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SCHOOL ADJUSTMENT OF BORDERLINE INTELLIGENCE PUPILS

- summary of doctoral thesis -

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Contents

Chapter 3. Research objectives. Methods Used to Identify Borderline Retarded Pupils

We have set the following **objectives** for the thorough study of the problems of borderline children and for the development of methods that could assist psychologists in helping such children:

1. To analyze the characteristics of borderline pupils from the point of view of:
   a. school results;
   b. their attitude towards school;
   c. the way they integrate into the community;
2. To study some of the factors that influence such children's school adjustment; we had in view factors regarding: a. family;
   b. children's cognitive characteristics;
   c. metacognitive strategies used;
3. To organize formative psycho-pedagogical experiments in order to develop certain cognitive functions and to improve the school results of borderline pupils.

The research was carried out over a period of five years (from November 1997 to June 2002), at the "Teodora Lucaciu" School in Vulcan and the "I. G. Duca" School in Petroşani, Hunedoara County.

Each stage of the research required **the identification of normal intellect pupils, borderline and mild retarded ones**. In the diagnosis of borderline intellect the psychometric and school proficiency criterion was used. For this purpose two intelligence tests were used: the NEMI test and the Raven's (Standard) Progressive Matrices.

The NEMI test (Nouvelle Echelle Metrique de l'Intelligence) is an adapted form of the Binet's Metrical Scale of Intelligence, developed by R. Zazzo in cooperation with M. Gilly and M. Verba-Rad, in 1966. Those who use the psychometric criterion state that borderline intellect IQs range between 70 and 79 / 90. Taking into account the notes in DSM IV^{TM} (2000, p. 33)[1] saying that: there is a certain error of measurement of approximately 5 points in evaluating the IQ", we have classified as borderline pupils the ones
whose IQ ranges between 65 and 84. Besides the psychological examination results we also took into account each pupil's school results. Considering these two criteria, the examined pupils were divided into three categories:

- mild retarded pupils, who scored very low school and NEMI test results (IQ < 65);
- borderline pupils whose IQ ranges between 65 and 84 and whose school results are poor;
- normal intellect pupils that scored an IQ higher than 84 on the test. In the case of these subjects we did not take into account school results because these do not depend only on the intellectual level, but also on motivation, perseverance etc.

The Standard Progressive Matrices test was elaborated in 1938 by J. C. Raven and L. S. Penrose. For this test we have elaborated a local standard (table 1).

Age	9 years	10 years	11 years	12 years	13 years	14 years	15 years
Centile	Scores	Scores	Scores	Scores	Scores	Scores	Scores
5	9	9	12	15	15	15	17
10	14	12	15	21	21	22	26

[1] This note can also be found in other Psychology and Psychiatry textbooks, e.g. DSM – III R.

20	16	14	19	27	26	33	31
25	17	16	21	31	30	35	35
30	19	18	22	33	32	37	37
40	22	23	27	35	34	40	39
50	25	26	32	38	39	43	41
60	28	30	34	40	42	46	45
70	32	33	37	42	45	49	47
75	33	35	38	43	46	50	48
80	34	37	40	44	47	51	48
90	37	41	44	48	50	52	51
95	39	44	46	50	52	53	53
Nr.S	69	148	162	158	126	110	42

Table 1. The MP-s test standard

The examined students were divided into three categories:

- mild retarded pupils, who scored very low school and MP-s test results (up to centile 5);
- borderline pupils, whose score ranged between 5 and 20 and whose school results are poor;
- normal intellect pupils that scored higher than 20 on the test.

Chapter 4. The Study of School Adjustment of Borderline Pupils

4.1. Subjects and Methods

The main **sample** was made up of 537 pupils, 399 of which were normal intellect pupils and 138 – borderline intellect pupils. During certain stages of the research, depending on the aim we had in view, smaller groups were extracted from these samples, or mild retarded pupils from the classes studied were added to them.

The following **methods** were used during the research:

- the study of school documents;
- reading, writing and mathematics tests;
- questionnaires for the teachers requesting them information regarding the level of knowledge of some pupils;
- the sociometric test created by J. L. Moreno;
- the statistical comparisons were carried out based on the χ^2 test, the Z test, the Student test (t), the Kolmogorov-Smirnov test and the statistical test for two independent samples (I. Radu, 1976; V. Clocotici & A. Stan, 2000).

4.2. Analysis of Research Data on Borderline Pupils' Pedagogical Adjustment

4.2.1. Transversal Analysis of School Results Obtained by Borderline Pupils

A. Pedagogical adjustment of pupils in the first four grades. At the end of each school year we extracted from the rolls the marks received by primary school pupils in Romanian and Mathematics. In both subjects the results of borderline pupils were significantly poorer than those of normal intellect pupils. In these classes, the number of borderline pupils who have to go in for a second examination is higher compared to that of normal intellect pupils. Although borderline pupils' school results are much poorer than those of normal intellect pupils, the number of borderline pupils failing to get their remove is quite low. By giving primary school pupils poor marks and by having them sit for a second examination, the teachers draw the pupils' and their parents' attention on their school problems. However, the teachers avoid letting pupils fail in getting their remove.

