

Mathematics Diagnostic/Prescriptive Inventory (MDPI)

General Description

Introduction

Many students in today's complex world encounter problems with learning the mathematical skills appropriate to their cognitive potential, and are found to be struggling in the subject. Currently, there are limited tools available to mathematics professionals for identifying the underlying issues that are impeding the student's progress and then prescribing appropriate interventions. Most math assessment instruments, such as the Woodcock Johnson III (WJIII) or the Wechsler Individual Achievement Test (WIAT), may assess specific skills, but they reveal little information as to the nature and quality of the student's poor performance, or the reasons why a child is experiencing difficulty.

More than a simple assessment, what is needed is a comprehensive diagnostic instrument that can provide a thorough understanding of the learning issues underlying the student's poor performance in mathematics. The Mathematics Diagnostic/Prescriptive Inventory (MDPI), an individualized evaluation tool, provides educational professionals with an easy, efficient, yet comprehensive, instrument that assesses a student's performance, and then diagnoses the source of the student's challenges. It is designed to be administered to students, ages 7 to 15, whose cognitive potential is at least in the average range. Depending upon the performance of the particular student and the experience of the examiner, the assessment can take between 45 minutes and 1.5 hours. The average is about one hour.

The MDPI combines the advantages of personalized examiner/student interactions and on-line analytic capabilities. The student evaluation is conducted on a one-to-one personal basis by an educational professional. The MDPI relies on the examiner's judgments and observations. This is an important aspect of the MDPI approach because the examiner's observations of the student's performance is a key part of the input to the diagnosis.

A key and unique element of the MDPI is the use of a web-based, [Expert System](#) (ES) to summarize and interpret the results of the assessment and provide the information necessary for the examiner to make a diagnosis of the student's learning issues. The ES reflects the knowledge and experience of the Math Diagnostic principals who collectively have assembled and interpreted data for thousands of children over the last three decades. The ES design has been validated in research projects funded by the NIE and NICH.

The Elements of the MDPI

The Flow Chart attached as Appendix A shows the elements and process of the MDPI program. The steps are as follows:

To perform the student's assessment, the subscriber is provided with:

- MDPI User's Manual
- Demonstration Video
- Raw Data Recording Form
- Performance Characteristics Checklist
- Test Kit

The **User's Manual** and the Demonstration Video will be available for download from the MD website's Subscribers' Page. First time users should review carefully the video and become familiar with the Manual and the other materials, particularly the performance characteristics.

The **Test Kit** with the Activity Cards will be available for purchase from MD. The Test Kit contains all of the manipulative materials necessary to conduct the evaluation, including:

- Counting Chips
- Cuisenaire Rods
- Real Coins
- Base Ten Blocks
- Pattern Blocks and
- 2 cm Cubes

The **Activity Cards** are included as part of the Test Kit. They are used in the evaluation as references for the examiner and the student. The Cards are mounted on a stand and placed between the examiner and student. The test items viewed by the student are provided on the fronts of the cards, while the Administrative Guidelines, including directions and prompts used by the examiner, are on the backs of the cards. The cards are easily flipped on the stand after each question is completed.

The **Raw Data Recording Form** and the **Performance Characteristics Checklist** will also be available for download on the Subscriber's page. The Raw Data Form is used to record the results of the examination, including the examiner's judgment about the student's ability on each mathematical topic presented (scale of 0 to 2). The hard copy of the Performance Characteristics Checklist is provided so that the examiner has an understanding of which Performance Characteristics are to be observed. There is a list of the Performance Characteristics on the Raw

Data Form to record the examiner's observations. What's recorded is whether or not the Characteristic is present in the student's approach to solving the problem (1 or 0).

Depending upon the performance of the particular student and the experience of the examiner, the assessment can take between 45 minutes and 1.5 hours. The average is about one hour.

After the evaluation is completed, the examiner goes online with the MDPI system and manually inputs the data from the Raw Data Form. This takes about fifteen minutes to a half hour. At this point, the online application takes over and provides an analysis of the data. The Output is the individualized, Mathematics Learning Profile of the student, which is used as a basis for suggestions on an intervention program. Here is the details of how the MDPI arrives at its conclusions.

The Expert System has been programmed to translate the scores for each mathematical topic assessed and to generate an overall Achievement Level for the student (e.g. Late Grade 2 to Early Grade 3). The Achievement Level reflects the level for which the student meets the expectations set by the Common Core Standards for mathematics as well as the Focal Points of the National Council of Teachers of Mathematics (NCTM).

