teachers and mediators included all 26 cognitive functions, while in the questionnaire designed for pupils 3 items were removed because we assumed the children will have problems with their understanding.

3.3. The process of collecting and analyzing data

At the beginning of the school year (in September 2015) and at the end of the school year (in June 2016) all 32 selected pupils were tested with WISC-III subtests by the psychologist. In the same two periods parents, teachers, mediators and older children (from 3rd grade on, N = 23) completed the questionnaires.

Each item represented a cognitive function and was defined by two extremes. Teachers, mediators, parents and older children evaluated the pupil's development of cognitive functions by marking a point on the 10 cm long line between the 2 extremes describing the cognitive function.

For data analysis researchers measured the marked point and gained a numerical data. Data from questionnaires and standardized data from WISC-III were further analized with the SPSS program for Windows. The data was analized with descriptive statistics and t-test

4. RESULTS AND INTERPRETATION

In this section we present the results related to the hypothesis.

4.1 First hypothesis testing

The first hypothesis assumed that pupils from our sample will benefit in verbal comprehension area after one-school year exposure to Feuerstein IE training. In order to investigate our fist hypothesis data from four subtests of WISC-III SI (general knowledge, similarities, vocabulary and comprehension) were analyzed. Pupils' scores at first testing (before IE training) were compared with their scores on the second testing (after one year IE training) using t-test.

Table 3: Verbal comprehension scores

	N	Mean	Std. Deviation	Std. Error Mean
Verbal comprehension beginning	29	7,793	4,4602	,854
Verbal comprehension final	29	8,966	4,781	,888

Table 3 shows the sum of beginning and final scores on measures of verbal comprehension. It can be noted that the mean scores value increased on the second (final) testing indicating improvement. For determining the significance of the observed differences t-test was used (see Table 4)

Table 4: Comparison of beginning and final evaluations of verbal comprehension scores

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Beginning - final verbal comprehension	-1,172	,945	,176	-1,532	-,813	-6,680	28	,000

A paired-samples t-test was conducted to compare verbal comprehension scores at the first testing (beginning) and second testing (final). There was a significant difference in the verbal comprehension scores at the first (M=7,793, SD=4,602) and second (M=8,966, SD=4,781) testing; t(28)=-6,680, p = 0.000. These results suggest that once a week exposure to Feuerstein IE program had positive effect on the verbal comprehension of pupils from our sample.

We conclude that our first hypothesis is accepted as we found a statistically significant increase on the verbal comprehension scores after one-year's training with FIE program.

4.2 Second hypothesis testing

Our second hypothesis assumed that the progress made by pupils from our sample after the one-school year exposure to Feuerstein IE training would be noticeable. In order to investigate this,

three questionnaires were developed for different fulfillers (mediators, teachers, parents and pupils). For analysis purpose in the following sections, items from each questionnaire have been categorized into the input, elaboration and output level. For the purpose of the second hypothesis, below we analyze the results of items belonging to the input phase from the questionnaires fulfilled before IE training and the questionnaires fulfilled at the end of the IE training. Incomplete questionnaires were excluded from the analyses.

Table 5: Beginning and final input-phase cognitive function scores for all fulfillers

	N	Mean	Std. Deviation
teacher_beginning	25	4,6595	2,41370
mediator_beginning	29	4,3483	1,89148
pupil_beginning	22	6,3494	3,23885
parent_beginning	25	5,3865	2,42989
teacher_final	28	4,6893	2,40682
mediator_final	28	5,8147	1,89027
pupil_final	22	6,8188	1,60094
parent_final	27	6,0384	2,16868
Valid N (listwise)	13		

In Table 5 the average scores on all items relating to cognitive functions in input phase are presented separately, for each group of fulfillers. The estimation of input-phase cognitive functions development differed among fulfillers. Pupils made the highest estimation, followed by parents, mediators and teachers, respectively. Relative to the difference between beginning and final estimations, we can see that all four fulfillers recorded higher development of input-phase cognitive functions at the second testing. To determine whether these differences are statistically significant, we used t-test.