For borderline pupils the first two grades are the most difficult. After having assimilated basic knowledge they meet the requirements of the third and fourth grades more easily.

To find out the level of knowledge of borderline pupils in the first three grades in Romanian and Mathematics, we analysed their results on our tests, as well as the opinions of the teachers who filled in several questionnaires. The level of knowledge of these children was compared to that of normal intellect children.

At the end of the first grade, borderline pupils do not know all the letters and letter clusters, they have difficulty in reading, they do not understand the text they have "read". Most of them do not write on dictation and those who do, make very many mistakes. In Mathematics they manage to count objects up to ten and they know the numbers. They have difficulty in counting from 10 to 1; they do not understand

the order relation among numbers; they find it difficult to make additions and subtractions; it is also very hard for them to understand and solve Mathematics problems.

In the second grade progress is low. Borderline pupils now assimilate some of the knowledge their normal intellect colleagues assimilated in the first grade. At the end of the second grade, they still have difficulty in reading, they still do not understand quite well what they have read, they find it hard to express themselves in writing and they make many mistakes when writing on dictation. They also have difficulty with addition, subtraction, multiplication and division. It is also very hard for them to solve the problems in Mathematics textbooks.

In the third grade there is some improvement in their abilities to independently write a text in Romanian; borderline pupils' spelling is more accurate and they use punctuation marks better than in former grades. They still have difficulty in reading: first they read letters or syllables and only then connect the letters (syllables); they have difficulty in understanding the text they read, in answering questions about the text or in retelling what they read. In Mathematics approximately 25%of the borderline pupils manage to make additions and subtractions but they still have difficulty with multiplication and division, as well as in solving problems.

B. Pedagogical adjustment of middle school borderline pupils. Middle school borderline pupils have significantly poorer school results (expressed by their general average and by their average in Romanian and Mathematics) than their normal intellect colleagues. The number of borderline pupils who have to go in for a second examination or who failed to get their remove is much higher than that of normal intellect pupils in the same situation. The number of borderline pupils who pass the competence exam is significantly lower compared to that of normal intellect pupils.

4.2.2. Longitudinal Analysis of Borderline Pupils' Pedagogical Adjustment. In order to better understand the evolution in school of borderline pupils compared to that of normal intellect pupils, we carried out a longitudinal analysis. The sample used consisted of 143 normal intellect pupils and 31 borderline intellect pupils who, by the time all the data was collected, should have attended all the eight grades.

Analysing the data in registration certificates we came to the conclusion that only 50% of the borderline pupils manage to attend the eight compulsory grades in eight years. Even those who do, have many difficulties: 50% have to sit for a second examination at least once. 50% of the borderline pupils do not graduate after 8 years, either because they drop out of school before time, or because, failing to get their remove several times, they turn 16 / are two years older than the pupils in the grade they should be in.

Even if they graduate, their chances to pass the competence exam are quite low; only approximately 25% of them manage to pass it and get the right to learn a trade in a vocational school.

4.3.Analysis of Data Reflecting Borderline Pupils' Attitude towards School

In order to gather information on these pupils' attitude towards school, we compared the number of absences without leave, the marks in behaviour and the number of drop-outs, with the same data on normal intellect pupils.

In the $1^{st} – 6^{th}$ grade the number of absences without leave of borderline pupils is significantly higher than that of normal intellect pupils. In the 7^{th} and 8^{th} grade, the difference is no longer statistically significant because normal intellect pupils have many such absences. Borderline intellect pupils' behaviour marks are not lower than other pupils', which shows that infraction of discipline in their case is neither more frequent, nor more serious than in the case of normal intellect pupils.

The number of borderline pupils who drop out of school is significantly higher compared to that of normal intellect children. They most frequently quit school when they are in the 5^{th} or 6^{th} grade. The causes for this can only be determined clearly in the case of children who quit school during the school year. Those who do not show up at beginning of the school year are most frequently children who quit school, but also children who were "suggested" to continue their studies in distance learning schools, in accordance with articles 6 and 21 (2) in the Law of Education (1995)[1]. Borderline pupils quit school when

[1] Art. 6. General compulsory education lasts for 8 years. Compulsory attendance of 8 grades ends when the person turns 16.
Art. 21. (2). Exceptionally, general education may also take the form of night school or without attendance in the case of persons who are more than 2 years older, than their classmates.

they were about 2 years and 4 months older than their classmates. Normal intellect pupils who quit school reached this point sooner, when they were only 1 year and 10 months older than their classmates who had never failed in getting their remove. This could show the fact that some borderline pupils might have wanted to continue their studies.

4.4. Analysis of Interpersonal Relationships between Borderline Pupils and Their Classmates

In order to analyse borderline pupils' relationships with their classmates, we used **the sociometric test created by J. L. Moreno**. The test was carried out in 8 different classes. The pupils were asked to answer two questions meant to highlight the likes and dislikes in the class: "If classes were to be reorganised, name three of your present colleagues whom you would / would not like to be with in the new reorganised class and state the reason why".

