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ABSTRACT

Through the Problem Solving and Reasoning Skills Cognitive Development Model for Severely Disadvantaged Puerto Rican College Students, the Ana G. Mendez Educational Foundation developed a model for cognitive skills development for disadvantaged, low-achieving Hispanics. The program incorporates cognitive skills into existing remedial courses in Spanish and mathematics. The model was tested with lower tier entering freshmen students with less than a 2.00 high school grade point average, and College Entrance Examination Board scores under 400 in Spanish and mathematics. The final course design integrated Piagetian theory, Karplus' Learning Cycle, Whimbey's Problem Solving technique, and some of Feuerstein's Instrumental Enrichment strategies. Results indicated that the model is highly adaptable to Hispanic populations in and outside of Puerto Rico. It also proved to be effective with a population of disadvantaged learners that is typical of those entering most private institutions. The extensive appendices include the following: (1) a summary description of a teacher training workshop; (2) curriculum guides; (3) list of diagnostic instruments examined; (4) a student survey questionnaire (in Spanish); (5) letters of interest in the program from two colleges; (6) a symposium program on Puerto Ricans and the humanities (in Spanish); (7) the 47-page external evaluation report; (8) a form for requesting additional information; and (9) a list of related documents. A financial status report is supplied separately. (Author/FMW)

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COVER SHEET

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Project Overview

Through the Problem Solving and Reasoning Skills Cognitive Development Model for Severely Disadvantaged Puerto Rico College Students, the Ana G. Méndez Educational Foundation developed a model for cognitive skills development for disadvantaged, low achieving Hispanics through the incorporation of cognitive skills into existing remedial courses in Spanish and Mathematics. The model was tested with and served lower tier entering freshmen students with less than a 2.00 GPA in High School and CEEB scores under 400 (of a possible 800) in Spanish and Mathematics.

The final course design integrated Piagetian theory, Karplus' Learning Cycle, Whimbey's Problem Solving technique and some of Feuerstein's Instrumental Enrichment strategies.

Results indicated that the model developed is highly adaptable to Hispanic populations in and outside of Puerto Rico, and proved to be effective with a population of disadvantaged learners that is very typical of those entering most private institutions in Puerto Rico and many areas with high concentrations of Hispanic populations in the nation.

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Executive Summary

The Ana G. Méndez Educational Foundation, a Hispanic University System with three Institutions, the Puerto Rico Junior College (2 year College), Metropolitan University (4 year Institution), and Turabo University (4 year Institution) developed the Problem Solving and Reasoning Skills Cognitive Development Model for Severely Disadvantaged Students, over a thirty (30) month FIPSE grant period. This Pilot program involving very low achieving college freshmen from the three Institutions integrated Piaget's cognitive development theory, Karplus' Learning Cycle, and the delivery strategies of Whimbey's Problem Solving techniques and Feuerstein's Instrumental Enrichment into first year remedial Spanish and Mathematics courses.

The problem of the lack of basic skills among freshmen, is characteristic not only of our three institutions, but is also a major problem at all institutions in Puerto Rico. More than 90% of all entering freshmen at the Ana G. Méndez Educational Foundation institutions as in all private colleges in Puerto Rico come from the highly deficient public school system, of which 10% have completed their high school degree through equivalency tests. In 1985-86, 36% of the entering class had a high school GPA below 2.00 (on a 4.00 scale) reflecting serious educational deficiencies. An analysis of the College Board test results revealed that an overwhelming majority do poorly, 88.5% scored under 500 (of a possible 800) in both verbal and mathematics aptitude tests respectively.

Aware of the theoretical frameworks for explaining and addressing this type of problem, information was collected from institutions on the mainland that use varying methods for the development of analytical and reasoning skills for students showing poor academic success and low self-directedness. A review of these programs showed that while significant progress has been made in developing abstract thinking or reasoning skills among participants, they were directed at another target population, who are not severely disadvantaged.

The Foundation proposed to develop an alternative model to serve the seriously deficient lower tier entering freshmen students with basic and cognitive skills they needed to survive in college. Major intended outcomes of the project were:

Students

1. Increase achievement in basic courses by at least 15% as compared to other similar groups.
2. Reduce attrition rate by at least 10% in basic courses in Spanish and Mathematics.
3. Increase achievement by at least 15% in other basic courses students take at the institution compared to similar groups and increased achievement by 10% in more advanced courses also as compared to similar groups.
4. Reduce overall attrition rate in advanced courses.

Faculty

1. Develop a comprehensive knowledge of cognitive skills development theory and techniques and ability to apply these in the classroom.

2. Entire basic course faculty will have a working knowledge of cognitive skills development and techniques.

3. At least 85% of the basic courses faculty will have shown satisfaction with the project and will express a commitment to institutionalize and expand it.

Curriculum

1. Redesign basic remedial courses in Spanish and Mathematics.
2. Redesign the English remedial course.

Program

1. Develop a model for the systematic development of cognitive among the most seriously disadvantaged Hispanic college students through the incorporation of cognitive skills development strategies and techniques into remedial content area courses.

2. Elaborate a set of model courses in content areas that incorporate reasoning and problem solving skills which are readily adaptable to institutional settings both in Puerto Rico and on the mainland.

The first year of the project was dedicated to developmental tasks and the second to the implementation of the pilot project, evaluations of results and subsequent revisions to program designs and materials. The last period was dedicated to the implementation of the revised program, evaluations and dissemination.

Major activities during the first year of the project were (1) familiarization of the project staff and participating faculty with cognitive development theory though the "Literature Review Phase" of the project. Piagetian cognitive development theory, Karplus' Learning Cycle, Reuven Feuerstein's "Instrumental Enrichment" and Arthur Whimbey's problem-solving strategies and techniques were fully discussed and analyzed. (2) the redesign of the remedial courses in basic Spanish and Mathematics to incorporate cognitive skills development. Also the full design of the Pilot project including all course materials required. The last activity of the first year was the identification of lower tier freshmen, which took place during the summer. Incoming freshmen were classified and the lower tier identified through a listing of all students admitted with: (1) high school GPA's under 2.00; (2) CEEB scores under 4.00 average (of a possible 800). A rank listing of the lowest achievers at each of the three institutions was prepared. Of these, 60 participants per institution (180 total) for the Pilot project were selected as originally planned but only 162 students, 55 from the Puerto Rico Junior College, 52 from the Metropolitan University and 52 from the Turabo University, each divided into two groups per institution participated in the project.

The second year activities began with the implementation of the Pilot project redesigned courses at the three institutions in Spanish and Mathematics. A full evaluation of the courses was carried out at the end of the first semester of the second year. The evaluation revealed that substantial changes would have to be made, both in course design and in teaching strategies.

During the second semester of the second year and early summer project courses were reexamined and revised. After careful thought and broad consultation with the faculty involved at the three institutions, it was decided that the revised courses be evaluated. This required an additional test, though much less broad in scope than the one carried out previously. What we proposed and received was a six month no-cost extension to the grant period.

The fully revised courses we offered and evaluated during the Fall semester of the following academic year (1986-87) at the Puerto Rico Junior College (PRJC) to a group of approximately 20 students. At the end of the semester, a final evaluation was concluded and minor adjustments to the curriculum completed. Results of the project were:

1. Student attrition was significantly reduced during the project period and at the end of a three semester follow-up period.
2. There was high student and faculty satisfaction levels with course format, materials, and learning results.
3. A majority of faculty attained understanding of theories and skill in the application of the techniques.
4. Student academic achievement increased both during participation and in advance coursework.
5. Curriculum changes were incorporated into ongoing courses at one Institution and are expected to be incorporated into the others after further testing.
6. Dissemination of successful model aspects is being carried out in and outside of Puerto Rico.

Our project demonstrated that non-traditional innovative techniques are applicable to and motivate academically disadvantaged students. Some recommendations are worth considering before replicating this effort are:

1. Thinking strategies are most effectively taught in an integrated approach with Basic or Remedial coursework.
2. High degree of continued Institutional administrative support from top academic administrators is vital to long term project success.
3. Faculty personality characteristics (flexibility, tolerance levels, leadership skills and commitment) are key elements to model success.
4. Strong staff development should precede model implementation.
5. Incorporation of model techniques in all remedial courses on a long term basis at an Institution will result in the greatest benefit to the students.
6. Competition between at least two similar groups results in higher student motivation and better end results.

The Ana G. Méndez Educational Foundation FIPSE project has resulted in a successful cognitive skills development model applicable to severely academically disadvantaged Hispanic populations in Puerto Rico and the mainland. Applied with the modifications suggested, the model will result in a significant lowering of attrition rates and increase in student academic achievement levels.

Purpose

The demand for postsecondary education as a means of securing employment in a highly technical industrial setting, combined with the advent of Federal student financial aid programs, has doubled the Puerto Rico college population in less than fifteen (15) years. Because of the state university's strict admissions standards, it has become the institution of the well-to-do. Private institutions now serve almost 60% of the college student population. However, this surge in enrollments at private institutions has been of students that are poor, that are graduates of the highly deficient public school system, those who have lower grades in school and do poorly on their entrance exams. In sum, it has been of students who have the greatest social and academic disadvantages and hence have no chance of entering the free public university.

The fundamental problem of a large number of students entering the three institutions of the Ana G. Méndez Foundation is the lack of basic cognitive (reasoning, problem solving, abstract thought) skills that would allow them to compete favorably in the lower division and that impedes their acquiring skills in more advanced courses. Through a Pilot program, involving representative groups at the three institutions, the project was to develop, test and implement a model for cognitive skills development for very low achieving Hispanic college freshmen students by incorporating cognitive skills development into two areas of the first year remedial courses (Spanish and Mathematics). The project was an attempt to rethink remediation for the academically disadvantaged. It was based on a variation of Piagetian framework regarding the

stages of cognitive development, Karplus' Learning Cycle, and the delivery strategies of Whimbey's Problem Solving Techniques and Feuerstein's Instrumental Enrichment.

Background & Origins

The project was granted to the Ana G. Méndez Educational Foundation, a private nonprofit organization and its three affiliated institutions: the Puerto Rico Junior College (a two year Junior College), Metropolitan University (a four year Institution), and Turabo University (a four year Institution) which maintain an open admissions policy.

The majority of the students come from poor socio-economic backgrounds. Over 90% of Puerto Rico Junior College and Metropolitan University students reside in the San Juan area, whereas 86% of Turabo University students are from the rural central mountainous region of the Island. The average family income of over 70% of students is below $5,850 and 36% are from families with five or more members. Over 90% depend almost exclusively on financial assistance to remain in college. Seventy-nine percent (79%) are first generation college students and 33% are from families in which the father is either unemployed, disabled or retired, and has an average junior high school education. In 76% of these households, the mother is a housewife with less than nine years of schooling.

More than 90% of all entering freshmen at the three institutions come from the highly deficient public school system, of which 10% have completed their high school degree through equivalence tests. In 1985-86, 36% of the entering class had a

high school GPA below 2.00 (on a 4.00 scale) reflecting serious educational deficiencies. An analysis of the College Board test results revealed that an overwhelming majority do poorly, with 88.5% scoring under 500 (of a possible 800) in both verbal and mathematics aptitude tests respectively. It is not surprising that over two thirds of this class reported that they had applied to other institutions but had been rejected.

The problem of the lack of basic skills among freshmen is characteristic not only of our three institutions, but is also a major problem at all institutions in Puerto Rico. At the institutions of the Foundation there has been a consensus as to the need for intensive remediation if any advances are to be made in providing the students with the tools they need to complete their education and successfully compete for jobs. As a consequence the administration has made an important investment in remedial courses and in testing alternate instructional strategies to meet student needs.

At the Foundation institutions, the development of courses for students who score poorly in their College Board exams and who have low high school GPA's, using a variety of instructional techniques, have contributed to significant improvements in freshman and upper division retention and achievement levels. However, it has been a consistent finding that the colleges are losing out on those in the lower tier among the disadvantaged. Students who have scores under the 400 average on their College Boards and have GPA's under 2.00 are not developing the skills they need. Not only do they fail or drop out of basic remedial courses, but they tend to withdraw or do inferior work in more advanced courses.

Traditional remediation combined with varying instructional techniques are most effective with students in the middle and upper tier (in prior achievement and entrance exam scores) among the disadvantaged that are placed in freshman remedial courses. With intensive work in the basics of the content area and exposure to techniques that are stimulating, these students are able to develop the base they need for college level courses and later for more advanced courses. However, at the three institutions of the Foundation, as in many others, it has been found, through student follow-ups and now through the diagnostic testing system, that students in the lower one third among entering freshmen and that take remedial courses during their first year, still do not gain the skills they need. Therefore, it has been found that it is this group that is mainly responsible for the still high freshman course attrition and low achievement statistics and constitute the group that is most prone to drop out or fail in more advanced courses.

The main problem with this type of student was the lack of ability to apply the reasoning and problem solving skills required to develop the particular content area skills.

Aware of the theoretical frameworks for explaining and addressing this type of problem, information was collected from institutions on the mainland that use varying methods for the development of analytical and reasoning skills for students showing poor academic success and low self-directedness. These included the ADAPT program at the University of Nebraska, the SOAR program at Xavier, the Freshman Abstract Reasoning program at the College

of Charlston, DOORS at Illinois Central, STAR at the Metropolitan State College in Denver, many of these efforts were supported under FIPSE.

A review of these programs showed that while significant progress has been made in developing abstract thinking or reasoning skills among participants, they were directed mainly at either regular students entering college (and showing no particular deficiencies) or at students requiring remedial assistance (low achievers) but who are not particularly disadvantaged nor have serious deficiencies, those with which remedial programs have much less of an impact, regardless of their content or intensity.

Thus, the Foundation proposed to develop an alternative program to serve the seriously deficient lower tier entering freshmen students with basic and cognitive skills they needed to survive in college.

Statement of Intended Outcomes

Students

1. It is expected that participating students will have increased their achievement in basic courses by at least 15% as compared to other similar groups at the three institutions and at others on the Island.

2. It is expected that the attrition rate will have been reduced by at least 10% in basic courses in Spanish and Mathematics.

3. It is expected that achievement will improve at least 15% in other basic courses students take at the institution compared to similar groups and will increase their achievement by 10% in more advanced courses also as compared to similar groups.

4. The overall attrition rate in advanced courses among students taking the cognitive skills development-remedial courses will be 15% under the norm for the three institutions.

Faculty

1. It is expected that participating faculty will have developed a comprehensive knowledge of cognitive skills development theory and techniques applicable to the more seriously deficient student and will be able to successfully apply these in the classroom.

2. That the entire basic course faculty at the three institutions will have a working knowledge of cognitive skills development and development techniques that will allow them to revise courses and/or teach courses that incorporate cognitive skills development.

3. That at least 85% of the basic courses faculty will have shown satisfaction with the project and will express a commitment to institutionalize and expand it to other areas as applicable.

Curriculum

1. That the basic courses designed will, upon revision and if proven successful, be incorporated into the regular offering at the three colleges and will constitute the remedial course offering for the most seriously disadvantaged.

2. That, if proven successful, the remedial course in English will be redesigned along the lines of the courses in Spanish and Mathematics and will be fully institutionalized hence transforming the entire remedial offering into a content area/cognitive skills development program.

Program

1. That a Model for the systematic development of cognitive among the most seriously disadvantaged Hispanic college students will have been developed through the incorporation of cognitive skills development strategies and techniques into remedial content area courses.

2. That a set of reliable diagnostic instruments for ascertaining the degree of mastery of basic cognitive skills (levels for reasoning and problem solving skills) among the lower tier of the disadvantaged in Puerto Rico will have been elaborated and will serve as a model for the development of similar measures and instruments at institutions throughout the mainland, especially at institutions serving large numbers of disadvantaged Hispanic.

3. A set of model courses in content areas will have been elaborated that incorporate reasoning and problem solving skills that allow for concurrently developing both content and cognitive skills and hence levels of attainment conducive to higher achievement in advanced courses. This will include courses that are fully designed and the materials required and techniques to be used in these courses, which are readily adaptable to institutional settings both in Puerto Rico and on the mainland.

Project Description

The project was conducted over a two and a half year period. The first year was dedicated to developmental tasks. The second was dedicated to the implementation of the pilot project, evaluations of results, revisions to program designs and materials. In the

final half-year period the implementation of the revised program, evaluations and dissemination were carried out.

The first few months of the project were dedicated to the familiarization of the project staff and participating faculty with cognitive development theory though the "Literature Review Phase" of the project. Piagetian cognitive development theory, Karplus' Learning Cycle, Reuven Feuerstein's "Instrumental Enrichment" and Arthur Whimbey's problem-solving strategies and techniques were fully discussed and analyzed.

A series of three, two day intensive workshops were held. The first two day workshop entitled "College Teaching and the Development of Reasoning" was held for a group of 30 professors, ten (10) from each institution. The workshop was offered by Dr. Melvin Thornton and Dr. Joy Ritchie, who are staff members of the ADAPT Program (Accent on Developing Abstract Processes of Thought) at the University of Nebraska at Lincoln. (See Workshop Description Appendix A). The purpose of this workshop was to provide the faculty with an overview of Piaget's theory of cognitive development, its relevance to college teaching, and strategies for effectively incorporating these ideas into classroom instruction. These experiences were translated into Karplus' practical "Learning Cycle" model for classroom instruction.

The second workshop, "Instrumental Enrichment Awareness Sessions for Decision-Making Purposes" was conducted by Frances Link of Curriculum Development Associates in February, 1985, also for a group of 30 professors and department Chairpersons (See Workshop Description Appendix B). In addition, the academic deans of

the three institutions participated in this workshop, thus creating a deeper awareness of the project at each Institution.

This IE workshop was based on Dr. Reuven Feuerstein's Instrumental Enrichment Program which is a curriculum intervention program for the development of thinking and learning skills. It provides problem solving tasks, strategies for individual mediation, and discussions for insight to correct specific deficient cognitive functions and provide the prerequisites for learning. Among its many objectives are the arousal of motivation and insight, creation of good work habits, and methods of gathering and elaborating information. The Instrumental Enrichment Program aims to render the individual able to perform, as an independent learner by providing him/her with the concepts, skills, strategies and techniques necessary.