Table 6: Comparison of beginning and final input-phase cognitive functions assessments for all fulfillers

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
teacher beginning - teacher final	,18958	2,90241	,59245	-1,03600	1,41516	,320	23	,752
mediator beginning - mediator final	-1,46652	1,90894	,36076	-2,20673	-,72631	-4,065	27	,000
pupil beginning - pupil final	-,41565	3,18627	,69530	-1,86602	1,03473	-,598	20	,557
parent beginning - parent final	-,71600	1,61951	,32390	-1,38450	-,04750	-2,211	24	,037

A paired-samples t-test was conducted to compare the estimations related to input-phase cognitive functions development. The mean scores from the questionnaires compiled at the beginning were compared with the mean scores from the questionnaires compiled at the end of the program, for all groups of fulfillers. There was a significant difference in the mediators estimations of input-phase cognitive function development at the beginning (M=4,348, SD=1,926) and at the end (M=5,815, SD=1,890) of the FIE program; t(27)=-4,065, p = 0,000. Similarly, there was a significant difference in the parents estimations of input-phase cognitive function development at the beginning (M=5,39, SD=2,43) and at the end (M=6,10, SD=2,20) of the FIE program; t(24)=-2,211, p = 0,037. Contrary, a non-significant difference in the child's estimations of input-phase cognitive function development at the beginning (M=6,425, SD=3,299) and at the end (M=6,841, SD=1,637) of the FIE program; t(20)=-0,598, p = 0,557. There was a non-significant difference in the teachers estimations of input-phase cognitive function development at the beginning (M=4,637, SD=2,463) and at the end (M=4,447, SD=2,292) of the FIE program; t(23)=0,320, p = 0,725.

These results suggest that estimations of mediators, teachers, parents and pupils made at the end of the program were higher than their beginning estimations although only the difference in estimations recorded by mediators and parents reached the statistical significance.

We conclude that our second hypothesis is partially accepted. Although all four groups of assessors recorder progress in the input-phase cognitive functions after FIE training only scores of two groups of assessors (mediators and parents) reached statistical significance.

4.3. Third hypothesis testing

In order to investigate our third hypothesis which states that pupils' progress will be observed on the elaboration level after the one-school year exposure to Feuerstein IE, the results of questionnaire items belonging to elaboration phase were analyzed. The analysis made for each group of fulfillers follows. As with the previous hypothesis testing, incomplete questionnaires were excluded from the analyses, which generated differences in the number of questionnaires, included in the analysis.

Table 7: Beginning and final elaboration-phase cognitive function scores for all fulfillers

	N	Mean	Std. Deviation
teacher_beginning	23	4,6928	2,50570
mediator_beginning	29	4,4497	2,06765
pupil_beginning	21	5,2286	1,35013
parent_beginning	21	5,2036	2,49730
teacher_final	28	4,4446	2,24653
mediator_final	28	5,6890	1,65374
pupil_final	21	5,9013	1,15272
parent_final	26	5,7606	2,41143
Valid N (listwise)	12		

The estimations of elaboration-phase cognitive functions development were converted into scores and thereafter analyzed. In Table 7 the average scores on all items relating to cognitive functions in elaboration phase are presented separately, for parents, teachers, mediators and pupils in both periods of filling in the questionnaires.

The differences between the two estimations (beginning and final) indicates the evaluation of the pupils' progress. As presented in Table 7 mediators recorded the highest difference between

the estimations made in the two periods of fulfilment (September 2015 and June 2016), followed by pupils, parents and teachers. Only in the latter case we see a reduction in the value belonging to the second (June) answering. To determine whether these differences are statistically significant, we used t-test.