Of the many sociometric indices that can be calculated we used the Preferential Status Index. This can be calculated using the following formula: $\frac{S-R}{N-1}$, where S shows how many selected the respective pupil, R shows how many rejected him / her and N stands for the number of people in the group who answered the questions of the test (U. Şchiopu, 1997, D. Grama, 1974). In order to determine to what degree borderline pupils integrate into their class, we compared the mean of the Preferential Status Index of these pupils with that of normal intellect and mentally retarded pupils.

Borderline pupils (both boys and girls) are **rejected** by more colleagues than their better classmates. There are no significant differences between the sociometric position of borderline and mild retarded pupils in mass schools. Such pupils are rejected by more classmates and are selected by very few.

The attitude towards borderline pupils is more negative in the 3rd and 5th grade. Starting with the 6th grade there are no longer significant differences between the sociometric positions of these pupils and those of normal intellect pupils. This change in the attitude towards borderline pupils can be accounted for by the fact that the pupils who have the most serious social adjustment problems, and who are also the most rejected, drop out of school. The borderline pupils in higher grades are those who have a greater ability to adapt. At the same time, one can notice a stronger feeling of belonging to the class and a stronger desire to be better integrated into the group, which can increase their tendency to comply with the norms set by the group.

Analysing the reasons given by borderline pupils for their choices we noticed that these are no different from the reasons why they themselves are selected or rejected by their classmates. Borderline pupils state that they would rather be in the same class with pupils of the same sex who are willing to offer them "emotional support", that is, they are understanding good friends and help them in case of need. They are selected by some of their colleagues for the same reasons. Borderline pupils reject those pupils who do not behave properly in their relationships with teachers and other classmates and have very poor school results; in turn, they are rejected for the same reasons. The great similarity of the reasons why borderline pupils reject their classmates and are in turn rejected could be accounted for by their **reduced capacity of becoming aware of their behaviour problems** and of inhibiting their undesirable behaviour.

Considering the number of and the reasons for the selections and rejections made and received by borderline pupils we have identified four categories of pupils who differ from the point of view of their way of adjusting to the group.

Positive status pupils (18,60% of the borderline pupils) – these pupils, although they have poor school results, behave well; this is why they are not rejected by their colleagues and are even selected by a few. They are appreciated because they are considered to be understanding, good friends, obedient, attentive in class. They are well adapted to the group.

Mixed status pupils (39,53% of the borderline pupils) receive both selections and rejections. Their capacity of social adjustment can be rated as average.

Isolated or almost isolated pupils (18,60% of the borderline pupils). They were selected or rejected once at best, which shows that they are poorly integrated into the group.

Negative status children. The pupils in the worst situation are those borderline pupils (23,25% of the studied sample) whose low intellectual level is associated with behaviour disorders. These children are not selected by anybody and are rejected by very many of their classmates. They are not rejected because of their bad school results, but because they cut classes, because they are bad, cheeky with the teachers, because they swear, pick fights and, in the 7th and 8th grade, pick on the girls in their class.

Conclusions

The data provided by this research showed that **borderline pupils have serious school adjustment problems**. Taking into account the significant differences between the school results of borderline pupils and those of normal intellect pupils we can state that, in mixed classes, **borderline pupils form a distinct category from the point of view of school results**. They assimilate knowledge at a slower pace than normal intellect children; their progress rate is behind the requirements of their curriculum. What is important, is the fact that the knowledge
assimilation rate is similar in the case of most of these pupils. Thus, **their intellectual and school progress can be predicted to a certain extent**. Knowing the specific features of their evolution in school, one can make more realistic demands concerning them in order to prevent failure and all its negative consequences. Such demands can be formulated in a differentiated curriculum.

We cannot state that borderline pupils' attitude towards school is more negative than that of their normal intellect classmates. The greater number of absences without leave may, on the one hand, be a sign of their frustration in an environment whose demands are beyond their adjustment abilities, and on the other, show the lack of interest of these pupils' families regarding attendance and the inefficient character of their control. Quitting school is not always a sign of a negative attitude towards school.

Many borderline pupils have **great difficulty in adapting to their classmates**. Both the boys and the girls have a significantly lower sociometric status than their normal intellect classmates. Approximately 20% of them are isolated within the class and 25% are strongly rejected by their colleagues. Children's attitude towards them is more negative in the $3^{rd} – 5^{th}$ grade. The reason why they are rejected by their colleagues are the same with the reasons why they themselves reject others. This demonstrates the difficulty these pupils have in becoming aware of their interpersonal relationship problems and in developing socially acceptable behaviour. The difficulty of integrating into the class sometimes contributes to their dropping out of school.

Chapter 5. Analysis of Certain Factors that Influence Borderline Pupils' School Adjustment

The facts presented in the previous chapter showed the school adjustment problems of borderline pupils. There are very many social, psychological, pedagogical factors that bring forth such problems. For the thorough study of some of these factors we have organised another research in order to:
- gather information on the specific features of the home environment of such children;
- see some of the cognitive characteristics of borderline children;
- understand haw they use metacognitive strategies when learning.