The third workshop was a five day "Instrumental Enrichment Implementation Training Workshop". This workshop was also conducted by Frances Link. Faculty members from the three Institutions, other than the project committee members were included in this workshop at Institutional expense. This training workshop provided Instrumental Enrichment applications for our disadvantaged lower tier students through detailed analysis and explanation of the instruments and demonstration lessons using the "Bridging" technique, into the specific subject area for the project staff.

Four other activities were held during the first year of the project. First, the development or adaption of diagnostic instruments specifically directed at ascertaining cognitive skills development. For this activity, sample sets of diagnostic

instruments used in various programs in the United States were examined (See Appendix C). The only instruments that met our needs were those used in the Instrumental Enrichment Program. These instruments serve a dual function: they are both a diagnostic and mediated learning experience tool. Other instruments examined were found to be too dependent on higher level skills in Mathematics, language and reading than what lower tier students master at the Ana G. Méndez Educational Foundation and similar institutions.

The second activity was the redesign of the remedial courses in basic Spanish and Mathematics to incorporate cognitive skills development. The third activity was the full design of the Pilot project including all course materials required. Committee members examined the curriculum map in each content area to determine specific content area skill demanded for the development of particular reasoning or analytical skills. This review determined the specific content areas (topics or sets of topic areas in each course) through which cognitive skills were to be developed. Once completed, the Spanish and Mathematics courses were fully redesigned. In this way, students were able to develop both the content area skills and the cognitive skills at the same time.

Student Selection

The last activity of the first year was the identification of lower tier freshmen, which took place during the summer. Incoming freshmen were classified and the lower tier identified through a listing of all students admitted with: (1) high school GPA's under 2.00; (2) CEEB scores under 4.00 average (of a possible 800).

A rank listing of the lowest achievers at each of the three institutions was prepared. Of these, 60 participants per institution (180 total) for the Pilot project were selected as originally planned but only 162 students, 55 from the Puerto Rico Junior College , 52 from the Metropolitan University and 52 from the Turabo University, each divided into two groups per institution participated in the project.

The second year activities began with the implementation of the Pilot project redesigned courses at the three institutions in Spanish and Mathematics.

Courses Offered

Courses were taught using the Learning Cycle strategy for lesson development of: exploration, invention and application. Also the Spanish version of the first, second and sixth instrument of the Instrumental Enrichment Curriculum were used each requiring paper and pencil tasks, the first instrument "Dots" developed organizational skills. The other two instruments "Space Orientation" and "Cartoons", however, did not arrive until a much later date than what was needed. After using the Instruments, the professors "bridged" into the content area and used Whimbey's (verbalization) technique in which small groups of students discussed how they solved the problem. However, there was a continual concern expressed by the faculty members regarding a time to cover all the material and under-use of the Instrumental Enrichment instruments.

The professors firmly believed the Instrumental Enrichment materials were very beneficial to the type of students the project served. However, after much discussion and debate it was felt that altering the Instrumental Enrichment Curriculum rather than

strictly completing the 14 Instrumental Enrichment Instruments as designed and not following the recommended time allotment to the instruments, made it very difficult to evaluate its true impact on the courses.

The students were continuously monitored and evaluated to determine their progress in each of the courses. Also, some students were interviewed by their course professor to determine the degree to which they perceived the skills being gained in the Pilot courses as useful in solving problems and understanding course materials in other courses.

As planned, the faculty teaching the courses met weekly with the staff to discuss their experiences. This allowed for the collection of data on the effectiveness of the courses and for the monitoring of their own progress, assuring they had a grasp of the ways in which the courses should be conducted and carried out (using the techniques, materials and others) in the most appropriate way. At the end of the first semester of our second year, we carried out a full evaluation of the courses. The evaluation revealed that substantial changes would have to be made, both in course design and in teaching strategies. One of the most interesting findings of the evaluation was that the leadership of the teacher in the classroom and capacity to be innovative is a key element in the effectiveness of the courses. We found that the course, basically the same at all three institutions, with a similarly experienced, trained and committed faculty, was decidedly more effective (highly successful) at one institution Puerto Rico Junior College (PRJC) than at the others. This, we found was due

to the fact that, confronted with unexpected learning situations in the classroom (for which no provision had been made in the course design and materials), the faculty at the college was highly innovative and flexible in their delivery and strategies increasing student yield in their grades and in their post test.

Through the evaluation we realized that substantial revisions to the courses were required to incorporate strategy alternatives that would address the problems that emerged during the test implementation and to build in ways to promote innovation on the part of the faculty. During the second semester of the second year and early summer we reexamined and revised each of the project courses.

Since we made substantial revisions to the courses, we concluded that it would not be productive to begin institutionalization or dissemination until we could make sure that the revised courses were actually effective in attaining our objectives with lower tier students at the AGMEF institutions.

After careful thought and broad consultation with the faculty involved at the three institutions, we felt that we needed to evaluate the revised courses. This required an additional test, though much less broad in scope than the one carried out previously. What we proposed and received was a six month no-cost extension to the grant period.

We offered and evaluated the fully revised courses during the Fall semester of the following academic year (1986-87) at the Puerto Rico Junior College (PRJC) to a group of approximately 20 students. However, having more than one group of students per

area added an element of competition which seemed to have had a positive effect on the motivation of students during the first application of the model which was not present during the second application. At the end of the semester, we conducted a final evaluation and completed minor adjustments to the curriculum.

Project Results

Assessment of critical thinking must take into account the context in which the thinking is done and the behavior change in the students as a result of thinking critically.

Critical thinking cannot occur in a vacuum. It requires that students apply what they know on a subject as well as use their common sense and experiences, and evaluate their own thinking in order to change their behavior as a result of thinking critically.

As a result of our project our students were exposed to new teaching techniques in order to develop their thinking skills. They were given the opportunity, perhaps for the first time in their lives, to self-learn. This is not a skill taught in the Puerto Rico Educational System which is based on traditional lecture format, teacher oriented class styles.

Specific Results

These students were exposed to an active versus established passive role in a non-threating atmosphere with minimal emphasis on correctness of form and maximum emphasis on meaning, thus little chance of students losing face and thus improving self-esteem.

Given the academic conditions of many of these identified lower tier students, one or two semesters of remedial courses is not sufficient to overcome deficiencies. In spite of this, using

project techniques, significant progress was achieved even with the lower tier students. Standard measures of assessment such as pre and post testing does not provide a total and adequate picture of all that has been accomplished. Satisfaction levels and opinions of both students and participating faculty were seriously considered.

In spite of the fact that statistically significant levels of achievement were not met for every objective, it is important that most of the results were higher than expected. This combined with the fact that both students and professors expressed very high satisfaction levels with the results of the project including the format and different teaching techniques and strategies.

Both participating students and faculty felt the experience with the courses was very positive and satisfying as evidenced by their answers on questionnaires. (See Appendix D)

For example: Over 95% of those surveyed stated that they liked the classes, the professors, and the materials; that they had been able to understand the material more easily with the methods used in the classes, and had found the use of the "caricatures" and "dots" (Instrumental Enrichment material) more interesting than traditional methods; and the professors were excellent and helped them to understand. In terms of the way in which the classes had helped them most, recorded answers include the raising of the grade averages as the most common answer; helping them to think, to improve study habits, to organize mentally, to express themselves more easily; helping to select their future profession; and helping them to acquire specific skills such as; forming paragraphs or working with decimals. Some of these comments reflect the positive

changes that occurred. Professors also reported higher class attendance levels than in other classes. Students level of written and spoken expression improved considerably since the courses required active participation of each student at his own level.

Also, professors received tremendous direct benefit from the project. They not only received intensive training and practice of new teaching strategies that can be apply to all other courses they teach, but some of the faculty expressed that they gained a new perspective of what the lower tier student can achieve; a broader respect for these students and a higher level of tolerance of their weaknesses.

Our organization obtained a redesigned remedial offering in Spanish and Mathematics including materials required and techniques to be used for the most seriously disadvantaged entering freshmen for the concurrent development of both content and cognitive skills. These offerings are transmittable to other similar groups of the students in other Island Institutions and the mainland.

Dissemination

In order to disseminate project information, a brief project description and list of available materials was elaborated. Additional material is available upon request. Also the project staff is available to visitors that are interested in adapting and/or adopting the project.

Dissemination of the project results have been made available to various Island and mainland Institutions with high Hispanic populations. (See Appendix E) In-house dissemination was carried

out through project faculty presentations to remedial, basic skills, and advance course faculty at the monthly Department meetings per area. A descriptive brochure on Instrumental Enrichment was prepared and distributed at one of the Institutions.

The concept and applications of the project were presented at the "Simposio - Las Humanidades en el Puerto Rico de Hoy" at the University of Puerto Rico on October 22, 1986, in which faculty from all Island Institutions were invited. (See Appendix F) A short videotape production in which both students and professors participated to discuss their experience with the FIPSE Project was prepared for this presentation. Also one of the Spanish professors is publishing an article in the College Magazine.

So far, Mrs. Ada Lugo, graduate student at the University of Massachusetts at Amherst has contacted the project and expressed a desire to examine in detail the possibilities of adapting the courses for a group of seriously disadvantaged Hispanic students in a bilingual program at a community college. All efforts are being made such that these students will benefit from our project.

Evaluation

The purpose of evaluating the project was to gain insight into how the project can benefit the Foundation and other educational institutions in best meeting the challenge of improving the opportunities of academically disadvantaged youth to complete post-secondary studies. Therefore, project evaluation, included both internal and external formative and summative evaluations. The internal formative evaluation consisted of ongoing project monitoring. A more formal process was conducted at the end of

each semester to determine the degree of progress and efficiency of project operations and needed adjustments.

An external, third party evaluation was conducted by an evaluation specialist towards the end of the project first year and towards the end of the no-cost extension period. (See Appendix G)

The summative or outcomes evaluation focused on two programmatic products: the degree to which expected outcomes were met and the degree of satisfaction of students, faculty, administrators and other users of the Model.

Data for determining the degree of success of the program in producing the expected outcomes was obtained mainly from student records and program documentation collected through the monitoring evaluation processes.

It must be remembered that the redesigned courses were originally offered to 162 lower tier students entering the three Institutions in August, 1985. These courses were revised and offered to 19 lower tier students entering during part of the no-cost extension period (August to December, 1986). The first experimental groups, (1985-86) are now entering their fourth academic semester and have follow-up information available.

The second experimental group are now about to end their second academic semester. Therefore, follow-up information is not yet available.

Taking into consideration the Statement of Intended Outcomes of the FIPSE proposal, and the data gathered and analyzed in the evaluation process, the following conclusions can be stated regarding the impact of the project on 1) Students; 2) Faculty; 3) Curriculum; 4) Program.

1) There was a statistically significant difference to .05 in the reduction of the student attrition rate in favor of the experimental groups (1985-86) (7% vs 53%) in first semester freshmen courses.

2) There was a statistically significant difference to .05 in the overall student retention rate after the third college semester in favor of the experimental groups of 1985-86 (40% vs 60%).

3) There was a high degree of satisfaction of students and faculty with the newly developed faculty with the newly developed courses as determined through faculty interviews and student questionnaires for both experimental groups.

4) There was a high degree of satisfaction of the faculty with the training they received (Piagetian theory Learning Cycle, Instrumental Enrichment, etc.) as determined through workshop evaluations and expressed in interviews with third party evaluators.

5) There was according to the personal opinion of the faculty involved a high degree of understanding of the theories, strategies and techniques presented. Expert consultants in the techniques indicated,after observing professors, that several had dominated the techniques relatively well.

6) The objective related to the achievement of students which was to have increased by at least 15% in basic courses was practically achieved. Achievement was measured through the pre-post test developed by the Center for Diagnosis and Placement to be adequate to assess academic achievement in the targeted academic classes. Statistical results of the first semester in which the FIPSE courses were implemented indicate a mix of results.

Scores reflect that only at the Junior College were significant differences found in pre-post tests in mathematics. While there was improvement in Puerto Rico Junior College students' pre-post test scores in Spanish, change was not statistically significant. No significant change in scores is reflected either at the Metropolitan or Turabo campuses, although math scores of the Metropolitan University did improve for the group of FIPSE students.

In terms of Grade Point Averages, comparing the first FIPSE group to the control group for the same period, only the Puerto Rico Junior College reflected higher GPA's for the experimental group. In both other institutions, the control group GPA were higher. No attempt to compare results to other institutions of the Island were carried out. It can be concluded that only the students at the Puerto Rico Junior College increased their achievement to the extent expected.

7) The objective related to the achievement of students in more advanced courses can be demonstrated by the fact that a greater number of FIPSE students were able to remain and go on to advanced courses compared to the control group.

8) The objective related to curricular changes and incorporation of revised course materials into "remedial course offerings for the seriously disadvantaged" of the three institutions was partially achieved. In the Junior College, curricular changes were incorporated completly.

9) The course materials developed by the project faculty constitute another objective achieved. Spanish and Mathematics materials were developed, tested, and incorporated into the Junior College courses on a permanent basis, as planned. To fully achieve

the objective, however, further institutionalization in the Ana G. Méndez system, other Island institutions, and the mainland are needed. Copies of the materials developed can be obtained by filing out and returning the form in Appendix H.

10) The objective related to the dissemination of products while not totally completed during the grant period was partially carried out. A conference in another local university (UPR) was presented; arrangements with three mainland institutions for dissemination and possible replications were made.

11) The objective related to the redesign of the English remedial courses was not achieved. Pilot test completion with Spanish and Mathematics courses was considered of greater importance to total project outcomes.

12) The objective related to the development of a Model applicable to Hispanic college students was achieved. The method is considered highly adaptable to Hispanic populations in and outside of Puerto Rico, and proved to be effective with a population of disadvantaged learners that is very typical of those entering most private institutions of Puerto Rico and many areas of high concentrations of Hispanic populations in the nation.

Summary and Conclusions

Much has been done in the area of critical thinking. Sound foundations have been laid by numerous prominent scholars. However, much remains to be accomplished. The important point to remember is not to waste time and resources reinventing the wheel.

Our project combined various Models not only to pyramid their effects but to address the different kinds of objectives and thinking that we wished to engender.

Our project demonstrated that non-traditional innovative techniques are applicable to, and motivate, disadvantaged Hispanic students: attrition was reduced, retention was increased and positive self-esteem was developed.

By teaching students how to think independently, we increase their power to teach themselves. We cannot teach students to think and then reject the ideas they develop. Traditional teaching systems tend to be inflexible especially for ideas presented by lower tier students. Our project was hindered in part, by its incapacity to alter the overall learning environment of student and professor. Changes must be made in systems as well as students for lasting results to occur. We must guide students so that they will develop better and better ideas on a regular basis over time and thus develop the confidence and self-esteem needed to succeed and create systems that accept these ideas.

Not everything can be anticipated during the proposal writing stage nor the actual development of the project. However, some recommendations worth considering before replicating our efforts are as follows:

1) Thinking strategies are most effectively taught in conjunction with appropriate subject contents. They should no be taught in a vacuum.

2) More orientation and involvement of institutional administrators and non-project faculty are necessary factors for a successful project.

3) The professor is the key element for the success of the project. Leadership skills, capacity for innovation, flexibility, tolerance, stability and a genuine desire to learn are prerequisites.

4) A large group of professors per area with whom to interchange ideas and compare results rather than a few isolated professors will have a greater impact on the project.

5) A very strong staff development program is needed if professors are to develop the skills that will enable them to teach students how to think critically. Intensive training and practice of new teaching strategies and an on going evaluation process are necessary before these become part of the professor's natural repertoire.

6) One semester in not enough time to really make a profound impact on the students. A minimum of two semesters preferably within the first academic year should be dedicated to the development of critical thinking skills.

7) Having at least two comparable groups of students to be served adds an element of healthy competition and positive motivation.

To enhance thinking skills, we need to use tested models of teaching and make the strong investment in staff development that is required for any innovation to succeed, but the main requirement is to think critically about the selection of critical thinking materials and teaching strategies.

A P P E N D I X A

COLLEGE TEACHING AND THE DEVELOPMENT OF REASONING

The Workshop on College Teaching and the Development of Reasoning can be flexibly offered within a 12 to 16 hour time period. It is a modular, reasonably self-paced, opportunity for faculty members to become aware of Piaget's theory of cognitive development, its relevance to college teaching, and strategies for effectively incorporating these ideas into classroom instruction. The Workshop includes participant analysis of reasoning skills (one's own first and then those of students), film and videotape portrayals of levels of reasoning, sample classroom demonstrations, analysis of educational materials, and substantial reading of relevant articles.

The Workshop offers teachers not only information about, but also experience with, the Piagetian stages of the learning process: teachers are then encouraged to discover the implications for their own disciplines. They receive sufficient Piagetian theory to have a model by which to interpret the different ways students cope with college level material.

Research findings have shown that most college freshmen have great difficulty applying what Piaget describes as "formal operational thinking." Our own experience and research confirms these findings for freshmen at Nebraska. Yet satisfactory understanding of nearly all college level courses presupposes that all students are using formal thought.

Learning to distinguish concrete operational from formal operational problem solving behaviors is very useful to educators. Through this training, Workshop participants learn to recognize student behaviors which they had previously been unable to account for -- much less respond to -- as a function of cognitive levels. The ability to recognize the Piagetian stages is a promising first step toward promoting student growth.

The self-regulation process described by Piaget is modeled in the workshop activities. Disequilibrating experiences are provided with subsequent opportunities for equilibration. These experiences are translated into the practical Learning Cycle model for classroom instruction. Learning cycles from various content areas are used. Ways to implement Piaget's ideas in college teaching are emphasized.