Table 8: Comparison of beginning and final elaboration-phase cognitive functions assessments for all fulfillers

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
teacher beginning - teacher final	,211	2,423	,505	-,837	1,258	,417	22	,681
mediator beginning - mediator final	-1,185	1,745	,330	-1,862	-,508	-3,593	27	,001
pupil beginning - pupil final	-,816	1,743	,400	-1,657	,024	-2,041	18	,056
parent beginning - parent final	-,240	2,038	,456	-1,194	,713	-,528	19	,604

In order to compare the estimations related to elaboration-phase cognitive functions development a paired-samples t-test was conducted. The mean scores from the questionnaires compiled at the beginning were compared with the mean scores from the questionnaires compiled at the end of the program, for all groups of fulfillers. There was a significant difference in the mediators estimations of elaboration-phase cognitive function development at the beginning (M=4,504, SD=2,085) and at the end (M=5,689, SD=1,654) of the program; t(27)=-3,593, p = 0,001. The pupils estimations of elaboration-phase cognitive function development at the beginning (M=5,115, SD=1,336) and at the end (M=5,932, SD=1,210) of the program slightly failed to reach statistical significance; t(18)=-2,041, p = 0,056. There was a non-significant difference in the parents estimations of input-phase cognitive function development at the beginning (M=5,227, SD=2,560) and at the end (M=5,468, SD=2,545) of the program; t(19)=-0,528, p = 0,604. An opposite trend was found in the teachers' estimations. There was a non-significant difference for elaboration-phase cognitive function

development at the beginning (M=4,693, SD=2,506) and at the end (M=4,482, SD=2,121) of the program; t(22)=0,417, p = 0,681.

These results suggest that estimations of mediators, pupils and parents made at the end of the program were higher than their beginning estimations although only the difference in estimations recorded by mediators reached the statistical significance. Only teachers estimations of elaboration-phase cognitive functions were lower on the second assessment, indicating that they observed poorer development of cognitive functions after the one-year attendance of FIE program.

We conclude that our third hypothesis is partially accepted as three of four assessors observed progress on pupils' elaboration-phase cognitive functions at the end of one-year's FIE program.

4.4. Fourth hypothesis testing

Our fourth hypothesis assumed that the progress made by pupils from our sample after the one-school year exposure to Feuerstein IE training would be noticeable on the output level. In order to investigate the evaluations of cognitive functions development on the output level made by mediators, teachers, parents and pupils, the results of questionnaire items belonging to output phase were analyzed and the initial evaluation (questionnaire competed in September) was compared with the final (questionnaire completed in June). The presentation of results follows. Again, incomplete questionnaires were excluded from the analyses.

The estimations of output-phase cognitive functions development were converted in scores and thereafter analyzed. In Table 9 the average scores on all items relating to cognitive functions in output phase are presented separately for all groups of fulfillers, before and after the FIE training.

Table 9: Beginning and final output-phase cognitive function scores for all fulfillers

	N	Mean	Std. Deviation
teacher_beginning	25	4,5073	2,22547
mediator_beginning	29	4,2161	2,22833
pupil_beginning	19	5,6149	1,74397
parent_beginning	26	5,2596	2,20346
teacher_final	27	4,8327	2,32697
mediator_final	27	5,3327	1,60345

pupil_final	23	5,7464	1,91671
parent_final	26	5,8327	2,18323
Valid N (listwise)	10		

The differences between the two estimations (beginning and final) indicate the evaluation of the pupils' progress. As shown in Table 9 all groups of fulfillers recorded higher development of output-phase cognitive function at the final testing, indicating greater development of cognitive functions in output level after FIE training. Mediators recorded the highest increase of output level cognitive functions after FIE training, followed by parents, teachers and pupils, respectively.

To determine whether these differences are statistically significant, we used t-test.