The research was carried out at the "Teodora Lucaciu" School in Vulcan, Hunedoara County.

5.1. Analysis of the Investigation Data on the Characteristics of the Home Environment of Borderline Pupils

The group used to contrast the social status of borderline children's families with that of normal intellect children's families, was made up of 454 subjects, 110 of which were borderline pupils and 344 normal intellect pupils. The families live in the same area and the children attend the same school. **The method** used was the study of school documents, that is, teachers' rolls, which gave us information on the occupation of the parents. The data showed that **borderline pupils come from lower social status families** than normal intellect children. Their fathers have jobs that require a lower level of education than the jobs of normal intellect pupils' fathers. Among the mothers of borderline pupils, there are significantly more housewives and unemployed workers than among the mothers of normal intellect children.

For a more thorough study we created a **smaller group** of 51 borderline pupils and 62 normal intellect pupils. We also interviewed their parents at their homes, on the basis of an interview guide in order to gather more information on the families borderline pupils come from. The data showed that these families share many **similarities**:
- in the families of borderline pupils the number of "special" problems (divorce, child abandonment etc.) is not greater than in the families of pupils with a higher intellectual level;
- the number of family members, the living conditions and the cultural environment are similar;
- borderline pupils and their families do not have more health problems;
- the image of borderline children, from the parents' point of view, is similar to the image of normal intellect children. The children in the two groups are described in a similar way by their parents in terms of their sociability and their tendency to be communicative, hardworking, obedient or persevering. The only important difference is that *borderline pupils are considered to be more*

impatient and more restless. Despite this, the parents of borderline children do not state the existence of serious disciplinary problems and do not punish their children differently.

Although the families of the children in the two categories are in many ways similar, there are also very important **differences** between them:

- there is a great difference in the **parents' attitude towards intellectual activities**. As their own intellectual level is (probably) lower, the parents of borderline children:
  - do not consider it important to intellectually stimulate the child before he / she starts school;
  - although they do not show lack of interest in their children's school results, the way they help children with their homework is not really efficient;
- the parents of borderline children tend to overestimate the children's intellectual level, and in many cases, their school results, too. We believe this is due to the fact that the parents have a similar intellectual level. They themselves do not understand many of their children's school problems and when they were pupils they had similar school results. **Many parents of borderline children do no see the intellectual and school problems of their children as being a problem**. They accept the child's school results as being something normal and do not undertake anything in order to improve them.
- their parents' attitude may be one of the reasons why borderline pupils have a more negative attitude towards school activities than their colleagues with a higher intellectual level. They allot significantly less time to studying than normal intellect pupils.

5.2. Analysis of Cognitive Characteristics of Borderline Pupils in the First Two Grades

The research was carried out on 86 pupils in the 1st and 2nd grade. The following **methods** were used:

- the NEMI test and a non-verbal test from the Binet's Metrical Scale: the lottery game;
- the "Draw-A-Man" test created by F. Goodenough;
- operational psycho-genetic tests: the evaluation and conservation test (conservation of number and length) (B. Inhelder, H. Sinclair, M. Bovet, 1976);
- knowledge tests in Romanian and Mathematics;
- questionnaires filled in by the teachers who assessed the level of knowledge of their pupils.

A. Cognitive Characteristics of Borderline Pupils in the 1st and 2nd Grade

Analysis of results on the NEMI and on the lottery game.

Borderline pupils' mental ages lag behind the mental age of normal intellect pupils. The mental age of those in the 1st grade is of 7 at best and of those in the 2nd grade – of 8. 50% of the normal intellect pupils are over these mental ages.

Analysing the NEMI test items and the lottery test we realised that the greatest **differences** between borderline and normal intellectual pupils in the 1st grade are the following:

- regarding verbal abilities – borderline pupils have a smaller *vocabulary*; when they are requested to say what they see in a picture, they only *enumerate* some of the objects seen, instead of describing the actions;
- their thinking is *rigid* and has a low degree of reversibility; they have difficulty in making *comparisons*, that is in noticing differences, if the objects are only verbally indicated to them and not placed before them;
- they have a reduced capacity of *using* their ability to count and calculate in situations new to them;
- the capacity of their short-term memory is more *limited*;
- almost half of the borderline children show immaturity of the sensorimotor function.

The borderline pupils in the 2nd grade have almost the same problems as those in the 1st grade:

- their thinking is more *rigid* and less reversible compared to normal intellect pupils in the same class;
- the capacity of their short-term memory is more *limited*;
- they have difficulty in applying their Mathematics knowledge outside of school;
- time orientation of borderline pupils is poorer than that of normal intellect pupils.

The "Draw-A-Man" test. This test indicates that intellectual maturation is slowed down in the case of children who were classified as borderline on the NEMI test, as compared to normal children. The body shape drawn by borderline children is simpler, less elaborate than that drawn by their classmates with a higher intellectual level.

Operational tests. Preoperational children give correct answers to the items of tests only if there is no change in appearance. When there is a change in appearance, pupils in the transition period ("intermediary") sometimes realise that number and length do not vary and sometimes they do not realise that. For operational children number and length remain constant, irrespective of the changes in appearance.