Furthermore, we have found that as college teachers we are no less dependent upon experience for learning new material than are our students. We can confirm, and our Workshops demonstrate, that even formal thinkers learn more quickly and surely in situations where they engage in concrete activities. The knowledge derived from reading about theory and application is no substitute for the comprehension derived from the active learning situations provided by the Workshop. Participants who have explored and defined their own learning processes are much better able to apply what they know to develop learning in others.

Outline of the Workshop

Modules 1 - 4:	How people reason; the Piagetian stages of development; Concrete Operations and Formal Operations.
Module 5:	Recent Research Findings.
Module 6 & 7:	Analysis of Test Questions, Class Assignments, and Textbooks.
Module 8 & 9:	Self-regulation: The Learning Cycle; Sample Classroom Activities.
Module 10:	Teaching Goals and Strategies.
Module 11:	Implementation and Suggested Readings.

Results

This workshop has been offered at numerous colleges and universities in the USA and Canada. Several other educational programs have gotten started at these colleges after this Workshop was held. These programs include: SOAR at Xavier University of Louisiana; DOORS at Illinois Central College, STAR at Metropolitan State College, Denver, and FAR at the College of Charleston, South Carolina.

The Staff of the Workshop

The persons who lead the Workshop learned to apply Piagetian theory to a variety of disciplines through their association with the multidisciplinary experience-based program for Freshmen at the University of Nebraska-Lincoln. That program, called the ADAPT* Program, was begun in 1975, with support from the Exxon Education Foundation. Workshop staff members have developed materials for use in their disciplines and will help participants to do the same.

The staff includes professors of anthropology, economics, educational psychology and measurements, English, history, mathematics, philosophy, physics and sociology. They are associated with the ADAPT Program at UNL.

* ADAPT stands for "Accent on Developing Abstract Processes of Thought."

For further information and to arrange for Workshops: contact

Dr. Robert Fuller, Director or Mrs. Marilyn McDowell, Adm. Asst.
The ADAPT Program
213 Ferguson Hall - The University of Nebraska
Lincoln, Nebraska 68588 (402) 472-2790

A P P E N D I X B

Curriculum Development Associates
1211 Connecticut Avenue, N.W., Suite 414
Washington, D.C. 20036

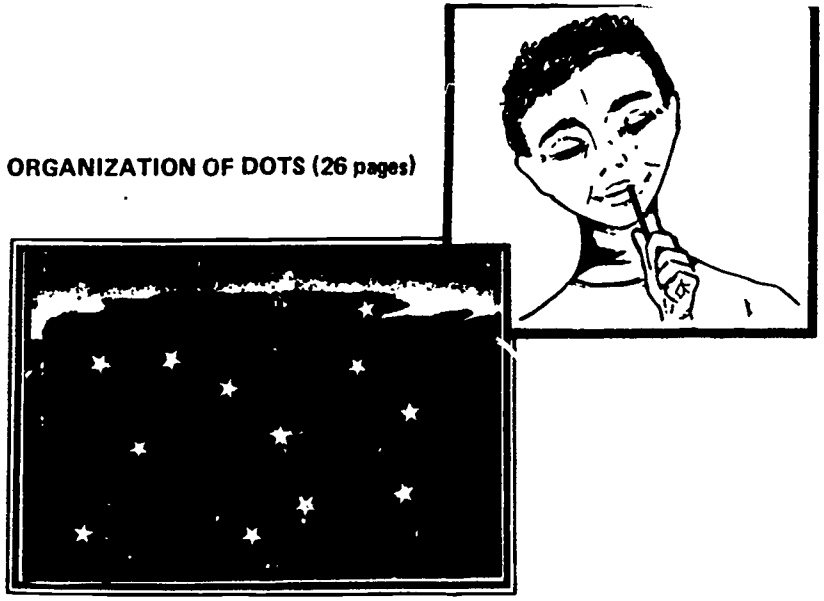
Instrumental Enrichment Cognitive Functions

I. **Gathering all the information we need (Input)**
   1. Using our senses (listening, seeing, smelling, tasting, touching, feeling) to gather clear and complete information (clear perception).
   2. Using a system or plan so that we do not skip or miss something important or repeat ourselves (systematic exploration).
   3. Giving the thing we gather through our senses and our experience a name so that we can remember it more clearly and talk about it (labeling).
   4. Describing things and events in terms of where and when they occur (temporal and spatial referents).
   5. Deciding on the characteristics of a thing or event that always stay the same, even when changes take place (conservation, constancy, and object permanence).
   6. Organizing the information we gather by considering more than one thing at a time (using two sources of information).
   7. Being precise and accurate when it matters (need for precision).

II. **Using the information we have gathered (Elaboration)**
   1. Defining what the problem is, what we are being asked to do, and what we must figure out (analyzing disequilibrium).
   2. Using only that part of the information we have gathered that is relevant, that is, that applies, to the problem and ignoring the rest (relevance).
   3. Having a good picture in our mind of what we are looking for, or what we must do (interiorization).
   4. Making a plan that will include the steps we need to take to reach our goal (planning behavior).
   5. Remembering and keeping in mind the various pieces of information we need (broadening our mental field).
   6. Looking for the relationship by which separate objects, events, and experiences can be tied together (projecting relationships).
   7. Comparing objects and experiences to others to see what is similar and what is different (comparative behavior).
   8. Finding the class or set to which the new object or experience belongs (categorization).
   9. Thinking about different possibilities and figuring out what would happen if you were to choose one or another (hypothetical thinking).
   10. Using logic to prove things and to defend your opinion (logical evidence).

III. **Expressing the solution to a problem (Output)**
   1. Being clear and precise in your language to be sure that there is no question as to what your answer is. Put yourself into the "shoes" of the listener to be sure that your answer will be understood (overcoming egocentric communication).
   2. Think things through before you answer instead of immediately trying to answer and making a mistake, and then trying again (overcoming trial-and-error).
   3. Count to ten (at least) so that you don't say or do something you will be sorry for later (restraining impulsive behavior).
   4. If you can't answer a question for some reason even though you "know" the answer, don't fret or panic. Leave the question for a little while and then, when you return to it, use a strategy to help you find the answer (overcoming blocking).

ORGANIZATION OF DOTS (26 pages)



JUST A MINUTE...
LET ME THINK!

The student must perceive the dots in an amorphous, irregular cloud so as to project figures identical in form and size to those in the given models. The task becomes more complicated by density of the dots, overlapping, increasing complexity of the figures and changes in their orientation. Successful completion demands segregation and articulation of the field.

Among the cognitive functions involved are:
- Projection of virtual relationships
- Discrimination of form and size
- Constancy of form and size across changes in orientation
- Use of relevant information
- Discovery of strategies
- Perspective
- Restraint of impulsivity

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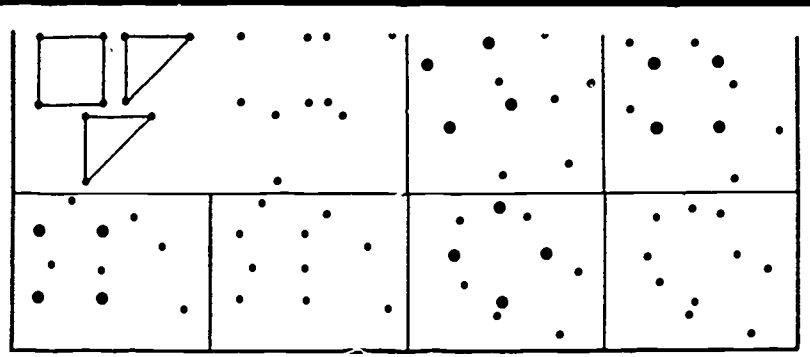
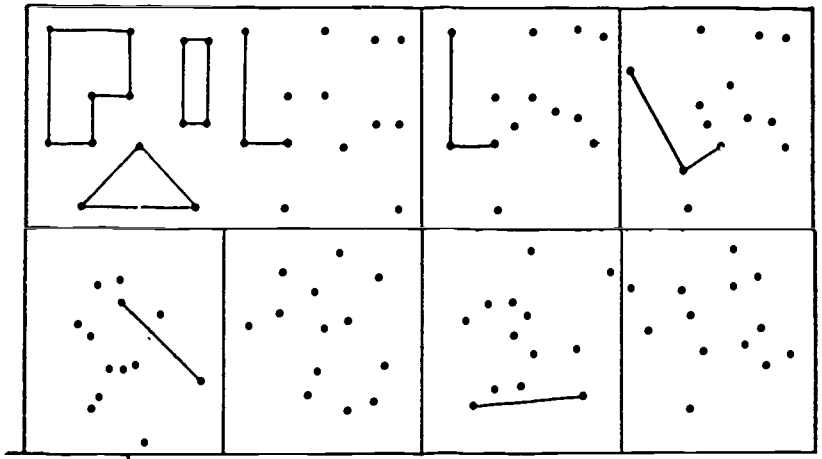
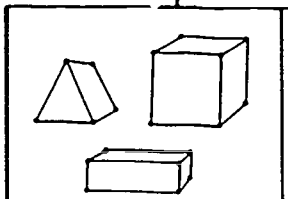
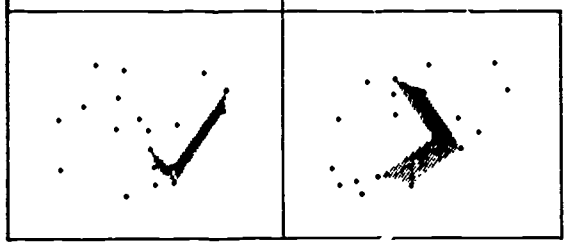


The thickened dots aid in projecting the square, but also serve as a distractor and prevent the perception of similarities between frames. In addition to the functions and operations listed on the title page (left), the tasks involve labeling, precision and accuracy, planning, determination of starting point, systematic search and comparison to model. Successful completion aids in creation and maintenance of motivation.





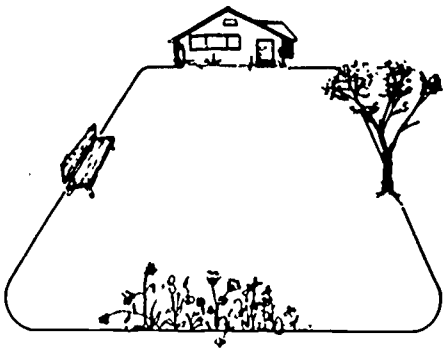
An asymmetric figure in the model necessitates representational re-orientation in space. The provided cues are reduced until extinction so that an alternate starting point must be found. Scientific thought: hypothesis, investigation and confirmation, as well as logical evidence, are necessary.

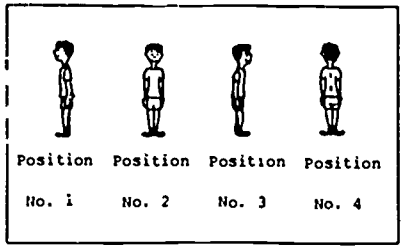


Addition of the third dimension complicates differentiation, internalization and spatial orientation. A dot, instead of connecting only two lines, serves as a nexus of 3 or more lines. The shaded cue is a synthesized whole, formed from parts separate in the model and each cue is relevant to a different form in the model.

ORIENTATION IN SPACE I, II, III

To enhance the ability to use concepts and stable systems of reference for orientation in space – concrete, abstract and interpersonal. Distinction is made between relationships that are relative and can be described from a multiplicity of angles and those that are stable and can be fixed by coordinates. Precise and accurate communication of information lessens egocentricity.



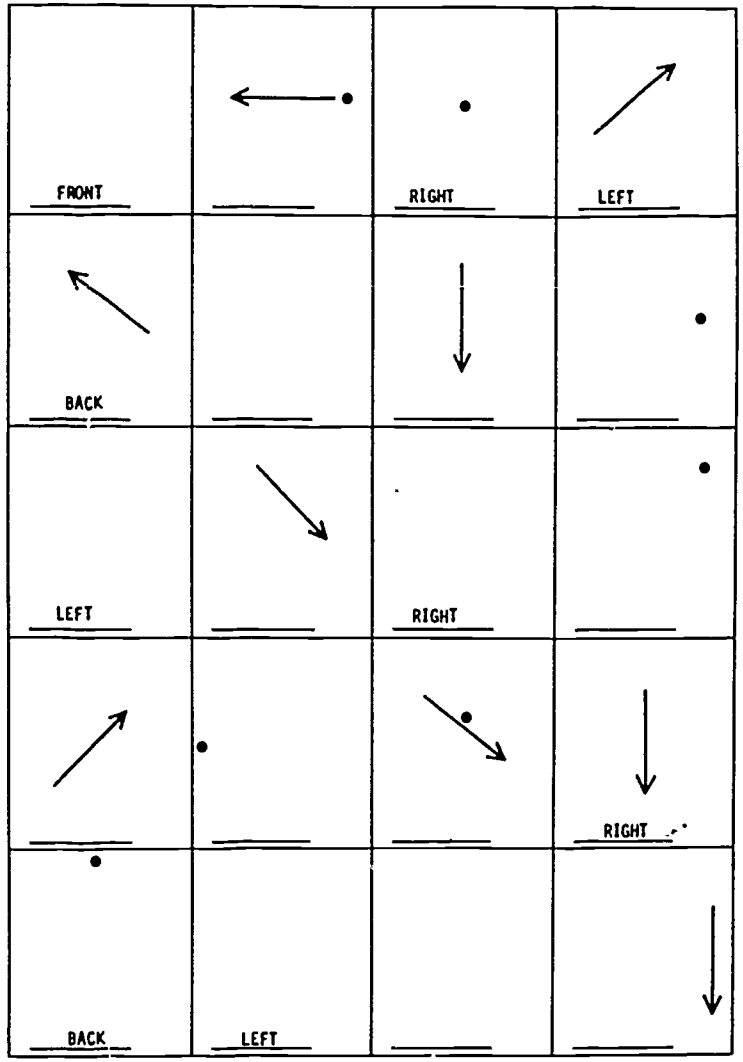


IV. Fill in what is missing:

Position	Object	Direction in Relation to the Boy
1	The tree	
4		right
2		back
	The house	front
3	The bench	
2	The house	
	The tree	left
4		back
	The bench	
		left
3		back
4	The tree	
		right

This page summarizes preceding exercises and illustrates varied repetition of a principle to facilitate habit formation. Solution requires: Definition of the problem, visual transport of internalization; simultaneous use of several sources of information; systematic work; and hypothetical and inferential thought as a basis for logical conclusions. The student learns of delimitation of alternatives and how to summarize his data, using a table.

Fill in what is missing so that each frame contains an arrow, a dot, and a word which describes the relationship of the dot to the arrow.



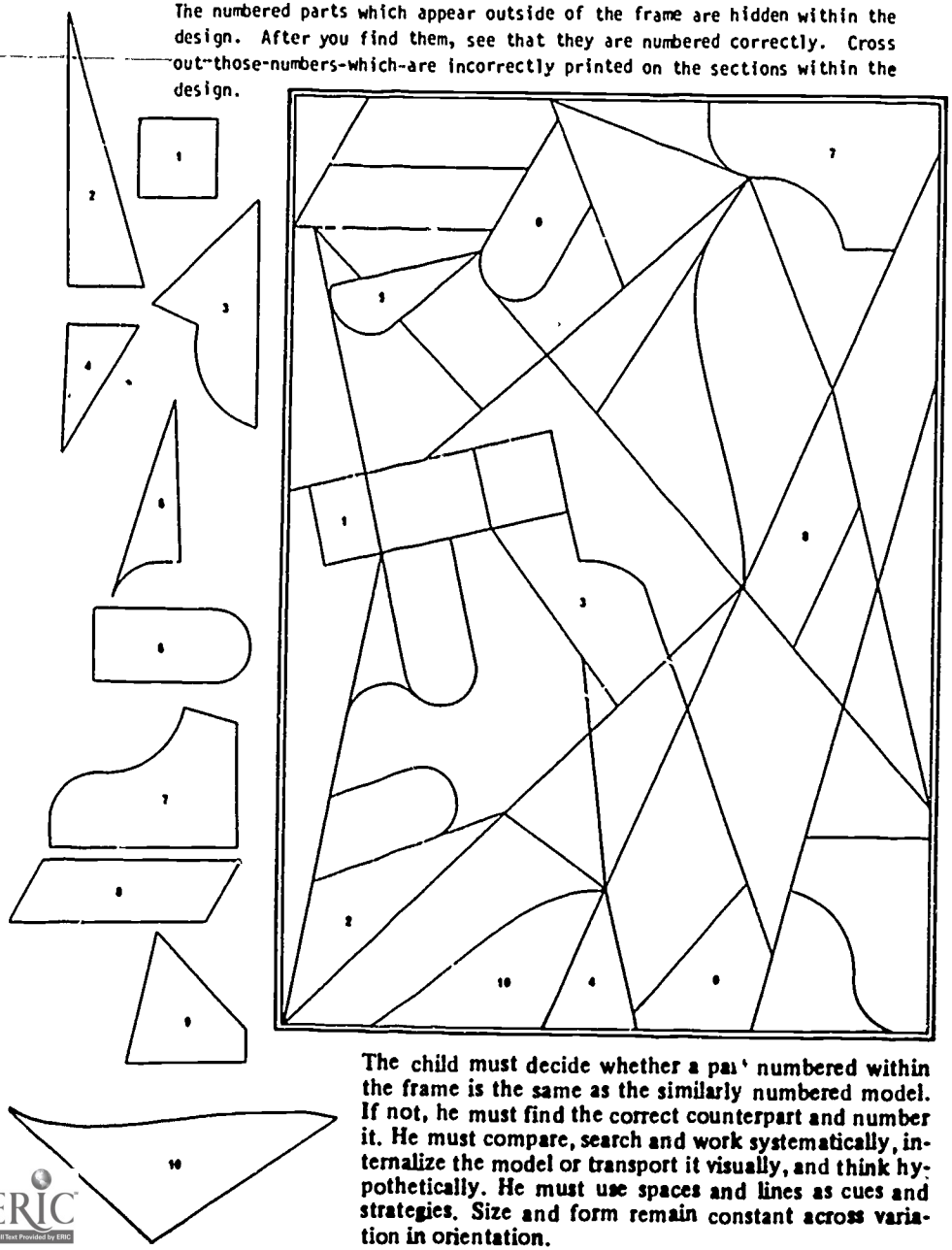
Solution involves re-definition of the problem with each frame; the use of symbols, encoding and decoding; the conservation of the constancy of the relationship across variations in the orientation of the arrow; projection of virtual relationships; hypothetical thought, and precision in gathering and communicating information.

