Middle Grades Longitudinal Study of 2017–18 (MGLS:2017)

Assessment Item Level File (ILF), Read Me

NCES 2023-015

Contents

1. Introduction

This readme provides guidance and documentation for users of the Middle Grades Longitudinal Study of 2017-18 (MGLS:2017) Assessment Item Level File (ILF). Data for the base year or Main Study year one (MS1) is contained in the ASCII file mgls_student_ilf_ms1.csv and for the follow-up round or Main Study year two (MS2) is mgls_student_ilf_ms2.csv. These files are made available to researchers under a restricted use only license.

The MGLS:2017 followed a nationally representative sample of grade 6 students across three school years. This multisource, multimethod longitudinal study focused on understanding the development and learning that occur during students' middle-grade years (6-8). It included self-administered surveys completed by parents, math teachers, and special education teachers, as relevant, and school administrators, and surveys and assessments of middle school students. The MGLS:2017 was conducted by the National Center for Education Statistics (NCES) within the Institute of Education Sciences (IES) of the U.S. Department of Education.

The intended population of inference is students in brick-and-mortar schools in the U.S. who were in grade 6 during the Fall of 2017. This nationally representative sample was selected with the intention of enabling inferences about the overall US middle grades population. See chapter 4 in the *MGLS:2017 Data File User's Manual* for more information about the sample.

For a full description of the direct student measures see Sections 3.1-3.3 and Section 7.4.1 of the *MGLS:2017 Data File User's Manual* and Section 1.3 (overview), Section 4 (Math), Section 5 (Reading), and Section 6 (Executive Function) of the *MGLS:2017 Psychometric Report* (Appendix A). Briefly, the mathematics and reading assessments used a multistage adaptive assessment (MST) design. Each mathematics and reading assessment form consisted of a router and multiple second-stage forms. The student's router performance determined which one of multiple second-stage forms was administered, as they were of different difficulty levels (low-, middle-, and high-difficulty). Items appropriate for use in both rounds of data collection were embedded in the MS1 and MS2 assessment forms to support the development of a longitudinal scale. Items overlap across the MS1 and MS2 routers and in the math assessment also across second-stage forms. There were two executive function tasks, Hearts and Flowers (administered in MS1 and MS2) and the Spatial 2-Back (administered in MS2 only). Identical versions of each of these tasks were administered to students within and across data collections.

2. Data File structure and Content

The MGLS assessment item-level file (ILF) includes two flat files, one for MS1 and the other for MS2, each with cases on the vertical axis and assessment item-level data (e.g., actual response, scored response, answer key, and response time) along the horizontal axis. This is a wide format file in which each case represents a single student. STUID is the identification variable in column 1. Student demographics can be added by merging the ILF with the main dataset on this identification variable as explained in Section 4. The variables in the ILF are grouped by assessment in this order: Math, Reading, Executive Function Hearts & Flowers task, and Executive Function Spatial 2-Back task (applicable to MS2 ILF only). Then within each assessment items are ordered based on order of administration. Each of the MGLS assessment instruments and its data layout is described below.

When attempting to replicate the item parameters used in scoring students in MGLS:2017, the user should create a long file by combining the MS1 and MS2 files for a given assessment and adding a variable for "round". Each STUID will then, in theory, have two instances in the new dataset. This is recommended if the user is attempting to replicate results because a concurrent calibration approach was used to estimate item parameters. Note that results may vary due to different statistical software used, settings, or to estimation technique. Further note that if estimating item parameters for the two years separately, a Stocking and Lord linking approach could be used but will not produce the same results that are shown in MGLS_Math_and_Reading_Items_User_Guide.xlsx.

Academic Measures

Mathematics. The MGLS:2017 two-stage MST math assessment drew from four domains that contribute to student growth in sixth through eighth grade toward high school algebra readiness. These are Number System (NS), Ratios and Proportions (RP), Expressions and Equations (EE), and Functions (F). The router was a mini version of the total test and was designed to have items with difficulties spanning the expected range of ability, while second-stage forms tested material more specific to each difficulty level and developmental level of learning by ability and by year.