Almost all *borderline pupils* in the 1st grade (81,8%) and 41,6% of those in the 2nd grade are in the preoperational period. None of them is operational in the 1st grade and in the 2nd grade only 33,3% of them reach this level. The other children are "intermediary".

Only 9% of the *normal intellect pupils* in the 1st grade are still in the preoperational period and none of them are preoperational in the 2nd grade. Most of these pupils are operational: 59,9% in the 1st grade and 75% in the 2nd grade.

B. The Relationship Between the Cognitive Characteristics and the Level of Knowledge of Pupils in the First Two Grades

There is a statistically significant relationship between the mental age of the children, established by the NEMI test, and the operational period they are in: up to the mental age of 6 the child is preoperational; the period of concrete operations starts when the child passes this limit. Starting from these observations we wished to study the relationships among the pupils' mental age, the operational period they are in and their level of knowledge. These relationships were analysed globally, without distinguishing between borderline and normal intellect children. The following relationships were found:

- children whose mental age in the first two grades is up to 6 and / or are preoperational do not succeed in learning how to read, write and calculate;
- those whose mental age ranges between 6 and 7 years and / or are closer to the period of concrete operations have poor results in Romanian and Mathematics.
- pupils who have passed on to the period of concrete operations and whose mental age is over 7 assimilate quite easily the things taught in the first two grades.

5.3. Analysis of Metacognitive Strategies Used by Borderline Pupils

Knowing what the learning difficulties of borderline pupils are, compared to pupils whose level of intelligence is higher, we assumed that these are due not only to a low cognitive level, but also to inadequate metacognitive strategies.

In order to gather information on the metacognitive strategies used by borderline pupils we examined **a group** of 36 pupils in the 7th grade (8 borderline pupils and 28 normal intellect pupils). In order to compare the ways of memorising / learning used by the two categories of pupils we used **4 lists of 15 words each**, containing highly used words. Several lists were used in order to prevent pupils from influencing one another.

The subjects were examined individually. Each subject was given a list of words and the following instruction: "Please read these words carefully and memorise them. When you are sure you know them all, please let me know so that I can check. You don't need to say them in the same order as on the list". Without the pupils' knowing it, the time allocated to memorising was measured. All the words said by the children were written down, even those mentioned twice and those that were not on the list. Then the children were requested to explain, as accurately as possible, how they had learned the words and what methods they had used in order to memorise them.

We observed that the **metacognitive strategies** used by borderline pupils are **less efficient** than those used by their classmates whose intellectual level is higher. They are not aware of their reduced learning potential; this is why:

- they tend to underestimate the task and they do not allot enough time for learning / memorising; the "physical" time is not shorter than that used by normal intellect pupils, but it is too short considering their learning abilities;
- borderline pupils end the learning process too soon because the feeling of knowing appears too soon;
- although they spontaneously use several efficient learning strategies (they do not just read the material they wish to learn, but they also realise that they must review it; they split it up and learn it by bits; they use the active reproduction method; after they have learnt, they try to check their knowledge), they learn mechanically, without trying to establish logical relationships between the parts of the materials they are learning.

5.4. Conclusions

The school problems of borderline pupils can be accounted for (besides many other factors) by some features of their home environment and by their intellectual characteristics.

A. These children's school results are negatively affected by the following characteristics of their home environment:
- the lower social status of the family;
- the parents' less favourable attitude towards intellectual activities;
- the parents' reduced ability to become aware of their children's intellectual and school problems;
- reduced intellectual stimulation during the pre-school period;
- low efficiency of parents' help with homework;
- children's negative attitude towards learning activities in school;
- little time allocated to doing homework;
- children's impatience and restlessness, which makes doing homework more difficult.

B. In the first two grades, poor school results are due to the following cognitive characteristics of borderline children:
- their mental age lags behind that of normal intellect children;
- their thinking is still in the preoperational period;
- their verbal abilities are poor, their vocabulary is smaller;
- the capacity of their short-term memory is more limited;
- the sensorimotor function is less developed;
- their ability to apply their knowledge is rather reduced.

C. Borderline pupils use less efficient metacognitive strategies than
- their normal intellect classmates:
- they do not allot enough time to learning / memorising;
- the "feeling of knowing" appears too soon, before they manage to actually learn something;
- they learn mechanically, without trying to establish logical relationships between the parts of the material they are learning.

Chapter 6. Carrying out Formative Psycho-Pedagogical Experiments in Order to Ensure the Development of Cognitive Functions and Improve Borderline Pupils' School Results

The research that we have carried out demonstrated the following:
- borderline pupils in the first two grades have much poorer school results than normal intellect pupils;
- most of them are in the preoperational period;
- there is a close relationship between the operational period and the level of knowledge the pupils can assimilate;
- borderline children in the first two grades have a small vocabulary; they have difficulty in expressing themselves and applying their knowledge to other fields;

Based on these observations we assumed that the school results of borderline pupils in the first two grades could be improved if they were helped:
- to reach the period of concrete operations sooner;
- to assimilate the systems of notions and develop the verbal skills that are fundamental in the process of learning in the first two grades.