ANALYTIC PERCEPTION (38 pages)

To correct blurred, sweeping and global perception and to break down field dependency. The child learns to analyze the whole into its component parts and to recognize the relationship between them. He learns that each part is a whole unto itself, and that it is possible to create new wholes by combining parts. In the process, he learns that any division is essentially arbitrary and dependent on needs and goals. Successful completion of the tasks demands both structural and operational analysis.

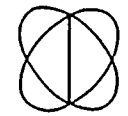
Correct the errors

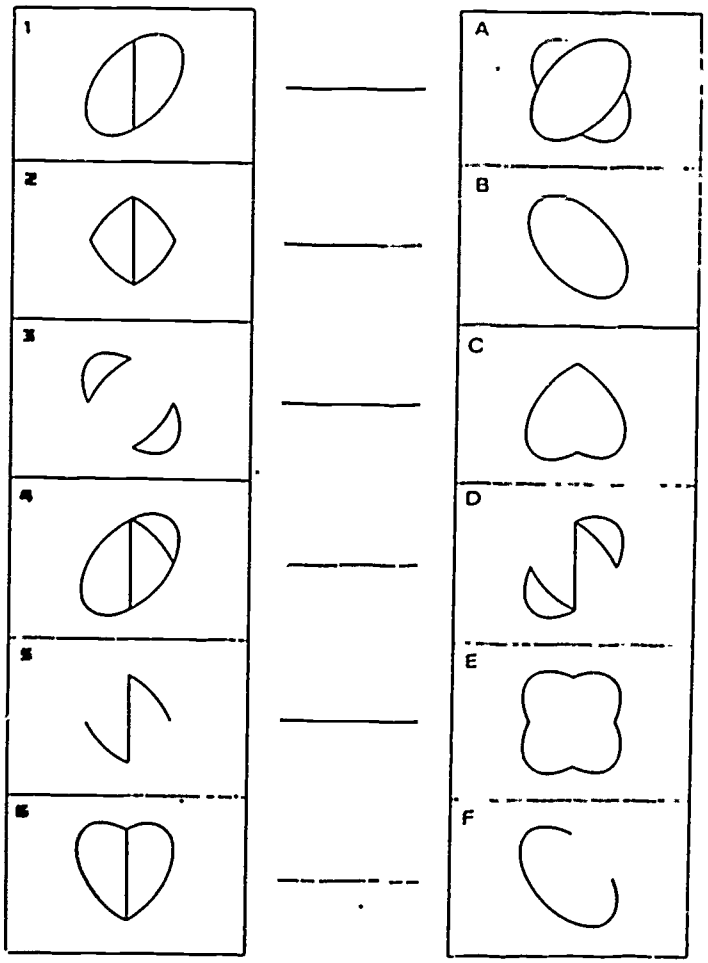
The numbered parts which appear outside of the frame are hidden within the design. After you find them, see that they are numbered correctly. Cross out those numbers which are incorrectly printed on the sections within the design.



The child must decide whether a part numbered within the frame is the same as the similarly numbered model. If not, he must find the correct counterpart and number it. He must compare, search and work systematically, internalize the model or transport it visually, and think hypothetically. He must use spaces and lines as cues and strategies. Size and form remain constant across variation in orientation.

Look at the figure at the top of the page. For each drawing in the left colu ., there is a drawing in the right column which completes it. Write the number and the letter of the two drawings you combine to make the complete figure.



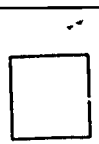
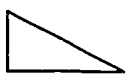


The child must select the appropriate drawing from the left to complete the one on the right so as to obtain a figure identical to the model at the top of the page. The task requires representation, internalization and labeling of the model, definition of the missing parts, systematic work and comparison to the model for self-criticism.

COMPARISONS (22 pages)

To automatize the act of comparison, to provide the basis for classification, and to correct his episodic grasp of reality, the student learns to find similarities and differences between objects, events and ideas. He learns to use concepts in his identification of the most essential or characteristic dimensions and to ignore the irrelevant. Among the functions treated are: blurred and sweeping perception; unsystematic exploratory behavior; lack of verbal tools; inability to relate to two or more sources of information; narrowness of the psychic field and trial and error responses.

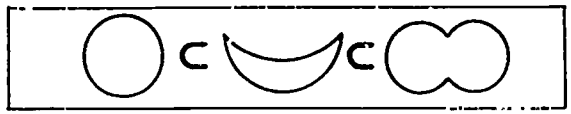
Look at the sample. In each of the two frames, make a drawing that is different from the sample in those aspects indicated by the encircled words.

Sample	Picture 1	Picture 2
	size form (number) color	(size) form number (color)
	number (size) (form) direction	number size (form) (direction)
	size (form) color (number)	(size) form (color) (number)
	(color) number (size) form	(color) (number) (size) (form)
	(size) (direction) form number color	(size) direction form number (color)
	(number) (color) (size) form	number color (size) (form)

The student actively creates two pictures, each of which differs from the example only in the aspects encircled, and is similar to the model on all other dimensions. The task is complicated and requires the ability to define the framework necessary for the solution of the problems, the simultaneous use of several sources of information and a strategy for checking. Salient are the conservation of constancy and the need for planning.

SYLLOGISMS (60 pages)

In this instrument, the student learns to use formal logic. He distinguishes between identical sets, sub-sets, and intersecting sets, and then applies what he has learned in order to arrive at conclusions regarding validity and truth. Using the relationship between two statements and its implications, he is able to infer the validity of a third statement. In these exercises, he uses the Venn diagram to encode his information. Thought becomes abstract and not based on verbal meaning, but rather on the form and structure of the given statements.

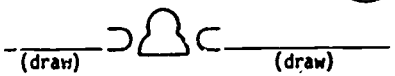


Every  is a  is a 

Conclusion: _____ is a 
(draw)

 is a 

Can we conclude that  is a  ? ____


(draw) (draw)

Every  is a _____
(draw)

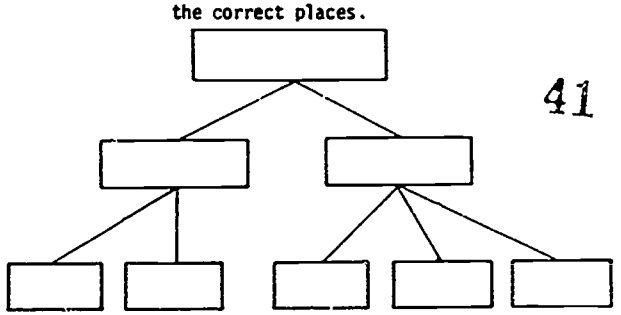
 is a Can we conclude that  is a  ? _____

Each one of the above shapes represents a set. Every set has a name.
The names of the sets are: salt, spices, food, ice-cream, dessert, cake, pepper, vinegar.

Fill in the name of the set.

Shape	Name of Set
	= food
	= _____
	= dessert
	= vinegar
	= pepper
	= ____
	= _____
	= ____

Fill in the names of the sets in the correct places.



Logico-verbal reasoning becomes highly abstract. Meaning is based on the rules which have been acquired regarding members of sets and sub-sets. The task involves encoding and decoding, use of signs, finding relationships, discovering the principle upon which categories have been formed, choosing and processing data and thinking logically.

CURRICULUM DEVELOPMENT ASSOCIATES, INC.
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TO: The Teacher
and
Teacher Aides

INSTRUMENTAL ENRICHMENT
GUIDELINES FOR
AN INSTRUCTIONAL SEQUENCE

Over-all Objective: To teach the concepts, operations, and vocabulary necessary for Instrumental Enrichment, other problem-solving situations and school subjects.

I. PREPARATION OF THE LESSON

A. Objective of the Page

Decide on:
The Rule or Principle and skill you wish to develop in the lesson. (See back of this page for sub-goals.) Think about examples of:

1. Its application in daily life experiences and interpersonal relations.
2. Its transfer or bridge to academic subjects.

B. Prepare the lesson in advance so as to utilize the time effectively. Each lesson should include an introductory discussion, independent work, discussion toward developing insights, and summary. Be flexible, however, in following the leads from the students. Varied presentations lead to increased interest. Always prepare an extra page or two.

C. If you plan to use teaching aids such as newspapers, pictures, overhead projector, maps, etc., be sure these are ready in advance and operational. For bridging into a content area like math, have specific examples ready related to the rule, operation, or principle being developed in I.E. lessons.

D. Make sure that the I.E. materials are available in the classroom or laboratory folders, pencils, erasers, and pencil sharpeners should be available as well as such items as scissors and crayons, if necessary.

E. Leave time for technical matters such as distribution of pages and for students to file them in their individual folders.

F. If possible, place students' desks in a semi-circle or "U" to facilitate easy movement and to enable eye contact. With a very heterogeneous population, you might wish to use groupings at tables.

SUBGOALS OF INSTRUMENTAL ENRICHMENT

Consider the following subgoals of Instrumental Enrichment and decide which of them you want to emphasize in the particular lesson.

1. To correct deficient cognitive functions (thinking skills).

2. To teach the concepts, operations and vocabulary necessary for Instrumental Enrichment and other problem-solving situations.

3. To develop motivation to work on a task because of the nature of the task and its mastery.

4. To produce insight and understanding of one's own thought processes, and the underlying reasons for success and failure. (Insight should also lead to generalization and transfer.)

5. To create both an intrinsic need system and proper work habits so that the use of acquired operations, techniques, strategies and processes will be spontaneous and automatic.

6. To help the slow performer change his attitude toward himself as a passive recipient and reproducer to that of an active generator of information, with the ability to infer and reach proper conclusions.

* Consult the list of deficient cognitive functions (input, elaborational and output phases) as you review the pages you intend to teach, in order to determine the focus of the exercises.

II. INSTRUCTIONAL SEQUENCE OF THE LESSON

A. Introductory Discussion (10 minutes)
This stage is appropriate for definition of tasks, problems and objectives, and arousal of interest and motivation. The definition of the problems and the specific objectives of the page should ultimately come from discussion with the students. At the beginning of the program, however, it will be a joint effort of students and teacher. Through questioning the teacher must make sure that the students thoroughly understand the instructions, and the concepts, terms and vocabulary of the exercises or tasks. The students should be oriented towards gaining insight into the nature of the problems and their relevance to themselves. The introductory discussion may start with real world examples which relate to the principles to be developed in the lesson.

Questions which teachers will find important to raise to stimulate thought during this introductory stage of the lesson:

1. What do you see on the page?/or on the first two rows of the page?
2. What looks familiar to you?
3. What is "new" on the page?
4. What vocabulary or words do we need to discuss this page?
5. What cues indicate the directions for starting the page or for doing the exercises? (If there are printed instructions, teacher should focus on key words and main ideas.)
6. How can we check our work to eliminate possible errors?

B. Independent Work (25 minutes)
The teacher and/or teacher aide goes from student to student, offering individualized assistance and encouragement; reinforcing successful mastery and preventing frustration or the repetition of errors. Teacher/teacher aide investigates the process with the student and the specific source of an error, and, also, initiates discussion of the problems with individual students or several students together.

The ultimate aim is to develop independence and self-confidence on the part of the student. To do so, the student must be taught how to check and evaluate his work. This is done as teachers move from student to student during the independent work phase of the lesson.

C. Discussion and development of Insight (10 minutes)
When most of the students have completed their independent work, the class as a whole is joined for discussion. The teacher and the students explore divergent thought processes and alternative responses. Although many solutions may be viable and correct, the students should decide on the most appropriate solution through reflection. The teacher and the students analyze the difficulties which were faced and how they were overcome. Also, discussion should include a review of the vocabulary, concepts, and operations used. The principles presented in the introductory phase are developed, elaborated and applied to daily-life experiences, and bridged to academic subjects.

Kinds of questions to raise for discussion:to develop insight:

1. What strategies did we use to solve these problems?
2. Was one strategy more appropriate than another?
3. Which tasks were most difficult? Why?
4. Think of an example of how what we were doing on the page relates to our daily lives and/or problems related to learning math, science, art or music, etc.

D. Summary (5 minutes)

The summary should include a restatement of the objectives set at the start of the lesson, with students evaluating the degree to which they feel they were achieved. It should make the students aware and conscious of the particular areas to which the lesson addressed itself.

E. Guidelines for Changing the Instructional Sequence

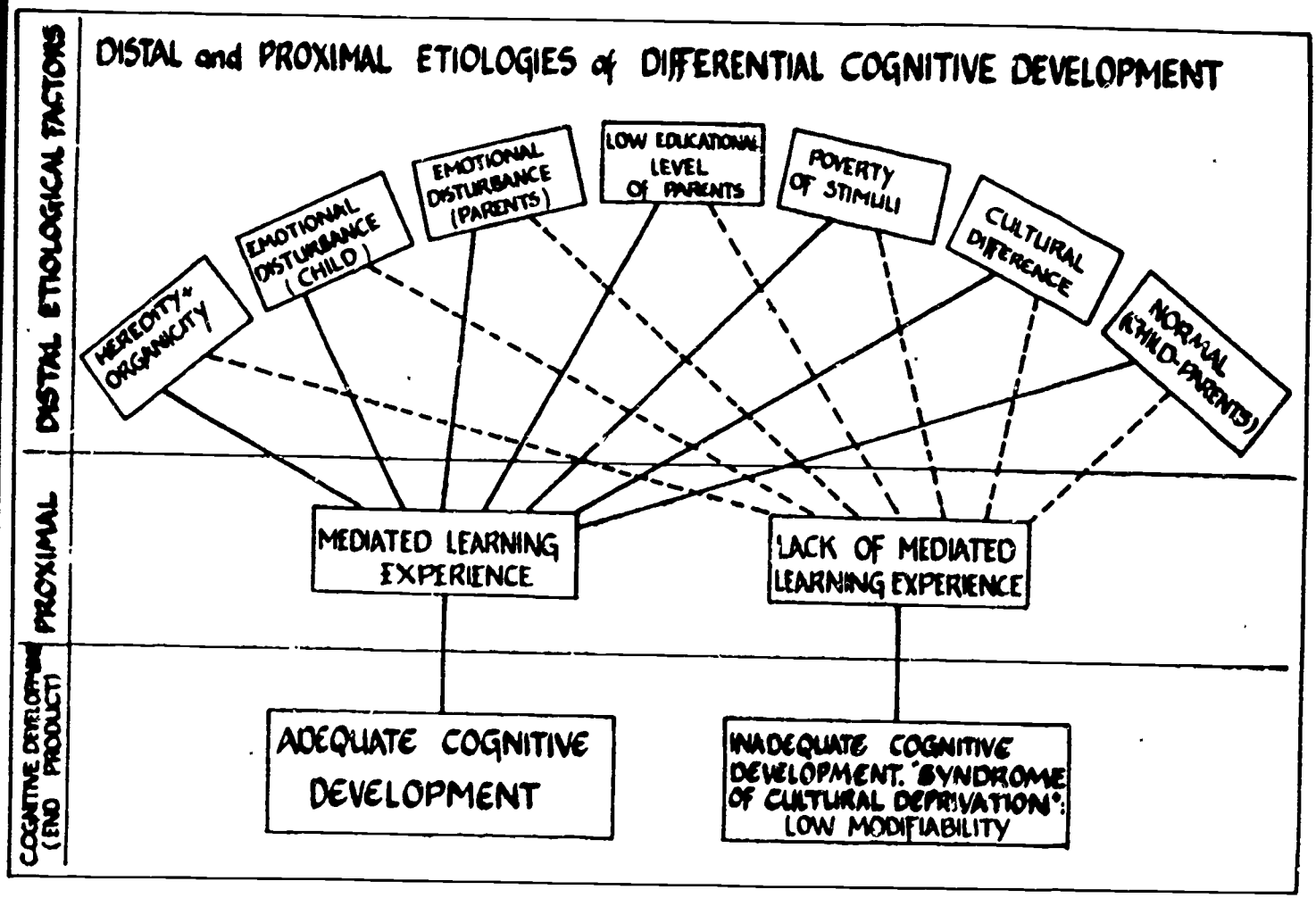
The teacher must be willing to digress from a lesson plan according to the needs of the students and the classroom situation. For instance, if the independent work, its discussion and summary is completed before the allotted time, the teacher may introduce a new page which may not be finished in the time remaining. On the following day, the student would continue with his/her independent work. There can be variations on the pattern for I.E. lessons, although all of the above-mentioned components should be included. Teachers must be cautioned, however, not to reduce the time spent on actual work on the pages.

III. CLASSROOM CLIMATE

Try to maintain a friendly, relaxed attitude, supporting students' efforts for self-control. A belief in the modifiability of the child, an understanding of his/her difficulties and an involvement in their resolution should be evident from your behavior. Your encouragement, feedback and guidance in developing insight are essential for his/her success. A willingness to listen, a sense of humor and flexibility on your part contribute immeasurably to lessons.

Students should enjoy Instrumental Enrichment, displaying an interest and the motivation to cope with increasingly difficult tasks. They should be active participants in all stages of a lesson. Students should be encouraged to initiate questions and participate in discussions, confident that what they say will not be ridiculed. Cooperation should be encouraged. Some students will be able to help classmates. Students should be willing to give help properly (by giving cues to classmates and asking questions, but not by showing or telling how to solve the problem), and to receive help graciously. Discussions should be marked by a readiness to listen to one another attentively and courteously.

THEORY OF MEDIATED LEARNING EXPERIENCE



Reuven Feuerstein, Instrumental Enrichment: An Intervention Program for Cognitive Modifiability (Baltimore, Md.: University Park Press, 1980), p. 18.

A P P E N D I X C

List of Diagnostic Instruments examined.

