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ABSTRACT

The KeyMath Revised is a power test that measures the understanding and application of mathematics skills and concepts. It is individually administered and is intended for students from kindergarten through the ninth grade to determine student mastery of mathematics concepts. The revised version is designed to be user-friendly for the student and examiner and differs from the original mainly in its simpler format. Test results can be used for general or remedial instruction, as part of a comprehensive evaluation, for pretest and posttest assessment, and for curriculum assessment. The revised version appears to be covering all the mathematics concepts for the grades intended. Scoring, which is also a change from the original version, involves marking answers on a protocol. Tools to assist in scoring are available. The KeyMath Revised was standardized in 1985 and 1986 using a sample of 1,798 students in kindergarten through grade 9. Reliability was acceptable, and content and criterion-related validities were reported. The instrument provides a clear and concise way to assess a student's level of mathematics, but is limited by the low reliability of the subtests when used in special education to pinpoint specific mathematics disabilities. In addition, the norms may not be appropriate for all grades because the sample for any given grade was not large. Overall, however, the KeyMath Revised is an appropriate tool to assess mathematics skills and concepts. (Contains 3 references.) (SLD)

A Review and Critique of the KeyMath Revised: A Diagnostic Inventory of Essential Mathematics

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General Information

Title: KeyMath Revised: A Diagnostic Inventory of Essential Mathematics
Author: Austin J. Connolly
Publisher: American Guidance Service
Date of Publication: 1988
Time Required to Administer: The time will be heavily influenced by the grade level, ability, and work habits of the student and by the proficiency of the examiner. The time ranges from 35 to 50 minutes.
Selected Costs:

Form A Kit $199.95
Form B Kit $199.95
The Combined Kit $ 374.95
The ASSIST Software Kit $189.95

Brief Description of Purpose and Nature of Test

The KeyMath Revised is a power test that measures the understanding and application of mathematic skills and concepts. It is individually administered and is intended for students from kindergarten through the ninth grade in order to determine their mastery of mathematic concepts. The KeyMath Revised is designed to be user friendly for both the student and the examiner. It has an easel format and exists in two equivalent forms for re-test purposes. The KeyMath Revised provides detailed information on exactly where the student is having difficulty.

The changes made to the original KeyMath in the Revised version focus on a simpler format of the sections. The KeyMath Revised consists of three areas: Basic Concepts, Operations, and Applications with 13 different strands which are measured by subtests. The strands include numeration, rational numbers, geometry, addition, subtraction, multiplication, division, mental computation, measurement, time and money, estimation, interpreting data, and problem solving. Each subtest contains three or four

specific domains represented by six test items. The results are easily translated into instruction because specific problems can be located within the domains.

The KeyMath Revised is intended to be used in one of five ways. The test results can be used for general or remedial instruction, as a contribution to a comprehensive test battery, for pre and post assessment, and for a curriculum assessment. The author created the KeyMath Revised in order to provide a means for assessing students in specific areas of mathematics, such as addition and subtraction.

Practical Evaluation

The KeyMath Revised provides a comprehensive assessment of mathematics achievement and pinpoints specific skill deficits. The manual provides clear instructions for administration and scoring. It explains in depth how the test was created and thoroughly describes the different parts. The KeyMath Revised may be administered by a range of users including regular and special educators, classroom aides, and counselors, but the interpretation of the results does require some knowledge of psychometrics. The materials are easy to use with the manual as a guide, although the administrator will need practice before giving the test.

One main feature of the KeyMath Revised is that it was created to be motivating for the student. By using a flip chart method, the author wanted to make the administration of the test more enjoyable. The easels contain many colorful pictures and a variety of content. The pictures appear to be relevant to the intended population and contain diverse, non-biased subjects. The flip charts provide a smooth presentation for administration. The instructions suggest the administrator capitalize on this and expect the

student to have fun during the exam. A toll free number is provided if technical assistance is needed.

The KeyMath Revised appears to be covering all of the mathematical concepts for the grades intended. The thirteen strands make it easy to see the essential elements being examined. The changes made from the first KeyMath to the Revised focus on providing a simpler way of organizing the material. First, the Content Subtest area was changed to Basic Concepts. Second, the missing elements strand was eliminated and interpreting data was added. A rational numbers strand was also added to cover fractions, decimals, and percents. Other changes include the mental computation strand was expanded, a strand on estimation was added, and the time and money strand replaced several previous subtests.

Scoring the KeyMath Revised is one of the major changes in the revision from the original KeyMath. The scoring method changed from shading little circles on a sheet of paper to marking the answers on a protocol. The responses are scored 1 for correct and 0 for incorrect. Three consecutive items correct constitute a basal and three incorrect items constitute a ceiling. To help communicate the results, a supplementary Report for Parents can be ordered. This provides a way for the administrator to explain the student's scores to the parents. Also, when ordering, a KeyMath Revised ASSIST Kit can be purchased. This computer package prepares the scores of a student and calculates the chronological age; computes the scores for the subtests, areas, and the total score; translates these into derived scores; and produces an analysis of domain performance in approximately three minutes. The test does come with scoring sheets in order to calculate the student results if an ASSIST Kit is not available.