With these aims in view we organised two formative psycho-pedagogical experiments. The first relied on the research carried out by W. Doise and G. Mugny, and the second was a version of the Concept Teaching Model developed by M. Nyborg.

6.1. Carrying out a Formative Psycho-Pedagogical Experiment to Accelerate the Transition From the Preoperational Period to the Period of Concrete Operations

6.1.1. Hypothesis, Subjects, Stages and Methods of Research

Hypothesis: if borderline pupils in the preoperational period take part in social interactions that involve sociocognitive conflicts, sharing and social marking, significant progress will appear both in the operational structures of their thinking and in their school results.

Subjects. The experiment was carried out on 18 borderline pupils in the first two grades. They were divided into two groups: an experimental group and a witness group. The pupils were divided in such a way that each pupil in the experimental group had a correspondent with similar results on the NEMI test in the witness group.

The research was carried out in **4 stages:**

1. **In the first stage (the pre-test)** we administered the tests based on which we assessed the pupils' intellectual level (the NEMI test and operational tests) and we also assessed the pupils' knowledge in Math.
2. **In the second stage** the pupils in the experimental group were involved in four activities whose aim was to stimulate their intellectual development.
3. **In the third stage (the first post-test)** the pupils were once more submitted to the operational tests and their knowledge in Romanian and Mathematics was assessed.
4. **In the fourth stage (the second post-test),** a year after the activities had come to an end, the pupils were again subject to the NEMI test and their knowledge in Romanian and Mathematics was assessed again.

Methods of Research

A. Methods used to evaluate pupils during the pre-test, the two post-tests and in statistical data processing.

1. In order to determine the children's intellectual level we used the NEMI test and three operational tests: conservation of number, conservation of equal length and conservation of unequal length.
2. To assess the pupils knowledge we used knowledge tests in Romanian and Mathematics and questionnaires filled in by teachers.
3. For the statistical comparison of the results obtained by the subjects in the experimental and control groups on the pre-test and on the two post-tests we used the Wilcoxon test and the McNemar test.

B. Methods used to stimulate intellectual development. In the second stage of the research, the pupils in the experimental group were involved in four activities. These activities took the form of games. The children in the control group were involved in similar activities (in the same room, with the same toys), but the independent variables whose effects were studied were not used.

1. The first problem the children in the experimental group were faced with was the conservation of equal length. The independent variables were *the sociocognitiv conflict* and *the conflict of centrations*.
2. The second activity referred to the conservation of volume. The independent variable was *the sociocognitiv conflict*. To create a sociocognitiv conflict situation we confronted a non conserver child with a conserver one.
3. The third activity referred to the conservation of unequal length; the factors used to stimulate cognitive restructuring were *the sociocognitiv conflict* and *social marking*.
4. The last "game" was a test regarding the conservation of number, accompanied by *social marking*.

6.1.2. Analysis and Interpretation of Results

A. Comparative Analysis of Pre-test and First Post-test Results

A_1. Comparative analysis of results on operational tests. During the time of the experiment no pupil slid back from "intermediary" to "preoperational", but they did not pass on to the concrete operational stage either. In the experimental group 66,66% of the pupils made progress; they started giving answers showing conservation. Although they did not pass on to the concrete operational stage, they came closer to it. At the end of the experiment, the operational level of all the pupils in the control group was the same as in the beginning. This indicates that the progress of the pupils in the experimental group is due to the variables used in the four activities they were involved in.

A_2. Comparative analysis of the pupils' knowledge of Mathematics on the pre-test and the first post-test. Using the Wilcoxon test we compared the progress made by children in the experimental group and in the control group and we came to the conclusion that the result is not statistically significant ($T^* = 9,5$; $p > 0,05$). The formative experiment caused significant reorganisation in the thinking of most subjects, without leading to immediate improvement of their results in Mathematics.

B. Comparative Analysis of Results on the Pre-test / First Post-test and on the Second Post-test

B_1. Comparative analysis of results on the NEMI test, the pre-test and the second post-test. Comparing the results of the pupils in the experimental and control groups on the NEMI test, in the first and last stage, we observed significant differences in the way the intellectual level in the two groups had evolved ($T^* = 3$; $p < 0,05$). Within the experimental group the IQ increased significantly in 4 cases (44,44%) with at least 8 points. In the other cases the IQ remained unchanged. Within the control group the intellectual level remained unchanged in 7 cases (77,77%) and diminished in the case of two pupils.

The pupils in the experimental group made significant progress on verbal tests and on mainly sensory tests that examine observation and perceptive analysis. The discussions of preoperational pupils with the examiner / operational pupils had positive effects on the verbal abilities of the children in the experimental group. They learned to express themselves more accurately, ask questions, give explanations, provide arguments.