1. SRA Pictorial Reasoning Test.
2. SRA Non-Verbal Form.
3. Cognitive Abilities Test (Grades 3-12) by R. Thorndike, E. Hagen and I. Lorge.
4. Omnibus Personality Inventory 1968.
5. Abstract Reasoning: Differential Aptitude Tests, Grades 8-12 and adult.
6. Watson - Glaser Critical Thinking Appraisal Grades 9-16 and adults by G. Watson and E. Glaser.
7. Analysis of Learning Potential by W. Durost, E. F. Garned, R. Madden and G. A. Prescott.
8. Test of Logical Thinking (TOLT) by William Capie.

A P P E N D I X D

Fundación Educativa Ana G. Méndez

Centro de Diagnóstico y Ubicación

Proyecto FIPSE
Diciembre 1985

Cuestionario al Estudiante

Instrucciones: A continuación aparecen una serie de preguntas. Trata de contestarlas lo más sincero posible.

1. ¿Cómo te sientes al ser un estudiante participante del Proyecto FIPSE?

2. ¿Qué es lo más que te ha gustado del proyecto?

3. ¿Qué es lo menos que te ha gustado del proyecto?

4. ¿Encuentras que existe alguna diferencia entre los cursos de FIPSE y tus otros cursos? Menciona y explica en que consiste dicha diferencia.

5. Comenta si el material que se te entregó en el curso FIPSE llenó tus necesidades para realizar el trabajo de español y matemáticas.

6. ¿Le recomendarias a un amigo tuyo o familiar que tome los cursos de FIPSE? ¿Porqué?

7. Enumera en tus propias palabras aquellos conocimientos y destrezas que en tu opinión has obtenido de los cursos FIPSE.

8. De acuerdo a tu opinión; ¿Cómo te ayudaron los cursos de FIPSE con tus otros cursos? Explica la contestación en tus propias palabras.

A P P E N D I X E

Pioneer in Bilingualism
New Perspectives in Education
ST. AUGUSTINE COLLEGE

St. Augustine College

1333 West Argyle / Chicago, Illinois, 60640
Phone : 312 / 878 - 8756

April 16, 1985

Ms. Wilma Ferrer, Director
Centro de Diagnóstico y Ubicación
Fundación Educativa Ana G. Mendez
Carr. Cupey Km 1.6
Apdo. E Rio Piedras
Puerto Rico 00928

Dear Wilma:

Unfortunately, I was unable to meet with you before returning to Chicago as I had hoped. Anyway, I would like to keep in touch as we are working on areas of mutual interest.

Your mention of what you were doing with the **FIPSE PROJECT** has definitely aroused my curiosity. We are teaching a course in Academic Skills for our incoming students and have found that the students greatest need is precisely learning how to think. During the summer we will be redesigning the course and it would be great to incorporate something to that effect. Maybe if we could share ideas, what we do in that area for the course could be of benefit to your project.

If you have any information or have some mailing list for dissemination, please include us.

As to our discussion of the work you were doing at the Centro de Diagnostico, I want to reiterate our great interest in the "Examen de Orientacion". It would be of great assistance in our screening and placement. Also I believe it could be interesting to evaluate its use for an adult population. Our President -Dr. Carlos Plazas- will be writing to Mr. Mendez to follow-up on the possibility of collaboration in this area.

Again, thank you very much for your time and assistance. I am looking forward to developing a working relationship with you for the benefit of our students.

Cordially,

Luis J. Zayas
Dean of Student Affairs

Front Range Community College
Student Assistance Center
3645 West 112th Avenue
Westminster, CO. 80030
May 12, 1986

FIPSE Director, Wilma Ferrer de Martinez
POB Box E
Rio Piedras, PR 00928

Dear Wilma Ferrer de Martinez:

Recently our long-range planning task force identified areas of concern, where the institution needs to strengthen its administrative, instructional, student and other capabilities.

It has been brought to our attention that you have been involved with a Reasoning and Problem Solving Skills Model.

We would appreciate any materials, including in- depth sketches and plans that pertain to the above need. We would also appreciate any evaluations and studies in this or any of the above-mentioned areas.

Thank you for your assistance.

Sincerely,

Dr. George Williams
Student Assistance Center

A P P E N D I X F

UNIVERSIDAD DE PUERTO RICO
RECINTO DE RIO PIEDRAS
CONFERENCIA PUERTORRIQUEÑA DE LAS HUMANIDADES
LAS HUMANIDADES EN EL PUERTO RICO DE HOY
Apartado 21839, Estación U P R
Río Piedras, Puerto Rico 00931

Director

57 Dr. Angel Villarini Jusino

Subdirectora

Sra. Ileana Lacot Martínez, M.A.

Coordinadores:

Dr. José Luis Méndez
Dr. Manuel Angel Morales
Dr. Gabriel Moreno Plaza
Dra. Sylvia Rivera Viera
Dr. Roamé Torres

Programa de Actividades

Conferencia Puertorriqueña
de las Humanidades

SIMPOSIO

SIMPOSIO

LAS HUMANIDADES EN EL PUERTO RICO DE HOY

Universidad de Puerto Rico
Recinto de Río Piedras

Fundación Puertorriqueña
de las Humanidades

Anfiteatro Núm. 1 — Pedagogía
22, 23, 24 de octubre de 1986

Definición de las Humanidades

La expresión "Humanidades" se refiere a toda aquella experiencia transformadora del hacer humano. Llamamos Humanidades a aquella experiencia que tiene el efecto de desarrollar la humanidad de los individuos, es decir, su capacidad para el sentimiento, el pensamiento y el lenguaje en cuanto condiciones de posibilidad de la dignidad y solidaridad humana.

La experiencia humanística se cumple tanto en el proceso de la creación cultural misma como en la recreación que tiene lugar cuando apreciamos e interpretamos el hacer humano expresado en sus formas de vida o cultura.

La experiencia humanística es una manera de crear y de interpretar la realidad, de juzgarla y criticarla, de tomar decisiones y actuar. Implica una reconstrucción o reorganización continua orientada por un interés en la emancipación, es decir, por el conocimiento y la crítica de lo que afirma y de lo que niega lo humano. Implica, además, la consciencia o imperativo ético de defender aquellas prácticas y relaciones que propician la dignidad y solidaridad humana y el rechazo de las que las niegan.

La experiencia humanística en cuanto creación y recreación de lo humano, de la dignidad y la solidaridad, a través del sentimiento, el pensamiento, el lenguaje y el trabajo, tiene sus raíces en la vida y cultura de los individuos en cuanto pertenecen a un pueblo. La cultura universal, acopio de aportes e interpenetración de los diversos pueblos a lo largo de la historia, sólo es significativa a partir de la propia experiencia del individuo particular y la cultura del pueblo que la sustenta.

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Miércoles, 22 de octubre

8:15 a.m. Registro de asistentes

8:45 a.m. Bienvenida: Dr. Juan R. Fernández, Rector del Recinto de Río Piedras

Saludo: Dr. Arturo Morales Carrión, Director Ejecutivo, Fundación Puertorriqueña de las Humanidades

9:00 a.m. Una Definición de las Humanidades: Dr. Angel R. Villarini, Director del Proyecto, Facultad de Estudios Generales, UPR

Comentaristas:
Dr. Arturo Morales Carrión
Lic. Fernando Agrait
Lic. Marcos Ramírez

Moderador:
Dr. Manuel Maldonado Rivera

10:30 a.m. Café

10:45 a.m. Discusión y recomendaciones

12.00 m. Receso

1:00 p.m. Las Humanidades en la Escuela: Dr. Roamé Torres, Coordinador, Grupo de Trabajo, Facultad de Pedagogía, UPR

Comentaristas:
Sra. Awilda Aponte Roque
Prof. Nilda García Santiago
Dr. Israel Ramos Perea

Moderadora:
Prof. Aurea Echevarría

2:30 p.m Café

2:45 p.m. Talleres concurrentes: Las Humanidades en la Escuela

Taller A: Dra. Vivian Auffant "Los procesos de pensamiento y la enseñanza del Español"

Taller B: Dra. María del Carmen Martínez — "Desarrollo del razonamiento lógico en el nivel primario"

Taller C: Profs. Marlyn Souffront y Monelisa Báez — "La organización del ambiente escolar y el desarrollo del pensamiento"

Taller D: Prof. Apolinar Cintrón "La enseñanza de la Historia desde un punto de vista crítico"

Jueves, 23 de octubre

8:15 a.m. Registro de asistentes

8:45 a.m. Bienvenida: Dra. Nilda García Santiago, Decana, Facultad de Pedagogía, UPR

9.00 a.m. Las Humanidades en las Profesiones — Dr. Manuel Angel Morales, Coordinador, Grupo de Trabajo, Escuela Graduada de Administración Pública, UPR

Comentaristas:
Dr. Juan R. Fernández
Prof. Pedro Juan Rúa

Moderador: Dr. Rafael Irizarry

10:30 a.m. Café

10:45 a.m. Discusión y recomendaciones

12:00 m. Receso

1:00 p.m. Las Humanidades en la Universidad — Dra Sylvia Rivera Viera, Coordinadora, Grupo de Trabajo, Facultad de Estudios Generales, UPR

Comentaristas:
Dr Pedro Badillo
Dr. Carmelo Rosario

Moderador:
Dr. Manuel Alvarado

2:30 p.m. Café

2:45 p.m. Talleres concurrentes: Las Humanidades en la Universidad

Taller A: Dra. Evelyn Quiñones "La música popular en la enseñanza de las Humanidades"

Taller B: Dra. Olga Torres de Javier — "La cultura puertorriqueña en la enseñanza de las Humanidades"

Taller C: Dr. Angel R. Villarini "Aplicando los clásicos en el proceso de solución de problemas"

Taller D: Prof. Ruth Hernández "Las nuevas estrategias en la enseñanza de las lenguas extranjeras"

Viernes, 24 de octubre

8:15 a.m. Registro de asistentes

8:45 a.m. Bienvenida: Dr. Eduardo Rivera Medina, Decano de Estudios del Recinto de Río Piedras

9:00 a.m. Las Humanidades en los Medios de Comunicación — Dr. Gabriel Moreno Plaza, Coordinador, Grupo de Trabajo, Facultad de Ciencias Sociales, UPR

Comentaristas:
Sr. Ramón Arbona
Sra. Norma Valle

Moderadora:
Dra. Idsa Alegría Ortega

10:30 a m. Café

10:45 a m. Discusión y recomendaciones

12.00 m. Receso

1:00 p.m. Las Humanidades en la Cultura Puertorriqueña — Dr. José Luis Méndez, Coordinador, Grupo de Trabajo, Facultad de Ciencias Sociales, UPR

Comentaristas:
Dr. Eduardo Seda Bonilla
Dr. Elías López Sobá

Moderador:
Dr. Eladio Rivera Quiñones

2:30 p m. Café

2:45 p.m. Discusión y recomendaciones

3:45 p.m Clausura del Simposio

A P P E N D I X G

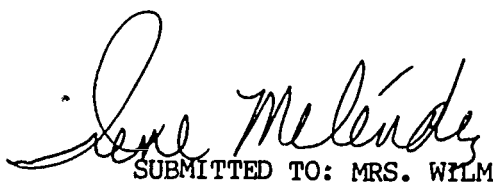
PROBLEM SOLVING AND REASONING SKILLS COGNITIVE DEVELOPMENT MODEL FOR SEVERELY DISADVANTAGED PUERTO RICAN COLLEGE STUDENTS

FEDERAL IMPROVEMENT OF POST SECONDARY INSTITUTION PROGRAM (FIPSE)
FEDERAL DEPARTMENT OF EDUCATION GRANT TO THE
ANA G. MENDEZ FOUNDATION OF PUERTO RICO

GRANT #6008440414

SEPTEMBER, 1984 TO FEBRUARY, 1987

EXTERNAL EVALUATION REPORT



SUBMITTED TO: MRS. WILMA FERRER DE MARTINEZ

BY: MRS. IRENE MELENDEZ, EXTERNAL EVALUATOR

APRIL, 1987

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FIPSE FINAL EVALUATION REPORT-ANA G. MENDEZ FOUNDATION-MAY/1987

PROBLEM SOLVING AND REASONING SKILLS COGNITIVE DEVELOPMENT MODEL FOR SEVERELY DISADVANTAGED PUERTO RICAN COLLEGE STUDENTS

PROJECT SPONSORED BY THE FUND FOR THE IMPROVEMENT OF POST SECONDARY EDUCATION (FIPSE) - GRANT #G008440414 - 1/10/84 - 2/28/87

THROUGH THE ANA G. MENDEZ EDUCATIONAL FOUNDATION OF PUERTO RICO

FINAL EXTERNAL EVALUATION REPORT

I. BACKGROUND INFORMATION:

The Grant Award Letter for the project in reference was received on September 11, 1984, with a stipulated initiation date of September 1, 1984. The proposed grant period was two years, the project originally scheduled to terminate on August 31, 1986. In order to be able to provide for a pilot testing of revised courses, left-over funds from unexpended salaries of personnel hired after starting date in the amount of $8,445 were reserved for a no-cost extension which was requested in May of 1986, and approved, making the final termination date February 28, 1987.

The Ana G. Mendez Educational Foundation's FIPSE project was directed toward the general purpose of designing and testing a Model for the development of essential cognitive skills for low achieving Hispanic students through the incorporation of cognitive skills development techniques into two areas of the first year remedial courses. The project was based on Piagetian cognitive theory. The educational strategies and materials of Karplus (particularly the instructional strategy of the "Learning Cycle"), Whimbey (primarily the "cognitive therapy" techniques), and Feuerstein (the application of the materials from the "Instrumental Enrichment Program" for thought process organization and conceptualization capacity

development among students) were to be applied by a group of existing faculty members, trained by expert consultants.

The project was to direct this complex matrix of well-known educational theories to the re-conceptualization of remedial courses in Spanish and Mathematics for academically disadvantaged freshmen of the three campuses of the Ana G. Mendez Foundation: the Puerto Rico Jr. College (PRJC); Metropolitan University College (UMET) and the University of Turabo (UT).

Project direction and activity coordination was placed under Ms. Wilma Ferrer de Martinez, Director of the Ana G. Mendez Educational Foundation Assessment Center at the Central Administration, on a 75% time basis, who was to be assisted by a full-time Specialist in curriculum development.

The project format included mechanisms to incorporate and involve the personnel of various admininistrative levels within the university structure. Deans and Departmental chairpersons were to receive training on the general project aspects, and to be involved in administrative aspects of the project in the three campuses. Two faculty members, one in Spanish and one in Mathematics, from each of the three campuses were to be selected, and provided release time from two courses, for participation throughout the grant period. Three committees, one consisting of all project staff and participating faculty, and two comprised on the faculty members of the specific content area from the three institutions (Spanish and Mathematics) were to be established as a mechanism to assure on-going coordination. A fourth "Steering Committee" was to be comprised of the Chancellor and Deans of Academic Affairs of the three institutions with the

project staff to review project progress and assist in activity coordination and implementation.

The project was directed toward achieving change in the students, the faculty, the curriculum and the program of the Ana G. Mendez Foundation. Objectives included the:

Students:

1-increase in achievement scores in basic courses of at least 15% for participating students as compared to similar groups of students at the three participating campuses and of other Island universities;

2-reduction of attrition rates in basic Spanish and Math courses by at least 10%;

3-improvement of at least 15% in achievement scores in basic courses and of at least 10% in advanced courses, of participating students, as compared to similar groups;

4-reduction of at least 15% in attrition rates of participating students in advanced courses as compared to the norm for the three institutions;

Faculty:

1-development of comprehensive knowledge of cognitive skills development theory and techniques applicable to the more seriously deficient student and ability to successfully apply these in the classroom, in participating faculty;

2-development of a working knowledge of cognitive skills development and development techniques in the entire basic course faculty of the three institutions, that will allow them to revise courses and/or teach courses that incorporate cognitive skills development;

3-achievement of satisfaction with the project and expression of a commitment to institutionalization and expansion of the project to other areas as applicable, in at least 85% of the basic courses faculty;

Curriculum:

1-incorporation into the regular offerings at the three colleges as remedial course offerings for the most seriously disadvantaged, of the basic courses designed in the project, once revised and proven successful;

2-re-design of the remedial course in English along the lines of the courses in Spanish and Mathematics and full institutionalization of same to achieve the transformation of the entire remedial offerings

into a content area/cognitive skills development program, once project is proven successful;

Program:

1-development of a Model for the systematic formation of cognitive skills among the most seriously disadvantaged Hispanic college students, through the incorporation of cognitive skills development strategies and techniques into remedial content area courses;

2-elaboration of a set of reliable diagnostic instruments for ascertaining the degree of mastery of basic cognitive skils (level of reasoning and problem solving skills) among the lower tier of the disadvantaged in Puerto Rico, to serve as a model for the development of similar measures and instruments at institutions throughout the mainland, especially at institutions serving large numbers of disadvantaged Hispanics;

3-elaboration of a set of model courses in content areas that incorporate reasoning and problem solving skills that allow for concurrently developing both content and cognitive skills and hence levels of attainment conducive to higher achievement in advanced courses, to include courses that are fully designed with the materials required and techniques to be used in these courses, readily adaptable to institutional settings both in Puerto Rico and on the mainland;

4-utilization of the products of the project during the first year after the completion of the initial implementation and dissemination, by at least three institutions on the mainland and two institutions in Puerto Rico, through the direct application of the model courses and techniques or through their adaptation in collaboration with the Ana G. Mendez Foundation.

II. DESCRIPTION OF THE SPONSORING INSTITUTION:

This FIPSE project was developed at the three campuses of the Ana G. Mendez Foundation, a private, non-profit corporation which operates the Puerto Rico Junior College (PRJC), Metropolitan University (UMET) and the University of Turabo (UT), three separate institutions of higher education which respond to the Foundation's Central Administration, operating directly under the President. In addition to the centralized planning, budget, finance, personnel administration and legal services, the Foundation has an Assessment Center (CDU), which was administratively responsible for the FIPSE project in reference.