Table 10: Comparison of beginning and final output-phase cognitive functions assessments for all fulfillers

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
teacher beginning - teacher final	-,240	1,860	,388	-1,044	,564	-,619	22	,543
mediator beginning - mediator final	-1,202	1,846	,355	-1,933	-,472	-3,385	26	,002
pupil beginning - pupil final	-,282	2,586	,593	-1,528	,965	-,475	18	,641
parent beginning - parent final	-,729	1,876	,375	-1,504	,045	-1,944	24	,064

In order to compare the estimations related to otput-phase cognitive functions development a paired-samples t-test was conducted. The mean scores from the questionnaires compiled at the beginning were compared with the mean scores from the questionnaires compiled at the end of the program, for parents, teachers, mediators and pupils. There was a significant difference in the mediators estimations of output-phase cognitive function development at the beginning (M=4,130,

SD=2,262) and at the end (M=5,333, SD=1,603) of the program; t(26)=-3,385, p = 0,002. The parents estimations of output-phase cognitive function development at the beginning (M=5,078, SD=2,041) and at the end (M=5,807, SD=2,224) of the program slightly failed to reach statistical significance; t(24)=-1,944, p = 0,064. There was a non-significant difference in the teachers estimations of output-phase cognitive function development at the beginning (M=4,380, SD=2,268) and at the end (M=4,620, SD=2,152) of the program; t(22)=-0,619, p = 0,543. Similarly, a non-significant difference was found in the child's estimations of output-phase cognitive function development at the beginning (M=5,615, SD=1,744) and at the end (M=5,897, SD=2,022) of the program; t(18)=-0,475, p = 0,641.

The described results suggest that estimations of mediators, teachers, pupils and parents made at the end of the program were higher than their beginning estimations though only the difference in estimations recorded by mediators reached the statistical significance. Although it should be noted that the estimates made by parents were close to reach statistical significance.

Based on the results we conclude that our fourth hypothesis is partially accepted as only mediators' observation of the progress was significant. Parents, pupils and teachers reported higher development of output-phase cognitive function after FIE training, but the differences with the estimations made before FIE training did not reach statistical significance.

5. CONCLUSION

Feuerstein method is poorly known in Slovene educational system. CKSG is the only institution in Slovenia, which has trained professionals (mediators), certified by Feuerstein Institute and takes care for the spread and dissemination of the method within Slovenia school system.

As it is believed that Feuerstein approach has a potential to help children under the care of CKSG, the method was used from 7th September 2015 to 19th June 2016. 10 mediators participated and trained 32 pupils with FIE once a week. The progress of the pupils was monitored, initial and final evaluation was carried out with standardized test and questionnaires developed especially for the project. For the assessment of cognitive functions three questionnaires based on the description of cognitive function according Feuerstein method were developed. One questionnaire was designed for pupils, one for parents and one for teachers and mediators.

Quantitative research methodology was applied to verify four preset hypothesis.

The first hypothesis stated that pupils will show progress in the area of verbal comprehension after the one year training with FIE. Four subtests from WISC-III Verbal Comprehension Index were selected to access verbal comprehension ability – general knowledge, similarities, vocabulary and comprehension. A paired sample t-test used to compare verbal comprehension scores before and after the training showed a significant difference. Giving this we accepted our first hypothesis.

In the second hypothesis, we assumed that pupils' progress will be observed on the input level. For verifying it, items related to input-phase cognitive functions were analyzed for each group of fulfillers (mediators, teachers, parents and pupils) for both assessments (beginning and final). Results showed that all fulfillers recorded higher development of input-phase congnitive functions at the second testing. With t-test we discovered that only the difference in estimations recorded by mediators and parents reached the statistical significance. Based on those findings we partially accepted our second hypotheses.

The third hypothesis assumed that pupils' progress will be observed on the elaboration level. Mediators', pupils' and parents' final estimations of elaboration-phase cognitive functions were higher than their beginning estimations. Contrarily, teachers' estimations of elaboration-phase cognitive functions were lower on the second assessment. T-test showed that only the differences recorded by the mediator were significant. Based on the results we partially accepted our third hypothesis.