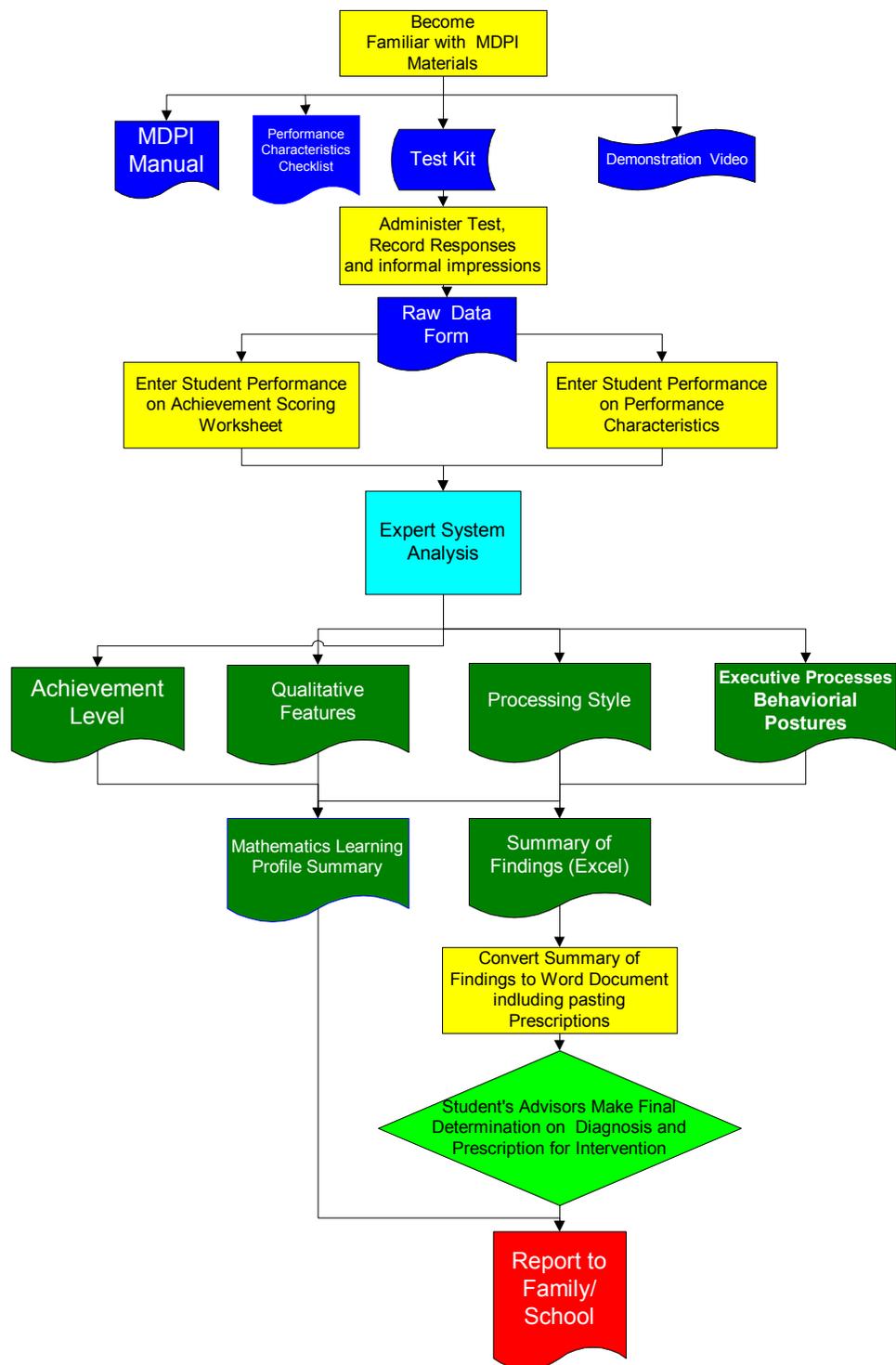
In parallel, the computer takes the items from Performance Characteristics Checklist, as entered by the examiner (scored 1 or 0 for present or not present) and groups them into sets of Qualitative Features and Executive Processes. This determination is not a direct output of the system but is available to the examiner by "drilling down" into the analysis to understand more details.

The Expert System then analyzes the Qualitative Feature and Executive Process and determines whether the student has Appropriate Skills, Some Deficits or Significant Deficits. These determinations are made by the ES, using the knowledge-base that reflects the judgments of the authors of the MDPI.

Finally, the Achievement Level and the Ratings of Qualitative Features and Executive Processes are combined by the application to provide the Mathematics Learning Profile for the student. This Profile then drives the selection of appropriate prescriptions. The student's team of teachers and advisors are provided with a range of optional approaches to intervention from which they can select the best choices for the student. The team takes into account the results of the MDPI as well as their observations of the student and his circumstances in order to make the most appropriate choices among the alternative interventions presented.

Appendix A

Mathematics Diagnostic/Prescriptive Inventory



Key to Shapes

MDPI
Test
Materials

Examiner
Tasks

Computer
Analytics
Performed

Analytics
Output
Worksheets

Decision

Final Report