As evidenced in the approved project proposal, the Foundation serves about 11% of the total postsecondary students of Puerto Rico, 90% of whom qualify for economic assistance. The great majority of students of the three institutions of the Foundation are academically as well as economically disadvantaged, over 90% coming from the public school system of Puerto Rico as first generation college students. In the PRJC and UMET, nearly all of the student body are residents of the greater San Juan metropolitan area, while at UT, over 80% of students come from rural areas in Northeastern and North central Puerto Rico. In terms of academic preparedness, there is little difference between students of the three campuses. More than a third of the entering freshmen at all three campuses have high school GPS's below 2.00, and over 85% score under 500 (out of 800) in both verbal and mathematics aptitude tests. Attrition rates for freshmen averages 18% and for upper classes, nearly 25%, with the highest attrition and lowest achievement rates being in Mathematics classes. Variations between the three universities are relatively small in terms of student characteristics.

The Puerto Rico Jr. College is located in older remodeled buildings in the Rio Piedras sector of metropolitan San Juan, in which administrative offices and classrooms have been distributed. The buildings of this campus line both sides of a busy highway, and the institution gives a visitor an impression of bustling crowds, noise and overcrowdedness. This is the oldest of the campuses.

The Metropolitan University facilities are of recent construction and are characterized by continual expansion. Located in the outlying urban area of San Juan, these facilities are also adjacent to a busy highway, although inside the main complex there is a small "campus".

The University of Turabo has relatively newly constructed buildings too, but on an extensive campus in a rural area in the northeastern city of Caguas.

The faculty of all three campuses is comprised of both full and part time professors. Like most private institutions in Puerto Rico, all three universities of the Foundation offer a complex program of classes from early morning through late night hours, drawing heavily on a teaching staff who may have commitments with one or more other Island universities at the same time, or who take on extra teaching hours in the same institution to supplement their salaries.

Salary scales are still low in Puerto Rico for university faculty, compared to mainland standards, and teaching loads are high leaving little time for research or other professional activities associated with university professorships. Also, like most private institutions, the faculty work relatively autonomously under the general supervision of the Academic Dean. The Ana G. Mendez Foundation has had a number of turnovers in administrative positions, including those of Academic Dean and Chancellor in recent years. From the evaluator's experience with institutions of higher education in the Island, deans tend to have a minor role in decision making, but rather implement decisions made at the level of the Chancellor, and also have little power over the faculty, but rather serve as coordinators and peace-makers in times of conflict. In the project in reference, the evaluator found no evidence of active participation on the part of any of the deans of the three institutions involved, but rather of autonomous faculty decisions.

The Ana G. Mendez Foundation is accredited by the Council on Higher Education of Puerto Rico and the Middlestates Accrediting body. Continually the institution has met accreditation standards, and emphasis is given to the accreditation status in publicity and recruitment efforts. Accreditation is, of course, required, to obtain student aid and other Federal funding, and thus is life sustaining for any institution that serves a primarily economically disadvantaged student body. Nevertheless, the Foundation has been characterized for going beyond merely meeting accreditation requirements by developing "innovative" programs for meeting educational needs of its students. It was one of the first institutions to open admissions to severely academically disadvantaged students and to provide them with remedial education courses as a transitional access to university studies. It was the first private university to develop televised academic programs. It has set up joint educational endeavors with mainland institutions like Berkeley, and participates broadly in Federal programs, due, in part, to a very active and well developed External Resources Office.

These facts, and the others presented in the extensive justification and needs assessment of the approved FIPSE proposal, contribute to the formation of the organizational context within which the FIPSE project was developed, and which influenced the results of the project.

III. EVALUATION METHODOLOGY:

The External Evaluator was contracted at the end of the grant period, thus only retrospective data collection could be carried out. The contract was signed on January 22, 1987, and the process of data collection, analysis and report preparation covered about four months.

An attempt was made to reconstruct the project processes and results as accurately as possible. The internal assessment tools and results were reviewed, the external evaluation report from the first project year was given consideration, and interviews were held with the Project Director, a collaborating statistician from outside the project, and the participating faculty members.

The External Evaluator understands that she was contracted on the basis of her past experience in program evaluation, especially of externally funded programs within higher education settings in Puerto Rico. She has had no prior, and has no current, professional relationship to the Ana G. Mendez Foundation, and can thus be considered fairly objective in her assessment of the project. The limitations to the evaluation are numerous. The Evaluator was not involved in the conception of the project, nor in the on-going assessment process. For this reason, only an after-the-fact and second-hand interpretation of project intent and objective's significance is possible. Also, conclusions and recommendations offered cannot assist in correcting problems encountered, except as related to efforts of the Foundation to institutionalize aspects of the project and/or efforts by other institutions to replicate it. Most of the data is second and terciary source data, and time limitations restricted the manner in which the evaluation was carried out and the volume and nature of the data collected.

In spite of these limitations, the external evaluator was able to review a great deal of material and gain insight into the project and its results due to the fact that:

1-A research format was used for the project that entailed rigorous, periodic, and comparative statistical data collection on student achievements throughout the grant period, all of which was provided the Evaluator for review, and which was interpreted for Evaluator in meetings with project administrative personnel and the highly qualified and experienced statistician who assisted in statistical analysis on a voluntary basis;

2-Extensive records were kept on all project process and product aspects in written narrative and audio-visual formats;

3-Project staff and participating faculty members were exceptionally cooperative and open in providing information and opinions regarding the project.

This report is a presentation of the Evaluator's assessment of the project's overall success in achieving the goals and objectives set forth in the approved proposal, based on the data available. The Evaluator has made a number of assumptions upon which the assessment is based.

First, it is assumed that the problem statement and needs assessment upon which the project is based are valid, i.e. that they present a fair assessment of the educational problems of the target population and the deficiencies of the institution to successfully overcome these problems using traditional approaches, substantiated by evidence and experience. Both the funding agency and the Foundation administration agreed with the problem statement and needs assessment presented in the approved proposal. While innumerable other very valid concerns could be considered as contributing to the academic deficiencies of students who come from socio-economically and academic-culturally disadvantaged backgrounds, the Evaluator sees the analysis of these as beyond the scope of this evaluation.

Second, the Evaluator assumes that the documents she was provided accurately represent what occurred in the project and present unaltered data obtained from the various internal assessment efforts.

Third, the Evaluator assumes that alterations of procedural aspects of the project necessarily alter the final results. Thus, while emphasis was given to the degree of achievement attained, consideration was also given to the degree to which the original activities of the proposed action plan were actually carried out, and how they were carried out. Quality of resources used, the degree of motivation of faculty and students, teaching and learning styles of participating faculty and students, and other subjective factors are considered important in providing possible explanations for final results, although these factors were not given ample attention in data collection or monitoring efforts of the project staff.

Fourth, the Evaluator assumes that the purpose of evaluating the project is to gain insight into how the project can serve to benefit the Foundation and other educational institutions in best meeting the challenge of improving the opportunities of academically disadvantaged youth to complete post secondary studies. It is assumed that most educational institutions have accepted at least partial responsibility for correcting the deficiencies of lower educational systems in order to increase the access of academically disadvantaged learners to one of the only means of upward social mobility available to them. For institutions to continue this role, it is thus, considered equally important to identify weaknesses as well as strengths of the project in order to avoid repeating those aspects which may have limited its success in achieving objectives, but also avoid discarding the positive results of what was done.

III. FINDINGS FROM VARIOUS INFORMATION SOURCES:

A. DOCUMENT REVIEW:

The following types of documents were reviewed by the External Evaluator:

-FIPSE Program guidelines and regulations
-Project's approved proposal and Grant Award Letter
-Contracts and resumes of staff and participating faculty
-Faculty training programs, signed attendance sheets, reports on training results, and completed evaluation forms
-Minutes, agendas, signed attendance sheets from project committee, staff, and evaluation meetings
-Copies of diagnostic tests and statistical and narrative reports of results
-Copies of theoretical materials upon which project is based
-Questionnaires administered to students and faculty, completed samples and reports of results
-Statistical reports and analyses of correlations between FIPSE group and control group in regard to high school and freshmen year college GPA, CEEB scores, achievement by course and by campus, Raven pre/post tests, Spanish and Mathematics pre/post tests, final course grades by campus, GPA by campus, GPA and retention rates of FIPSE participants three semesters later;
-Copies of model instruments, curricular designs, course syllabi and lesson plans, completed samples of student's work using project instruments
-Internal memorandums, correspondence to and from funding agency, and to and from other local and mainland institutions
-Progress reports from faculty and Project Director
-External Evaluation report for first project year
-Financial reports on project receipts and expenditures

Data from these documents was used to assess process as well as product concerns. The documented evidence reflects that the project followed closely the proposed Plan of Action for the first project year. Administrative approvals were obtained for release time for faculty (six hours per week), and the six faculty members, two (a Spanish and Mathematics professor) from each institution, were selected for project participation. The proposed committees were established and a weekly meeting schedule set up. Minutes indicate that relevant literature was reviewed and discussed at these meetings, using a format in which one professor would read a selected

work and report to the group for discussion. Three workshop training seminars were held to which faculty members and directors of the academic departments of the three institutions were invited. These were offered from January to March, 1985.

These covered the topics of "College Teaching and Development of Reasoning", based on Piaget's cognitive development theories and the Karplus Learning Cycle; "Awareness Sessions for Decision-Making Purposes", dealing with Feuerstein's "Instrumental Enrichment" methodologies; and "Instrumental Enrichment Implementation Workshop". There were 33 faculty members and administrative staff members who attended the first seminar; 34 in the second, and 23 in the third. These training seminars covered a total of six days, and were given by external consultants who were considered by the funding agency to have expertise in the respective topics.

The documented results of the participant's written evaluations of the training were generally positive for all aspects included in the Likert-scale instrument. It is pointed out in the first year External Evaluation Report, however, that reactions expressed in open questions by a minority (4 of 33) of the participants in the various seminars indicated resistence and/or rejection of the concepts presented and their relevance to the Foundation. These reactions are considered a normal resistence to change, but did have a negative impact on the project during the first year.

There was a complete turn-over in the Spanish faculty members participating in the project by the middle of the first year. This set back the project in terms of the timeline originally proposed. However, since all faculty had received the training, it was possible to replace those professors who left with already trained and more

motivated faculty members. Still, these had less time to complete activities. By summer of 1985, the revised Spanish and Mathematics curricula were produced, which was used for the pilot test in the fall semester of 1985. Students were carefully selected, registered in special block courses of remedial Spanish and English, and a control group was selected that met the requirements for the project's experimental design. High school GPA and College Board scores were the primary items used to match the experimental and control group.

A battery of diagnostic tests were developed and validated through statistical validation mechanisms, and were administered to the students. These were designed by expert consultants to assess the level of proficiency in academic skills of the students. They were administered as pre-tests to both the experimental and control groups. The decision was made to administer Spearman's Raven Progressive Matrices Test as a means of assessing the acquisition of cognitive skills in the students. The pre-test was administered early in the fall semester of 1985. Departamental exams were not administered in the FIPSE groups by mutual agreement of the faculty members, as indicated in the minutes of faculty meetings.

Classes were taught using the adapted curriculum and materials selected. The Spanish classes drew on the cartoon and some of the "orientation in space" materials of Instrumental Enrichment model while the mathematics classes used the dot matrix materials of the same model. Both applied "learning cycle" techniques. Later in the semester, the Spanish professors also applied dot matrix exercises of Instrumental Enrichment in their FIPSE classes. The minutes of the weekly committee meetings from August to December of 1985 indicate a

nearly perfect attendance of professors to the weekly departamental meetings, but that, in only one inter-departamental meeting were all participating faculty members present. These minutes provided the Evaluator with information regarding the problems encountered by the faculty in the implementation of the model in their respective classrooms, as well as the administrative problems that affected the pilot test stage.

There is continual concern expressed by faculty members in the minutes of meetings regarding not having the entire set of instruments to be used by the students at the beginning of the semester; not being able to "cover the material" of the courses if the model is applied as planned; and not being able to really measure results of the use of the model because "instruments were not used enough". At the same time, the various participating faculty members indicate that the students do "respond very well to the instruments", and , "in spite of the problems encountered, the students are learning the material better" than those of other non-FIPSE groups. An on-going concern over the psychological needs of students is expressed, especially by one of the professors, in the minutes, and the need to have support services as part of the project to meet these needs. The need for psychological services for the students is said to be based on an evaluation of the tendencies the majority of the group reflected in terms of attitudes and the many personal and family problems that were brought out in class during free expression times with students.

In a summary student profile delineated by Spanish faculty members of the project (Minutes ot September 30, 1985), the students are described as generally "defensive", "immature, clumsy, extremely quiet and timid in the classroom", unmotivated and without study

habits needed for academic achievement. In the same minutes, the characteristics that a professor for these students should possess are listed, and include "vast teaching experience", "a spirit of constant innovation", "flexibility", "openness" and "unprejudiced attitudes". While this description was said to be a concensus opinion of the Spanish committee, one professor was particularly verbal in regard to the student characteristics she perceived.

The minutes of December of 1985 reflect that the final examinations for Spanish and Mathematics were carefully planned to be uniform in the three institutions, to be equally valued and to assess the learning of course content using the same Instrumental Enrichment mode applied in the semester, i.e. caracatures in Spanish and dots in mathematics. In addition to these final examinations, the Assessment Center of the Ana G. Mendez Foundation administered validated post-tests to the students of both classes in all of the institutions.

In the second semester of the 1985-86 academic year, the minutes reflect that meetings continued on a weekly basis. Faculty members from the Jr. College only were provided release time (6 credit hours each) to revise the curriculum of the courses and prepare corresponding materials in accordance with the experience of the first semester. One mathematics and one Spanish professor from each of the three institutions were to have been selected to participate in this revision effort. The Spanish professor from the UMET, Dra. Mercedes Quinto, resigned from the committee, so that only five faculty members actually participated. Dr. Quinto did provide input after many requests regarding the past semester's experience. Minutes of the meetings indicate a near perfect attendance of committee members with

the Project Director in 19 of the 23 meetings held between December 6, 1985 and April 28, 1986. Only two joint meetings of the two disciplines were held during this time.

The committees decided that the Learning Cycle and Theories of Whimbey were the most adapted to the revision effort, and that not all of the Instrumental Enrichment materials could be used in any one class if subject matter were to be completed. A time schedule for activities was established. The minutes indicate that meetings constituted working sessions for the faculty members to revise content and methodology for the Spanish and mathematics courses. Suggestions for readings are brought by the various members, discussed, and decisions made as to which will be incorporated. the minutes show that outside work on the part of the various members is carried out, since they bring pre-developed materials and suggestions to the meetings. Concern is expressed by various members about the continuation of their efforts, the institutionalization of course modifications, training of other faculty members, and dissemination efforts.

Minutes of the meetings from September 4, 1986 to November 13, 1986, show that a total of 8 meetings were held for the two P.R. Jr. College faculty members who implemented the second pilot testing of the revised curriculums for the Spanish and Mathematics remedial courses. While the experimental and control groups were to have been selected in the same manner as for the original pilot testing, problems with the registration of students at last minute altered the process, so that the groups did not contain the students originally selected, and were smaller than originally planned. The two professors decided that the dot materials of Instrumental Enrichment would be applied in the Spanish class while caricatures would be used with dots

in mathematics. Learning cycles are to be emphasized in both classes.

Minutes demonstrate that the final decisions on class applications of materials were not made until late in September. Other activities are shown through the minutes, including dissemination efforts through talks and presentations of one of the professors in the University of Puerto Rico's Humanities Department and the production of a video-tape in which both students and professors participate to discuss their experience with the FIPSE project. In the minutes of October 29, the Mrs. Vivian Auffant, the Spanish professor, indicates, prior to the administration of the final examinations, that only one student "does not demonstrate improvement in the group, because of his attitude, not his capacity." She also notes, in these same minutes, that "problems of absences are not observed" among students, and that "the level of concentration improves as does that of interest in the classes." No evaluative statements outside of these are made in the minutes.

The revised course curriculum for Spanish includes a course description, a course justification, goals, objectives, content methodology, material and reading and audio-visual resources required, a description of supplementary activities, theoretical concepts and evaluation mechanisms. This short (6-page single-spaced narrative introduction plus outline format) document is accompanied by a 66-page Module of Readings with a Historical Summary written by Ms. Vivian Auffant, the Spanish professor of the FIPSE project and excerpts from various Puerto Rican authors.

The math materials presented to the Evaluator as the final curricular materials include a two-page statement of general and

specific course objectives and eight separate sets of exercises carried out primarily through the dot system of Instrumental Enrichment materials, with one set on caricatures. The topics covered are: Reading and Writing of Quantities; Multiplication, Division, and Potentialization of Cardinal Numbers; Fractions (Rational Numbers); Decimals-Operations; Geometric Formulas, Systems of Measurement and Applications; Whole Numbers; Think and You will Get It Right (Problem Solving in Caricatures; and Reason, Proportion and Percentages. These packages of exercises are not joined in any way by a set of guidelines or introductory statement of goals and objectives of any kind. They are, however, numbered consecutively from page 1 to 230, indicating a sequence or order in which the exercises should be taught and/or carried out. These materials, as well as those for Spanish, are currently in use in the remedial Spanish and mathematics classes of the Puerto Rico Jr. College, according to information given the Evaluator by the faculty members and the Project Director.

Completed written assignments and examinations of students demonstrate that these curricular guides were actually used for class assignments of the experimental FIPSE group on a regular basis. Written evaluations from the students reflect nearly a unanimous positive opinion of the FIPSE courses, their ability to help students in other classes, and their capacity to increase understanding of the subject matter over traditional methodologies.