In the fourth hypothesis, we stated that progress will be observed on the pupils cognitive functions in output phase. The output-phase cognitive functions estimations made by all groups of assessors after the FIE training were higher than their beginning estimations although only the difference in estimations recorded by mediators reached the statistical significance. We concluded that our fourth hypothesis is partially accepted.

Summarizing, the progress in the functioning of pupils involved in the project was confirmed by standardized WISC-III SI as well as with questionnaires for the assessment of cognitive functions. The evidence acquired with the administration of WISC-III SI and mediators' assessments of cognitive functions in all 3 phases (input, elaboration and output) were the most convincing, as beginning and final estimations differed on a statistically significant level and proved the pupils progress. Also parents and pupils final estimations of cognitive functions in input, elaboration as well as output level were higher than their beginning estimations although failed to reach statistical significance. Teachers' results are different - when assessing input and output-phase

cognitive functions their observations were in accordance with other assessors (mediators, parents and pupils) but their assessment of elaboration-phase cognitive functions had an opposite trend compared to other 3 groups of assessors. Teachers recorded poorer development of elaboration-phase cognitive functions after the one-year FIE training. This difference could be due to worse conditions for assessment. In Slovenia we usually have around 30 pupils in each classroom, therefore teachers may had difficulties to estimate pupils' cognitive functions, especially in elaboration phase as they are the most hidden and as such, difficult to observe in groups and without adequate knowledge.

Concluding, we have implemented the Feuerstein programs in Slovene school system and demonstrated its positive impact on the functioning of pupils with special educational needs. The experience gained during the project was satisfying for all the people that were involved. In fact they expressed the desire to continue with this method of work also in the future.

Results confirmed the progress in the functioning of pupils involved in the project. We can conclude that Feuerstein method had a positive impact on the functioning of pupils with various educational needs.

6. RECOMMENDATIONS

The deficiencies that impede performance on cognitive tasks for SEN students are amenable to mediation.

FIE ensures the development of intrinsic motivation, an underpin of progress in cognitive functioning in coping when the subject does not know what to do, but are mobilized to understand, act, evaluate and capitalize.

FIE program sub-objectives are intended to correct deficient cognitive functions that are characteristic to cognitive behaviour of individuals with low performance due to cultural deprivation.

Reseraches on FIE application show strong positive results in a variety of academic and nonacademic areas. A regular and systematic integration of cognitive strategies should become a part of the curriculum for children with special educational needs at all ages.

Altered teachers' beliefs about the modifiability of students' learning abilities and improvement of their teaching skills after application of FIE. Special educational needs children should develop not only basic cognitive functions but learning should involve also high-order thinking skills and strategies.

Review of the studies and researches shows that appropriate teacher training (both pre-service and in-service) has a crucial impact on students‘ cognitive functions development and academic achievements. Inclusion of critical thinking training strategies in teachers‘ education programs would have positive impacts in education of children with special educational needs. Teachers training on content-free FIE cognitive materials is essential for the success of the intervention.

The Feuerstein Instrumental Enrichment program could be beneficial to the hearing impaired, even, if started in late adolesence.

Data and reports indicate that the FIE experience impacts teacher-student relationships. Introduction to Feuerstein‘s Instrumental Enrichment Program and Mediated Learning influences teachers‘ attitude to significance of thinking strategies development. Teachers‘d „untied“ from curriculum and exam results and get more freedom to focus not only on academic achievements but also on teaching as a process facilitating students‘ cognitive development and thinking skills.

Slovene research revieled that after one year training with FIE pupils showed a progress in the area of verbal comprehension. Pupils’ progress in input, elaboration and output levels was not statistically significant. Therefore, to have more significant impact on pupils’ cognitive development application of FIE program should be more intensive or take a longer period.

During and after the implemenation of the FIE program parents should be exposed to child‘s success in order to modify their levels of expectation and image of their child. Positive changes and better achievements motivate parents to go on mediated learning in everyday life interacting with the child.

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