B_2. Comparative analysis of the level of scholastic knowledge of the subjects in the experimental and control groups on the first and on the second post-test. In order to find out whether getting closer to the concrete operational period helps pupils acquire knowledge more easily, we compared the progress the pupils in the two groups made in Mathematics and Romanian the year after the activities had ended. The comparisons made with the Wilcoxon test indicate significant improvement in the knowledge of Romanian ($T^* = 2$; $p = 0,01$) and Mathematics ($T^* = 6$; $p = 0,01$) of the pupils in the experimental group, compared to those in the control group.

6.2. Carrying out a Formative Psycho-Pedagogical Experiment Based on the Concept Teaching Model Developed by Magne Nyborg

6.2.1.Hypothesis, Subjects, Stages and Methods of Research

Hypothesis: if borderline children in the first grades are involved in activities where they systematically assimilate Basic Conceptual Systems and develop their verbal skills, both their intellectual development and their school results in Romanian and Mathematics will improve.

Subjects. The sample was made up of 16 borderline pupils. Dependent groups were formed: each pupil in the experimental group had his / her pair in the control group. The pairs were chosen in such a way that the difference in the two children's IQ on the NEMI test should not exceed 5 points.

The stages of the research

1. **Stage I (pre-test).** The pupils were subject to the NEMI test and data on their school knowledge was gathered.
2. **Stage II.** The pupils in the experimental group were involved in one or two activities, once a week.
3. **Stage III (post-test).** All the 16 pupils in the group were again subject to the NEMI test and data on their school knowledge was gathered once more.

Research methods

A. Methods used to evaluate pupils on the pre-test and post-test and in statistical data processing.

1. **The NEMI test** was used to determine the children's intellectual level;
2. To determine the pupils level of knowledge of Romanian and Mathematics we used:
   - school documents: teacher's rolls from which the marks received by pupils at the end of the 1st and 2nd grade were taken;
   - questionnaires filled in by teachers at the beginning of the 2nd grade (pre-test) and at the end of the school year (post-test).
3. Statistical data processing was carried out with the Student test (t) for matched data samples, the McNemar test and the χ^2 test.

B. Activities involving the pupils in the experimental group. Before actually starting the activities, it was necessary to elaborate a plan concerning the conceptual systems to be taught. When doing this we took into consideration:

- the indications given by G. Sonnesyn and M. A. Hem regarding the teaching of CTM in their manual: "Grunnlaget" ("The Foundation");
- the cognitive characteristics of borderline pupils in the 2nd grade;
- the school knowledge of borderline pupils in the 2nd grade;
- the syllabus, the textbooks and we also talked to the teachers so that we should use the same concepts they do when teaching.

The plan contained the following **conceptual systems**:

1. Colour – colour red;
2. Linear shapes – rectilinear, curved, angular;
3. Shape – areal shapes: round, triangular, four-sided;
   - spatial shapes: cubic, spherical;
4. Position – horizontal, vertical, sloping;
5. Size – great / small; greater / smaller than…
   - tall / short; taller / shorter than….
6. Place – placed on, under, at, next to, up, down;
   - to the right / left of;
   - placed first, second behind, between, in front of in a row;
7. Group;
8. Numbers in the group:
   identifying the number of elements in a group;
   changing the number of elements in a group;
   changing the number of elements by addition;
   changing the number of elements by subtraction.

Each activity had three fundamental stages: selective association, selective discrimination and selective generalisation. After the assimilation of the first three conceptual systems analytic codification exercises were added to the activities.

6.2.2. Analysis and Interpretation of Results

A. Comparative analysis of results on the NEMI test during the pre-test and post-test. Both within the experimental group and the control group, mental age increased significantly during the experimental period, but there were no significant changes in the IQ level. These data show that changes in the mental age within the experimental group are not due (only) to the activities carried out by the pupils, but also to other factors such as activities in school and outside school, maturation, which are factors that influenced the children in the control group, as well.

Analysing the results on the NEMI test items we observed that the pupils in the experimental group made significant progress on verbal tests and Mathematics tests. The activities helped develop the verbal skills of the children in the experimental group, they helped them become aware of and better express verbally the differences among concepts that were not discussed during the activities. The children's thinking became more flexible and their ability to use their knowledge in other fields improved.

B. Comparison of school results of children in the experimental and control groups on the pre-test and post-test. At the end of the 1st grade there were no statistically significant differences between the marks of the pupils in the two groups. At the end of the 2nd grade such differences began to appear in Mathematics. Comparing the teachers' evaluations we observed that the pupils in the experimental group made significant progress, both in Romanian and in Mathematics. In Romanian, they proved to have greater ability in grasping the meaning of a text. In Mathematics, the pupils in the experimental group made more progress in adding numbers whose sum exceeded 10 than their colleagues in the witness group.

6.3. Conclusions

Both methods proved efficient in activities involving borderline pupils. They can be used with differentiated teaching methods in the case of pupils in the first two grades.

The activities whose aim was to accelerate the transition from the preoperational stage to the concrete operational stage caused significant changes in the structure of the children's thinking and lead to the expansion of the proximal zone of development. They also had positive effects in other fields, different from the situations created during the experiment, and they allowed the children to learn in a more efficient way.