The most common answer to the question: "How do you feel about having taken the experimental Spanish and mathematics courses of the FIPSE project?" was, of course, "I feel fine" or "O.K." Of the 51 answers recorded, only 3 were consistently negative, one stating that he/she had learned nothing in the project; another that he/she was not

satisfied; and the third that he/she had not liked the Spanish class. Examining all of the answers to the six questions recorded, this ratio prevails. Over 95% of those surveyed state that they liked the classes, the professors, and the materials; that they had been able to understand the material more easily with the methods used in the classes, and had found the use of the caricatures and dots more interesting than traditional methods; that the use of the tutors was especially helpful; and that the professors were excellent and helped them to understand. About three answers for each question were negative, stating that the materials were boring and for elementary school children; that the mathematics professor did not explain as he should have; that the classes were all papers with dots or caricatures that were always the same; that the math was hard to understand; and that the professors missed a lot. In terms of the way in which the classes had helped them most, recorded answers include the raising of the grade averages as the most common answer; helping them to think, to improve study habits, to organize mentally, to express themselves more easily; helping to select their future profession; and helping them to acquire specific skills they mentioned, like forming paragraphs or working with decimals.

Outside of the evaluation forms administered to the faculty after the training seminars, written opinionnaires, comprised of six open questions were administered to participating faculty members in December of 1985.

The general impressions expressed in the five answers were all positive, stating that the project had given the students "a viable and real alternative to improve" by "utilizing innovative external

resources". Two of the faculty members mentioned the positive impact of the project on them as professors.

In the second open question, faculty are asked to identify strong and weak points of the project. The most common strengths include the "elimination of part of the students' anxiety toward mathematics", the "improvement of professor/student relations", the "benefits of professors meeting together" and "the excellent academic and administrative work team", and "the external resources", materials used in the project. Among the weaknesses identified by the faculty were "groups that were too large",delay in the receipt of materials and the subsequent need for faculty to then improvise, "need for more training for professors", and the overambiciousness of the project in the time allotted.

In terms of how faculty would improve the project weaknesses, they indicated that they would reduce groups to "no more than 20 students" per section; use tutors and a multi-disciplinary team of professionals, social worker, psychologist and psychiatrist for support services; reduce content and increase time allotted for courses; and expand the use of innovative materials. Two of the five participating faculty members mentioned the Instrumental Enrichment materials as the "most useful" of the educational strategies applied in the project, while two others indicated that they felt the Learning Cycle had been the most useful. One person indicated that the individualized teaching in which students had been permitted to feel comfortable and to express him/herself as an individual had been the most important project aspect.

All of the five professors indicated that the project had helped students to "increase self confidence", "to acquire knowledge they did

not have and to form study habits", "to understand basic concepts and acquired needed basic skills", "to develop their capabilities" without time pressures, and "to see that no matter how much they have suffered in the past they can face the future with courage and positiveness"

In December of 1985, a questionnaire was sent to the English faculty members who were giving classes to the FIPSE students in order to gather their opinion of whether they "had noticed in the students of the FIPSE project any noticeable change". They were asked to enumerate and explain their answers. Only three of the twenty faculty to whom the questionnaire was sent turned in replies, one from each of the three participating institutions.

One professor (P.R. Jr. College) indicated that she had noticed a positive change in attitudes in the FIPSE group, especially when working independently in groups. She also indicated that their grades were equal to those obtained by other English section students, in spite of the fact that they had lower grade averages coming into the course, (4-A's; 6 B's; 9 C's; 2 D's and 1 Incomplete).

The professor from the Turabo University indicated seeing no change in the FIPSE students, that they were placed with students of higher GPA's and that their academic capabilities were over-estimated. "For this reason, they do not study and their classroom behavior has been affected".

The third professor from Metropolitan University, indicated seeing a positive change in attitudes in the FIPSE students in her group. She noted, as did the PR Jr. College English professor, that the students had achieved a group cohesion that helped them, and that the tutor was of great benefit. She expressed that she thought the

tutors should be used in all classes with academically disadvantaged students. She said she was "very satisfied with the results obtained" through the FIPSE project.

In order to gather specific opinions of the faculty who participated in the FIPSE project, the Evaluator interviewed the faculty members who had been with the project for the longest period of time. Results of these interviews are presented below.

The most important documentary evidence of project results is that of the statistical analysis carried out on the various testing aspects related to student achievement, retention, and intelligence (Raven Test) stated above. The project benefitted from the services of an expert statistician who collaborated on a voluntary basis with the project director to carry out computations and interpret results.

B. INTERVIEWS:

The Evaluator carried out both telephone and personal interviews with the Project Director, and three of the faculty members who had been with the project for the longest period of time: two mathematics professors and one Spanish professor. Two of the interviews are taped, and the cassette is included with this report. The information provided by the faculty members and the Project Director is considered essential in the light of the retrospect manner in which the external evaluation has had to be carried out. Mrs. Gladys Davila was interviewed in the Faculty Lounge of the Puerto Rico Jr. College on March 20, 1987. Mrs. Vivian Auffant was interviewed in the Project Director's office, the Director not being present, on March 26, 1987. And Dr. Jorge Sarmiento was interviewed briefly by telephone during this same week. Approximately eight conversations/interviews were held with the Project Director during the months of data gathering.

A naturalistic approach was used for interviews, exploring the professors' opinions of the project, its effect on students, on them as professors, and the results. Professor Davila stated that the most significant aspect of the project was that it helped students to enjoy mathematics in a way that traditional methods had never done. She had taught for 14 years prior to the FIPSE experience, but had not taught remedial classes before. She found it difficult at first, especially since the format also changed. Under FIPSE, the role of the professor is passive, she stated, and since she has a "dominant personality", it was difficult to permit the students to self learn as the method called for. Nevertheless, as she began to see it working, she adapted, and feels that it helped her as a professor as well as the students. " Teaching calculus to college students is easy", but to be able to explain basic computations is very difficult, she stated. She stated that the ideal combination of techniques applied in FIPSE is the Learning Cycle with Instrumental Enrichment. The first year group, she said, achieved more with the method than the second because the first group was better selected and because there were two groups which formed a kind of competition which helped to motivate the students even more. Professor Davila indicated that there was a problem with the enrollment in the second year, and thus only one group was selected, and a small group, at that. This limited the results. Professor Davila found that the student who dominates the material does not respond as well to the techniques and materials as the student with very few skills coming into the courses. She rejects the idea that GPA and CEEB necessarily reflect the student's skills. Emotional, family, and other problems can affect his/her motivation

and cause the scores to be low, yet the student has skills he is not reflecting on tests. This type of student rejects the method as too basic, too elementary. In fact, she thinks that the level at which the materials and techniques would best be applied is at the elementary school level. Most students of the basic skills courses, however, respond very well since these are students who have not acquired skills in courses with traditional methods.

The role of the teacher is very important. "If there is not an adaptation between professor and student, it does not work". The teacher has to be able to see herself/himself as another companion of the students, not as the dominant figure, she explained. She feels she has grown as a professor. She used to think that teaching at this basic level was an "insult", but now she can teach at all levels, and in fact, has chosen to continue teaching basic courses this year when her participation in the project ended. She definitely thinks that she improved in her teaching role.

She feels that one of the primary negative factors this year versus the first project year, was the fact that the project was not developed in all three institutions again. It was hard on her not to have other professors with whom to interchange ideas and compare results. In spite of the fact that she feels that the project administration was positive and effective, she thinks that the institutional administration could have given greater support to the project, especially in the second year in the aspect of selection and classification of students. The project would have been more effective if it had been extended for at least another year. The results are limited because it was not continued as it could have been. More faculty should have the opportunity to participate in the project and

continue testing and modifying it. She expressed that she was not sure about the method's applicability in other institutions, as it would depend on the institution. She mentioned the conference carried out in the University of Puerto Rico and the documentary developed on the project as means of disseminating the results of the project. She, herself, has tried to disseminate the method among her teaching companions in meetings and with the administration of the college.

She mentioned the development of the "laboratories" as a direct result of the project. Students in basic mathematics courses at the Puerto Rico Jr. College now have to take five hours of laboratory every week. In the labs, the students carry out exercises using the FIPSE materials. Two professors and two technicians are in charge of the labs, and were trained on the model and the materials by Professor Davila, and are supervised by her. Some of the curricular materials are incorporated as classroom materials in the basic courses of the institution on a regular basis now. These are direct results of the project. She would defintely participate in another project of this nature, and stated that she knows that it works in helping to develop cognitive skills in students. She mentioned examples of students who could never have achieved the levels of success in subsequent courses that they have achieved if it were not for their participation in FIPSE, students such as a young girl with a 1.5 average coming into the college who participated in the FIPSE project and went on to Medical Technology, where there is a basis in mathematics, where she is doing successful work in regular classes. Professor Davila thinks that the project achieved partial success, not because of the model itself, but because of other factors that limited the capacity to be

totally successful. She would like to see it continued and expanded in the future within the Ana G. Mendez Foundation system.

Ms. Vivian Auffant stated that she had been teaching at university level for about 12 years when she began with FIPSE. She began with the project in 1985, about three months after the starting date. She was pregnant when the initial recruitment was carried out. She stated that at the beginning, "there were problems of all kinds". One of the original members of the group who was very competent had to leave the project because she was not a regular faculty member (just gave classes on a part-time basis), and it was decided that she should not participate. Another faculty member "did not want to understand the method" and left the project. Ms. Auffant was then recruited. She had already participated in the FIPSE trainings given at the beginning of the term. She reviewed the materials and began teaching in August of 1985. She taught two groups of FIPSE students every day. She had never taught basic courses before.

She thinks that other freshmen students she had taught were "the same" as the FIPSE group, only that these were classified as the very low students. She thinks it significant that the FIPSE students "know they are in the hole". Some are motivated to raise their level. Most have the capactity to learn, and have some basic skills, but they must have the attitude that they want to learn. The important part of FIPSE was the time permitted for them to learn skills. Once they learned "they flew". When asked if she had always used traditional teaching methods before, she said that this was hard to answer, since she had not taken education courses in her academic preparation. She always had used creative teaching methods in her courses. What the FIPSE did was to "confirm some things that she believed, but did not

have the scientific basis to prove", that these students could learn to express themselves if given the appropriate manner to do so. She thinks that the problem of expression of ideas is a general problem of people in Puerto Rico. Everyone has ideas, but not the words to express them. Instrumental Enrichment, "tranquilizes the students". She feels that these students have been isolated, rejected, labled as dumb, incompetent, etc. by "the system, their parents, others". Their self esteem is so low that this creates a great deal of anxiety, especially at test time. She and Gladys received an orientation about this from the College psychologist who confirmed what they had observed, that the anxiety level of these students was very high and that this affected their performance. The Instrumental Enrichment materials help to lower tension and to thus increase performance.

Professor Auffant had taken a course in which mathematical formulas had been applied to Spanish literature. She discussed this with Gladys Davila and they were able to then apply the dots materials successfully in Spanish the next semester. She feels that Spanish language teaching should be adapted to follow the division followed in the teaching of English, in which reading, grammar and literature are separated. In most Spanish classes a conglomorate of all of these is taught, but without a sequence or separation of skills. The project gave her the opportunity to develop materials that could do this with the students, to select readings that were more appropriate and lent themselves to skill development, and to teach more effectively.

She expressed the opinion that all students should have a psychometric examination. This was not done because of lack of funds in the project for this purpose. The project had limitations, in her

opinion. Time did not permit the provision of all of the Instrumental Enrichment materials in sequence. The "optimum would be to provide all of the materials in sequence". The real integration of all of the techniques originally planned was not optimally achieved. She used the materials and Learning Cycle. Even so, the method helped students to advance academically more than traditional methods.

She thinks her participation in the project helped her as a professional to develop "patience", a "tolerance to accept, not one different point of view, but many different points of view". The fall, 1985 semester was much better than the fall, 1986 semester. The latter group had a worse attitude than the first group, in general, and there was a lack of competition that had been present during the first pilot test period when two groups were used. The fall, 1986 groups was reduced in size, so there was an opportunity to interchange with the professor more, but a group of about 6 students had a very irresponsible attitude, and simply would not do the work. She had to give this group a Ø in a number of areas because they would respond in class sometimes, but would not do any work or hand in anything. Gladys had the same experience with this group. When asked if there were students who did not respond to the model of the project, she emphatically responded "yes, the students who are depressed". She defined depressed as being those students who are so overwhelmed by their problems that they simply cannot respond to stimulus. They cannot get out of their situation by themselves, and need professional help that the professor alone cannot give them.

The professor is a vital component for the success of the method, in her opinion. She feels that first, the professor must be very "tolerant". She/he must accept the students as they are. This is

very hard for most professors. She has tried to get other professors to accept the method and it has been very hard. She tries to explain to others, for example in the conference she gave in the University of Puerto Rico, that she first wants the students to express themselves and then worries later about grammar. Other professors are shocked by this. Most professors do not really listen to the ideas of the students, and they have to listen to them, no matter what they say. I tried to see the logic of what the students are saying, no matter how ridiculous it seems. This is important for the method to work.

She thinks that the method helps retention. The students do not miss class, even tests. She, however, said she is "bad" in that she does not make up tests, but only considers what they do. The students know this and do not miss.

When asked what she would do differently if the project were repeated, she said she would make it even more informal. She would use the classroom even less. She thinks that if she could help the students to express themselves in any environment, she could help them to come out of the "depression they have". The method, she thinks is applicable to all classes and levels. Analysis of literature, for example, lends itself to the method where reason is applied, curiousity is stimulated. In many students, this curiousity, this "spark" does not exist.

In terms of dissemination of the method, she said that mathematics integrated the materials and English adopted some of the techniques. She said there are many problems in the area of Spanish, a lot of debate in the field, itself. Persons outside the institution find the model very interesting. In the institution, there has been a

lot of support. The Deans, both the past and the present, were very supportive, attended training sessions, and helped the project.

She would not only participate again, but is anxious to learn more. She wanted to attend an international conference in which Feurerstein was speaking, but the college would not pay her trip. She complained without success. The academic area always suffers. She has tried to learn all she can on her own, but still feels she needs more information, more training.

In terms of administration, she thinks it was adequate, but that she and Gladys had to meet alone to really understand what they were doing, what was occuring. The Director finally understood this. Ms. Auffant thinks that the proposal, itself, had some "unpardonable faults". One of these is that other professionals, such as the psycholgist, were not included to provide auxiliary services to the students. Another was the time which was not sufficient to really prepare and test materials. Not enough time was spent in training the administration of the institution, so many still did not understand it. Not enough time was provided for materials development and preparation of the professionals. Not enough time was spent on evaluating the methods as they were implemented. Francis Link came and sat in on one class. The class she gave with me went perfectly, but it was only one time. " She could not evaluate me as a professional on the basis of one visit." The fall semester did not contemplate any such training or evaluation.

In terms of follow up, Ms. Auffant has two students of the past FIPSE group who are doing well. Other professors are still resistent to accepting the method. This is not easy. She thinks the project was positive and should have been implemented, even though there were

faults. She emphasized that much should be learned from the natural sciences where multiple experiments are carried out. She thinks that the experiment should be repeated, not just once, but more times. She would permit more time, involve more professors, correct the errors found this year, if she were to repeat the experience. She would give more time and attention to idea formulation and expression, analysis, construction of language. She thinks it should be even more flexible than it was. Ms. Auffant thinks that the European system of learning is more positive than the American, for example that past courses are valid forever, not just for a few years.

In terms of dissemination, apart from the conference she gave in the University of Puerto Rico, she is going to publish an article in the College magazine, and provide a training session to the tutoring personnel of the College. Otherwise, she is trying to implement a parallel system wherein Spanish students are to be required to take at least two hours a week with the professor to learn expression outside the classroom. This is not yet accepted formally, however.

Professor Sarmiento spoke briefly with the Evaluator by telephone. He participated in the project as a mathematics professor, and felt that the experience was a positive one for the students. The materials helped the students to express themselves more easily, but Prof. Sarmiento thinks that this level of student needs much more than what the project was able to give them. They are at such an elementary level that every skill has to be taught and learned for them to be able to go on to college work. This should be done before they get to college in his opinion. He stated that the administration of the project was adequate, that meetings were regular and a lot of

work went into the project. He does think that the students adapted better to the method than perhaps the traditional format, and most of the students he taught were able to go on to regular work, so it did seem to work.

The Evaluator was also able to speak to Carmen Hernandez, another of the Spanish professors who participated in the FIPSE project. In a telephone interview, she expressed many of the same opinions as Ms. Auffant. Prior to the FIPSE project, much of the teaching of Spanish at the remedial level in the institution had focused on grammar and language skills rather than on literature and reading comprehension and analysis. The FIPSE project helped to refocus the whole remedial education program in Spanish, according to Ms. Hernandez. The Instrumental Enrichment materials were useful in promoting open expression of the students, and the elimination of time restrictions helped the students. Ms. Hernandez indicated that she felt the project had helped the students gain self confidence and increase academic skills. She has continued to use the revised curriculum in her courses. She said the meetings with other faculty members was particularly helpful for idea interchange and design of uniform curriculum. She would have liked to have continued the project format for additional time, as she felt it was difficult to cover the material and test materials at the same time. She found the administration of the projec. positive.

C. OBSERVATION AND ANALYSIS:

The Evaluator was greatly limited by the fact that she was doing the evaluation in retrospect. She could not observe phenomena, and it was impossible to arrange student interviews because students were dispersed, and it was the end of the semester near examination time.

The limited interchange with the faculty members and the Project Director was the only opportunity for the Evaluator to capture, through observation and analysis, some of the underlying dynamics that necessarily influenced the outcomes of the project.

The professors interviewed demonstrated enthusiasm and frustration at the same time regarding the project. While they seemed to realize the potential of the techniques to which they had been exposed, they were not given the opportunity to understand them completely, or to apply them in the manner in which they desired. Both appeared to be well versed in their respective areas and expressed what appeared to be a very sincere interest in their students over their own welfare and convenience. They appeared to the Evaluator to be very dedicated and highly motivated professionals. While they knew, intellectually, that the project was a Federal grant and thus subject to limitations, the professors all expressed resistence to being subjected to the limitations imposed by the grant. They would have liked to carry out the project in their own way, in their own time. The Project Director was perceived more as one who was constantly making them stay within the proposal bounderies, rather than a project facilitator or program resource, although relations between the Director and the faculty members interviewed seemed friendly and not strained in any way.