Technical Evaluation

The KeyMath Revised was standardized in the Fall of 1985 and the Spring of 1986. The sample was selected based on the 1985 U.S. Census reports to help ensure a close fit to the national school population. The total sample included 1,798 students in grades K through 9 and was used to develop the national norms for the test. The sample selection was allocated proportionately across geographic regions and within the regions by grade, gender, ethnicity, socioeconomic level, and parental educational level. Although age was not used as the primary stratification variable, age-based norms are available for those who need to compare the KeyMath Revised scores with other age-based norms. Raw scores are connected to standard scores, percentile ranks, and age or grade equivalents.

Four methods were used to determine the reliability of the KeyMath Revised. They include the alternate-form, split-half, a method based on item response theory, and internal consistency. About 70% of the students in only five of the grades (K, 2, 4, 6, and 8) were re-tested with the alternate-form. The correlations ranged from the .50s to the .70s for the subtests, the low .80s for the areas, and averaged .90 for the total test. Split-half internal consistency reliability estimates were obtained for each subtest by correlating odd and even items. The split half correlations (connected using the Spearman-Brown formula) fell mostly in the .70s and .80s for the subtests, low to middle .90s for the areas, and mid to high .90s for the total test. The third estimate of reliability was based on an item response theory by using the Rasch, or one parameter, model. The coefficients for this method fell mostly in the middle .70s and low .90s for the subtests, in the .90s for the

areas, and the mid to high .90s for the total test. The author also reported internal consistency correlations ranging from .48 to .89. The highest correlations were found for the total test.

Both content and criterion-related validity is reported. Content validity was established through researching essential mathematics content, dividing it into domains, and developing items that accurately measure student mastery of that content. Criterion-related validity was assessed by comparing the KeyMath Revised scores with test scores for the Comprehensive Tests of Basic Skills (CTBS), the Iowa Tests of Basic Skills (ITBS), and the original KeyMath. The correlations between the KeyMath Revised and CTBS range from .33 to .65 and with ITBS from .40s to .70. These represent low to moderate correlations. The correlations with the original KeyMath ranged from .35 to .55 for the subtests and mid .80s to mid .90s for the total test. The subtest correlations with the original KeyMath are relatively low which is expected because of the changes made in the test items. The correlations for the total test with the KeyMath are fairly high which shows the test overall still measures similar content.

Reviewer Comments

Larson and Williams (1994) believe that the KeyMath Revised is appropriate for the purposes intended by the author, which include assessment for general instruction, remedial instruction, global assessment, and research. They find the use of the KeyMath Revised for remedial instruction the weakest area of the test. They feel this weakness is due to the low reliability of some of the subtests. The reviewers believe that in the hands of a knowledgeable user who is an advocate for the student, the results of the KeyMath Revised can be used wisely despite the individual scores of the subtests

Overton (1992) discussed the ease of scoring the KeyMath Revised compared to the original version. This was one of the main changes between the two versions. The KeyMath Revised provides a simple way to view the results without having to fill in circles and draw lines to find the current grade placement and the grade equivalent. The re-organization of the strands and domains makes it possible to view all the parts of the test at one time. Also, the Revised version now includes more relevant parts that needed to be covered in the exam, such as the estimation and interpreting data subtests.

Summary Evaluation

The KeyMath Revised provides a clear and concise way to assess a student's level of mathematics. Although it does almost exactly what Connolly had intended, the KeyMath Revised has some faults. It is typically used in special education to pinpoint the specific math disability and plan the Individual Education Plan, but the subtests are found to have low reliability. This poses a considerable problem when using the KeyMath for instruction. The results must not be used to make quick decisions for students based on subtest scores alone.

The KeyMath Revised was normed on a small number of students within each grade level which may not have yielded a representative sample of the population within the specific grades. For example, the ninth grade sample only consisted of 50 students. The test was created to be suitable for students in kindergarten through the ninth grade, but, because some of the samples are so small, the norms may not be appropriate for all grades intended.

Twenty five percent of the sample consisted of minority students. Although, this is a similar percentage of minorities as compared to the U.S. Census in 1985, it may not be

representative of all minorities. Therefore, the test may contain biases when using it in highly diverse areas.

Overall, the KeyMath Revised is an appropriate tool to assess mathematics. Its main weaknesses are with its low reliability for subtests. Those who interpret the scores need to keep this in mind when using the results for major decisions. The KeyMath Revised is a popular test and is very helpful in planning individual instruction. Its best feature is that teachers can find the specific types of problems students are having in the many areas of mathematics.

References

Connolly, A.J. (1988). Keymath revised: A diagnostic inventory of essential mathematics, Minnesota: American Guidance Service.

Larson, J.A. & Williams, J.D. (1994). Keymath revised: A diagnostic inventory of essential mathematics. Test Critiques, 10, 350-354.

Overton, T. (1992). Assessment in special education: An applied approach, New York; Macmillan Publishing Company.