The activities based on the Concept Teaching Model developed by the Norwegian researcher M. Nyborg also proved efficient with different teaching methods in the case of borderline pupils. The thinking of the pupils in the experimental group became more flexible, they improved their ability to make comparisons and to use the things learnt in school in other situations. Their ability to understand the text they read and to do Mathematics also improved.

Chapter 7. Closing Comments

Conclusions of the research

A. In mixed classes, **borderline pupils make up a special category from the point of view of school adjustment**. They are clearly different from normal intellect pupils.

1 Pedagogical adjustment in their case is inadequate. Their school results are much poorer than normal pupils'.
2. Relational adjustment in their case is also inadequate. Their sociometric status is significantly lower than their normal classmates'.
3. Their attitude towards school is not different from normal intellect children's attitude, which represents an important premise for the improvement of their school adjustment ability.

B. **The school problems of borderline pupils can be accounted for** (among other factors) by the features of their home environment and by their cognitive characteristics.

1. The home environment. Most borderline children come from families that have a lower social status than the families of normal intellect children. Their parents show less interest in intellectual activities. Most of them are not aware of the child's intellectual and school problems and do almost nothing to improve things.
2. The mental age of borderline pupils *in the first two grades* lags behind that of children with a higher intellectual level. Many of the former have not yet passed on to the operational stage of thinking; their verbal skills are poorer; the capacity of their short-term memory is more limited; the sensory-motor function is less developed; their ability to apply their knowledge to other fields is also lower.
3. Middle school borderline pupils know and spontaneously use some metacognitive memorising / learning strategies: they divide the material they are learning into fragments, they use the active reproduction method, they check themselves. Despite this, their learning is less efficient because they tend to memorise mechanically and they do not allot enough time to learning, considering their learning abilities.

Recommendations

The results of this research can be used both by psychologists working in the field of education and by teachers.

The research demonstrated that **intellectual development and knowledge assimilation are similar with most borderline pupils**: their intellectual progress and the quality of school adjustment in their case are, to a certain extent, predictable. After determining a pupil's borderline intellect and "drawing" his / her cognitive "portrait", the psychologist can foresee the future problems of the child (e. g. what knowledge he will find it harder to acquire). Based on these data, one can take measures to eliminate or reduce some of these problems.

1. The investigation showed that if the mental age of pupils in the 1st grade is of 6 and / or that they are preoperational, they do not manage to learn how to read, write and calculate. Preoperational children who enter the 1st grade and whose mental age, several months before that, is less than 6 years will most probably not be able to meet any school requirements. In such cases it is better to wait another year before they start school. In this stage borderline children's education should be assisted by a psychologist. The latter, besides other measures, could set up cognitive development stimulation activities similar to those presented in this research study.

2. Borderline pupils can be assigned to homogeneous classes from the point of view of the pupils' intellectual level / school results or they can be assigned to mixed classes. Their integration into such classes is efficient only if different teaching methods are used with them, such as:
   - after teaching the fundamental part of the lesson to the whole class, the teacher may divide the pupils into groups. The good pupils work independently, in small groups, while the weaker ones are helped by the teacher;
   - the teacher can assign different tasks and homework depending on the pupils' level of knowledge (A. Dancsuly, N. Oprescu, G. Văideanu, 1982).
   - optional activities may also be organised to help weaker pupils acquire the knowledge required by the curriculum, develop certain skills, make experiments related to subjects they studied, or not related to them, but useful to them in the future (I. T. Radu, 1974).
   - it is very important to create a differentiated curriculum for borderline pupils, adapted to their abilities. This requires very good knowledge of the pupils it is meant for, so that the requirements should be neither too demanding, or impossible for them to meet, nor below their ability. In the present paper we have shown what knowledge borderline pupils acquire in the first two grades in Romanian and Mathematics. Based on this we have also elaborated a different curriculum (appendix 10 to this thesis).

3. To make school adjustment in the first two grades easier and to prevent (or reduce) school adjustment problems in higher grades, we recommend that special activities be organised to accelerate the transition to the concrete operational period and to help pupils acquire the prerequisites of learning (the Basic Conceptual Systems, verbal skills, the dispositions for becoming emotionally and motivationally activated to learn – according to Nyborg). The experiments we have carried out proved that these activities contribute to the expansion of the proximal zone of development, making it easier to acquire knowledge in school.
4. Borderline pupils have difficulty in organising their learning. They need help in learning how to learn.
5. Many borderline pupils find it hard to integrate into the class. The measures taken to support their integration must consider the fact that these pupils are not quite aware of their behaviour problems. they need help in becoming aware of them and restraining their impulsive behaviours.

Finally, we need to draw attention on the fact that **reducing borderline pupils' school adjustment problems depends mostly on the change in their parents' attitude towards school activities**. Such a change is extremely important, but also very hard to make.

To ensure the efficiency of the different teaching methods used with borderline pupils, it is necessary for teachers and parents to have as many data as possible on their mental characteristics, and their learning ability, as well on the way they could be helped. The psychologists and specialists in the field of Special Psycho-pedagogy must take the responsibility of providing accessible and useful information, of helping parents and teachers improve their ability to empathise and of offering support not only to the children, but also to their families.