The Project Director also transmitted both enthusiasm regarding the project's potential and frustration at the limitations encountered in its implementation and the results. If it worked, why then did the statistical analysis not reflect a more significant difference between the FIPSE groups and control groups? Why was there so much turnover of

faculty, since you would think that this was a great opportunity for them to apply new and exciting techniques? What did the project really prove? These and other questions were constantly being posed by the Director to herself and to the Evaluator. Yet the mechanisms for evaluating the project did not lend themselves to finding explanations but only to inferring possible factors influencing results. An on-going evaluation process in which non-participant and unobtrusive observations could have been made, combined with multiple other data gathering techniques could have provided documented explanations.

The Project Director impressed the Evaluator as competent, responsible, flexible, and dedicated. She seemed organized and assertive, yet not dominating and very open to constructive criticism. She set deadlines and appointments, but would adapt easily when interrupted, or when changes had to be made. If these characteristics are typical, then it would appear to the Evaluator that the style of leadership for the project was an appropriate one.

Record keeping was very complete, with progress reports, minutes of meetings, financial information all available. The Director's office was well organized. Reports and materials were filed appropriately and easily located. The times that the Director had to call on other offices of the institution for information, she was able to obtain cooperation rapidly through informal channels. This would indicate that she has the necessary authority for the direction of a project such as FIPSE that transcends individual program lines, and that she has developed the required cooperative linkages within the institution that proper administration would require.

The Director sought expert assistance when she deemed necessary. The services of Mr. Antonio Magrina, the Psychometrist used for

statistical analysis on a volunatary consulting basis, were used very appropriately, and provided her valuable technical assistance.

V. CONCLUSIONS AND RECOMMENDATIONS:

Taking into consideration the Statement of Intended Outcomes of the FIPSE proposal, and the data she was able to gather and analyze in the summative evaluation process, the follcwing conclusions can be stated for the Ana G. Mendez FIPSE project regarding the impact of the project on 1) Students; 2) Faculty; 3)Curriculum; 4) Program, as the components delineated in the proposal (page 28):

1-"Achievement" of students was to have increased by "at least 15%" in basic courses. Statistical data indicates that this objective was only partially achieved. Achievement was measured both through the pre-post tests developed by the Foundation's Assessment Center, and by the final examinations of the courses. The Assessment Center pre/post tests were statistically validated and are considered by the Evaluator to be adequate to assess academic achievement in the targeted academic classes. Final examinations in the courses were based on class test scores and participation of students in the classes and their coursework, using the project materials. Statistical results of the first semester in which the FIPSE courses were implemented indicate a mix of results.

Scores reflect that only at the Jr. College were significant differences found in pre-post tests in mathematics. While there was improvement in Jr. College students' pre-post test scores in Spanish, as well, change was not significant statistically. No significant change in scores is reflected either at the Metropolitan or Turabo campuses, although math scores of the FIPSE group at UMET improved.

In terms of Grade Point Averages, comparing the first FIPSE group to the control group for in December of 1985, only the PR Jr. College reflected higher GPA's for the experimental group. In both other institutions, the control group GPA's were slightly higher. A follow up study in December of 1986, however, indicated that the FIPSE students had higher GPA's in both the PR Jr. College and UMET, with only slightly lower scores in UT. Overall GPA's for the FIPSE group versus the control group participating in the PR Jr. College in the pilot test in December of 1986 were significantly different, the FIPSE group obtaining an overall 2.Ø6 GPA versus the Control group's 1.76. No attempt to compare results to other institutions of the Island was carried out, as indicated in the proposal objective.

While it can be concluded that only the students of the PR Jr. College increased their achievement to the extent expected, long term benefits in terms of academic achievement were also demonstrated for students at the UMET campus. Reasons for variations are possibly the greater involvement of the faculty members of PR Jr. College campus in the project and variance in the manner in which the model was applied at the three institutions. The variance in results is indicative of the importance of the many variables that enter into play in a project of this nature. Exacting attempts were made to select students with as similar GPA's and CEEB scores as possible. It is considered important by the Evaluator that the quality, leadership skills and motivation of faculty participating in the project be given equal consideration. The statistical results would appear to confirm the importance of these factors in achieving the desired results with students.

2-Follow up data on student achievement shows a significant effect of the project on students' achievement in other basic courses or in

subsequent coursework, as two of the three FIPSE groups outperformed control group students in regular coursework three semesters after their participation in the project. The limited input from English faculty members (3 answered out of 20 solicited replies) is inconclusive, but two of the three who answered did have the opinion that FIPSE students were more motivated than other basic education students and did have a higher achievement level. While it is impossible to state that this verifies achievement of this objective, the Evaluator does feel that it demonstrates positive impact of the project on both individual students and the FIPSE students as a group. Faculty members who were not involved in the project observed noticeable differences which they were willing to document on a questionnaire. Considered together with the significant reduction in attrition rates of FIPSE students and other data of the project, the Evaluator feels that it can be stated that improvement (not at any particular percentage level, however) in student achievement in other basic courses was achieved.

4-Achievement in more advanced courses is verified by GPA's or FIPSE students three semesters after their remedial courses. Grades are higher for the FIPSE groups at the PR Jr. College and the UMET campus. Achievement is also demonstrated by the fact that a significantly greater number of FIPSE students were able to go on to, and remain in, advanced courses as compared to similar groups. Whereas similar groups of students, i.e. those with below 2.0 GPA's and 400 CEEB scores entering college, have an attrition rate of about 55%, the FIPSE group had an overall attrition rate of only 7% in their first semester of basic courses. Three semesters later, FIPSE students demonstrated

that they were able to carry out regular work in advanced courses successfully, and had an overall attrition rate of 40% for the group, as compared to the 60% attrition rate for the control group. By campus, the data reflects that the FIPSE group of the PR Jr. College had a 40% attrition rate as compared to a 60% rate for the control group. At the UMET, the FIPSE group had a 34% attrition rate as compared to a 71% rate for the control group. And at UT, the FIPSE group's attrition rate was 47% as compared to the control group's 50%.

These very positive results indicate to the Evaluator that the FIPSE model has, as confirmed by faculty interviews, a positive impact on student self esteem and motivation which results in the students' remaining in college even when they must continue to work harder than regular students to pass their coursework.

It is the Evaluator's opinion that the project was overambitious in assuming that the limited application of the model could overcome the deficiencies in students' academic levels to the point of reflecting significantly on grades, especially since extraneous factors as important as faculty consistency, dominance of techniques by faculty, and faculty motivation were not able to be controlled.

5-The most dramatic effect of the project demonstrated by data obtained both at the time of the implementation of the project and three semesters later, is that of reducing student attrition. These results, provided above, demonstrate the achievement of the objectives related to improvement of student retention at the 15% level in basic courses, at the 10% level in more advanced courses as compared to similar groups (the control groups); and at the 15% level as compared to the norm for the three institutions. The norm being over 50%, it can be stated that the FIPSE group's attrition rate was some 10% under

the norm for the three institutions, three semesters after their participation in the project.

Faculty

6-The objective related to the development of "comprehensive knowledge of the cognitive skills development theory and techniques" in participating faculty members was only partially achieved. The Evaluator would conclude, from evidence reviewed, that a maximum of five faculty members were able to acquire the skills required to adequately utilize theory and techniques in the classroom with academically disadvantaged students. It is the Evaluator's conclusion that training on the theory and techniques was too limited for the scope of the project, placing a burden of skill acquisition primarily on the faculty, only part of whom were sufficiently motivated to accept this responsibility. Evaluation mechanisms to determine the skill level of faculty members were insufficient, with only one "on site" assessment visit carried out by the project consultant.

It is due to the motivation of the five persons who did implement the project on a continuous basis, that they were able to acquire knowledge and skills which they, themselves, still consider incomplete. This is one of the primary deficiencies of the project.

7-The fact that all basic course faculty of the three institutions of the Ana G. Mendez Foundation received training on the cognifive skills development theory and techniques is not sufficient to state that the objective that they "have a working knowledge" of these was achieved. The Evaluator feels that this objective was partially achieved in that the entire faculty was exposed to the theory and techniques. Insufficient time was dedicated to discussion of these. Faculty,

other than those participating actively in the project, are now incorporating some aspects of the theory and techniques in their courses. The fact that the curricular materials developed for the Spanish and Mathematics courses through FIPSE have been approved by the Academic Council for use in all basic courses is a significant achievement of the FIPSE project. Although Professors Davila and Auffant have provided on-going orientation in staff meetings to other faculty members, this is not sufficient to assure that the techniques are understood and will be applied appropriately in the courses by other faculty members.

8-It cannot be stated that 85% of the basic courses faculty has shown "satisfaction with the project" nor "express a commitment to institutionalize and expand it". Only three of the English faculty members replied to the questionnaire sent to twenty members, and one of these was negative toward the project. The Evaluator, again feels that the proposal is overambitious is expecting change in traditional thinking faculty through this relatively small project implemented over a relatively short period of time. There is resistence to change, as stated in the interviews with participating faculty members. Not all faculty have the capacity to adapt to the flexible teaching patterns required under the cognitive skills development techniques, nor the willingness to do so. Yet the fact that materials have been institutionalized is very important, and makes it imperative that further training be provided to all basic course faculty on the use of the materials and the methods, and that mechanisms be developed to permit ample faculty discussion, input and interchange regarding the changes to promote their acceptance and more adequate implementation.

Curriculum

9-The objective related to curricular changes and incorporation of revised course materials into "remedial course offerings for the seriously disadvantaged" of the three institutions was partially achieved. In the Jr. College, curricular changes were incorporated completely. The Evaluator concludes that the acceptance of the revised curriculum and materials is due in part to the fact that no uniform format existed previously, and still does not for the three institutions. It has been impossible, to date, however, to achieve the same degree of institutionalization in the other institutions. The Evaluator concludes that this is due, to a great extent, to the fact that these institutions did not continue to participate in the project after the one semester, and did not have faculty members who were committed to the project.

9-The re-design of the English courses was postponed since it was considered more important to adequately complete the testing with the two content areas in which the experiment was initiated.

Program

10-A Model was developed that can be considered both applicable to Hispanic college students. The Evaluator found insufficient evidence of cultural adaptation of techniques to determine how cultural factors influence in the application of cognitive skills development theory and techniques. Through her knowledge of socio-cultural characteristics of Hispanics versus Anglo-Saxons and Puerto Rican versus American society, the Evaluator can infer a few differences that may apply to the FIPSE project's results.

In American universities, the faculty is "controlled" by the administration through the granting or withholding of tenure, whereas

tenure is non-existent for most Puerto Rican institutions of higher education. Faculty in Puerto Rican institutions are not required to carry out investigations, to publish, or even to attend in-service training promoted by their institutions. This gives the faculty a much greater leeway in determining how and what they teach. It is common for faculty members, due to lower salaries and higher costs of living in Puerto Rico, to teach part-time at various institutions, and even to carry more than a full time teaching load. this leaves them little time to dedicate to up-grading of skills or participation in special projects promulgated by the institutional administration. It is "easier" to continue to teach a traditional format and the same content than to change. Middle administrators have little authority over the faculty and seldom will risk losing a faculty member to institute what may be an unpopular change. It was only through the top administrative support of the FIPSE project, and the motivational force of the participating faculty members and Project Director that the institutionalization of the project was achieved to the degree that it was achieved.

Puerto Rico still has a class society in which lower socio-economic classes attend public schools, demonstrated to be inferior in quality to most private schools, attended by a large majority of middle and upper class children. Education is one of the only means of upward mobility open to youth, yet dropout rates are as high as 40% prior to high school graduation. This means that those who do reach university level, even with lower academic skills, have motivation that potentially can be promoted. Yet the public education system is based on a highly authoritative, teacher-centered tradition.

Hispanic youth generally are expressive and group oriented. The FIPSE model techniques are well adapted to these general characteristics. Also the techniques counteract the thwarting of creativity of the traditional systems and help to form new mind sets in students used to accepting total teacher authority. The method is considered highly adaptable to Hispanic populations in and outside of Puerto Rico, and proved to be effective with a population of disadvantaged learners that is very typical of those entering most private institutions of Puerto Rico and many areas of high concentrations of Hispanic populations in the nation.

11-While developed by the Assessment Center of the Ana G. Mendez Foundation and not by the FIPSE project, the validated pre-post tests used as diagnostic instruments as well as evaluation tools, proved to be highly adaptable and useful for the project. These could be disseminated for use in other institutions in Puerto Rico and the mainland as an important contribution of the Foundation through the FIPSE project.

12-The course materials developed by the project faculty constitute another objective achieved. Spanish and mathematics materials were developed, tested, and incorporated into the Jr. College courses on a permanent basis, as planned. To fully achieve the objective, however, further institutionalization in the Ana G. Mendez system, other Island institutions, and the mainland should be promoted.

13-The dissemination of products is in process now that the project grant period has ended. The objective regarding the replication of the model was not achieved outside of one of the sponsoring institution's campuses. The Evaluator reviewed correspondence to three institutions in the mainland which provided information about

the project and to provide materials upon request. Locally, fifteen institutions of higher education are being notified of the availability of project materials and the model for potential replication.

RECOMMENDATIONS:

The Evaluator recommends that the project be used as a learning experience within the sponsoring institution and the funding agency, upon which future experiments can be based. Future replications must take into consideration all factors that could influence results and institute appropriate controls. Teaching and learning styles of professors and students should be examined in order to determine the effect on project results. If possible, faculty and students should be matched according to styles. It would be beneficial to develop a personality profile upon which selection of faculty members could be based. The Ana G. Mendez FIPSE project has suggested that personality characteristics such as flexibility, tolerance of differences, strong group leadership skills, capacity for improvision and innovativeness are those most adapted to successful use of the Learning Cycle technique with Instrumental Enrichment materials.

It is recommended that as many motivational forces as possible be combined with the model to achieve maximum results with the severely academically disadvantaged students. For example, the use of comparative groups to add an element of competition seemed to have a positive effect during the first application of the model in the project. The "halo effect" very likely affected the FIPSE group performance, and is unavoidable in such a project. Future replications should anticipate and make use of this phenomena.

Supportive professional services may help counteract personal and family problems that impede student participation. While some universities may provide these services as part of institutional student services, or through agreements with community service entities, most institutions in Puerto Rico have limited access to professional services. It is recommended that special projects involving disadvantaged students follow the example of Federal TRIO projects of the past, and include such services as an integral part of the project to ensure greater success.

It is encouraging, however, to note that special attention and motivational tactics combined with appropriate learning materials can overcome part of the attitudinal problems of students with severe academic disadvantage, as demonstrated by the projects' impact on attrition rates. It is strongly recommended that this experience be disseminated to school systems in and outside of Puerto Rico at lower educational levels to promote potential replications that could counteract the extremely high dropout rates prior to high school graduation.

Additional faculty training must be incorporated in any future replication effort, including in-service training and on-going evaluation of teacher skill in applying techniques by experts with extensive knowledge in the use of the techniques with disadvantaged students. Without controlling how techniques are applied, it is impossible to assess results objectively.

More extensive planning and orientation of institutional administrators and all faculty should precede any future effort to replicate the model. This will reduce resistence and promote support

that will contribute to project success and the on-going incorporation of successful aspects once the experimental stage ends.

The Evaluator would recommend that various combinations of skill development techniques be tested to compare results. Since the project has demonstrated that the use of these non-traditional techniques is motivational to disadvantaged students and does reduce attrition and promote learning, it is cost-effective for the Ana G. Mendez Foundation to continue the efforts or for other institutions to replicate them. This should promote further experimentation in this area which is needed in our current educational system wherein more and more academically deficient students are entering. In order for this to occur, however, extensive dissemination should take place. The Evaluator would recommend that dissemination of project results be carried out with the administrative staffs of all three of the Foundation's institutions at the same time that efforts are directed to other Island institutions and identified colleges and universities in the nation.

Future funding should be sought for dissemination efforts, possible project modifications and further testing, and replications, either from FIPSE or other Federal, foundation, corporation, or local funding sources. This should be coordinated, at the Ana G. Mendez Foundtion, with the External Resources Office, and with the FIPSE program officers who have followed the project progress to date.

POSTSCRIPT:

The Evaluator wants to express her appreciation to Mrs. Wilma Ferrer de Martinez and her office staff, as well as to the various faculty members of the Ana G. Mendez Foundation for their cooperation in carrying out this external evaluation of the FIPSE project.

A P P E N D I X H

If you wish to receive additional information on the project and/or be on the project mailing list, please send this form to:

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P. O. Box 21345
Río Piedras, P.R. 00928

Name: _____

Title: _____

Institution: _____

Address: _____

_____

Telephone(s): _____

Requests: _____

_____

_____

Special Comments: _____

_____

_____

A P P E N D I X I

List of Documents
Available Upon Request

1. Spanish
   - Course Syllabus
   - Course Workbooklets
   - Instrumental Enrichment Samples
   - Pre-Post test results

2. Mathematics
   - Course Syllabus
   - Course Workbooklets
   - Instrumental Enrichment Samples
   - Pre-Post test results

3. Workshop Participant Evaluations and Attendence List for:

   a. College Teaching and Development of Reasoning
   b. Instrumental Enrichment Awareness Sessions for Decision-Making Purposes
   c. Instrumental Enrichment Implementation Training Workshop

4. Semester Progress Reports - December, 1984

5. Semester Progress Reports - May, 1985

6. Semester Progress Reports - December, 1985

7. Semester Progress Reports - May, 1986

8. Semester Progress Reports - December, 1986

9. Student Questionnaire Results (December 1985)

10. Student Questionnaire Results (December 1986)

11. Faculty Questionnaire Results (December 1985)

12. Faculty Questionnaire Results (December 1986)

13. Student attendence records

14. Evaluation data and results

15. Minutes of all project meetings

16. Sample sets of test instruments

17. Reference materials