Math Variable Naming Conventions: The variable name starts with a code that indicates what kind of data is present (See Exhibit 1). Next is the MGLS ID consisting of one of four domain initials (NS, RP, EE, F) and a three-digit numeric code. Note that this numeric code is not indicative of order. In the case of polytomous items, there will be one of several letters appended to the end of the variable name (a, b, c, etc.)[1].

Reading. The MGLS:2017 two-stage MST reading assessment drew items for its routers from the foundational reading skills subdomains of vocabulary (VOC), word recognition and decoding (WRDC), morphology (MA), sentence comprehension (SEN), reading efficiency (EFFIC), and basic reading comprehension of passages (RC). The low- and mid-level second-stage forms in MS1 also drew from these subdomains. The MS1 high second-stage form and all MS2 second-stage forms targeted advanced reading comprehension through scenario-based assessments (SBA).

Reading Variable Naming Conventions: The variable name starts with a code that indicates what kind of data is present (See Exhibit 1). Next is the MGLS ID consisting of one of seven subdomain abbreviations (WRDC, VOC, MA, SEN, EFFIC, RC, SBA) and a six-digit numeric code. Note that this numeric code is not indicative of order. In addition, for Scenario-Based Assessments, a scenario ID code is inserted between the subdomain abbreviation (SBA) and the six-digit numeric code. These are NB (Nelly Bly), CG (Community Gardens), OF (Organic Farming), and VR (Voting Rights). In the case of polytomous items, there may be one of several letters appended to the end of the variable name (a, b, c, etc.).

[1] An exception to this rule is that F040a has a letter appended to the end of the variable name, although it is not a polytomous item.

Exhibit 1. Math and Reading Assessment Variable Prefixes

Variable prefix	Meaning	Examples of Data
ANS_	Answer provided	A,B,C, 120, 5.5, 1/8, etc.
COR_	Scored answer	1,0
KEY_	Correct answer	A,B,C, 120, 5.5, 1/8, etc.
TME_	Response time in seconds	{CONTINUOUS}

Value Code Conventions: The value codes for the “COR_” variables in the reading and math data represent how the answers to assessment items were scored (see Exhibit 2). If the item was answered, a value of 1 or 0 is assigned with 1 meaning a correct answer and 0 meaning an incorrect answer. Because students were not required to answer a question and could skip items if they chose to, or that students did not see items based on planned routing to a particular second-stage form, reserve codes are provided to guide users in understanding why an item was not answered. Value -9 represents a question that was seen but not answered, -8 represents a question that the student did not reach but would have had the student completed the assessment, and -7 represents questions that were not administered due to routing logic (e.g., questions included in the low or mid second-stage form and not administered to students routed to the high second-stage form or student only took the router by design). System missing values are provided for assessments that the student did not participate in.

Data users should be aware that some data anomalies exist in the application of reserve codes. For example, in some rare instances, students skipped the entire router and took a second-stage form only; these students may be coded -8 (not reached) on the "COR_" variables instead of -9 (not answered). There are also rare instances where the wrong second-stage form was administered. It should be noted that the reserve code scheme reflects the actual form administered, not the form that should have been administered, and that the data from the form administered in these situations was the data used for scoring. Although the number of correct and incorrect responses can be reproduced from the assessment ILF, different types of nonresponse applied to the calculations will not always be reproducible, thus slight variations in statistics (e.g., P+ values) can occur. In addition, values in the “TME_” variables are provided as recorded and some abnormal times exist. For example, there are outlier instances where students spent extra time on items due to assessment accommodations or potential technical issues that resulted in timer malfunction and the times are extremely high or cases in which no values or negative values are provided when the student responded to the item. For polytomous items, where there are multiple variables associated with a screen, the timing information was captured for the screen and replicated across each of the polytomous items associated with the same screen.

Exhibit 2. Scored Variable/Items Value Codes

COR_ Value Code	Meaning
0	Incorrect answer
1	Correct answer
. or ""[2]	System missing, did not participate
-7	Legitimate skip, planned missing
-8	Not reached
-9	Not answered

Users can map values across different types of variables in the Assessment ILF by referencing the *MGLS:2017 Psychometric Report*.

Executive Function Measures

This section provides a brief overview of the executive function measures. See Chapter 6 in the *MGLS:2017 Psychometric Report* for more details on executive function measures.

Hearts and Flowers. This set of three related tasks assess cognitive flexibility, inhibitory control and working memory. The congruent condition (H-heart) asks the student to press the key on the same side as the heart presented on screen; the incongruent condition (F-flower) asks the student to press the key on the opposite side of the flower presented on the screen and the mixed condition (M-mixed) alternates between the congruent condition (heart) and the incongruent condition (flower). See MGLS_EF_HeartsFlowers_Instructions.pptx for a complete script and screen shots of the Hearts and Flowers directions.

Hearts and Flowers Variable Naming Conventions. The variable name starts with the data type (See Exhibit 3) then the next part of the variable name is the condition code (H, F, M), followed by a numeric order of presentation.

Spatial 2-Back. Data from the Spatial 2-Back task is found only in the MS2 ILF. This task measures working memory and inhibitory control. Line drawings of unfamiliar objects are presented in a series with each object visible for 2000 milliseconds. The student is instructed to press the spacebar upon seeing a replication of an object that they saw 2-back; that is, if there was only one object between the current object and the same object shown in a previous presentation, the student is to press the spacebar. The student must not press the key when the replications are closer together or farther apart than the specified distance. That is, students need to inhibit the tendency to press the spacebar for any object that they saw recently on the task. Throughout the task, students must continually update their memory with the series of objects. Each trial from an N-back task can be classified into one of four mutually exclusive categories: correct reject, false alarm, miss, and hit.

A variable was collected at the end of the 2-back assessment called "UNDERSTOODGAME2BACK" where students were asked whether they understood the game (value of 1) or did not understand the game (value of 0). The 2-back assessment was not administered in MS1 and is only available in MS2, thus the UNDERSTOODGAME2BACK variable is only provided in the MS2 file. See MGLS_EF_Spatial_2-Back_Instructions.pptx for a complete script and screen shots of the Spatial 2-Back directions.

[2] Actual values may vary after reading data into various statistical packages.

Spatial 2-Back Variable Naming Conventions. The variable name starts with the data type (See Exhibit 3) then the next part of the variable name is a code that indicates the test name (TB), followed by the numeric order of presentation (01-90).

Exhibit 3. Executive Function Assessment Variable Prefixes

Variable prefix	Meaning	Examples of Data
COR	Scored item	1,0
CRC	Scored item (response time>=200ms)	1,0
KDC	ASCII Decimal Key Code for key pressed	1-222
TMC	Response time for correct items (response time>= 200ms)	{CONTINUOUS}
TME	Response time in seconds	{CONTINUOUS}
LOR*	ASCII Decimal Key Code for correct response (H&F)	L=Left, R=Right
DBL**	First (a) and second (b) images of a paired sequence	a, b
KEY**	Image requires pressing the spacebar	YES, NO
OBJ**	Image code	2-64

*Hearts and Flowers only

**2-Back only

The values for the COR variables are similar to those assigned to the math and reading assessment variables, where a value of 1 indicates that student answered the item correctly, and a value of 0 indicates that the student answered the item incorrectly. The CRC_ variables are a copy of the COR_ variables. However, the CRC_ variables are recoded as -9 when the student answered an item in less than 200ms. CRC_ variables are set to 0 when the student answers incorrectly (i.e., corresponding COR_ variables are coded 0) and the time is equal to or greater than 200ms (i.e., corresponding TME_ variables are equal to or greater than 200ms).

For the Hearts and Flowers task, the expected values for the KDC variables are 17 for left and 39 for right. Other possible keystrokes that are captured in this variable are in accordance with ASCII designation (values 1-127). Also, for the Hearts and Flowers task, if a student participated in one or more of the conditions (Hearts, Flowers, or Mixed), but not all, the variables associated with the condition(s) that they did not participate in are coded -9.

For the 2-Back task, the student is instructed to press the space bar to provide a response which has a value of "32" on the KDC variables. For many trials not pressing a key is the correct response, therefore many of the KDC variables will not have a value. The DBL variables indicate the first and second images of a paired sequence in the 2-Back task. See page 44 of MGLS_EF_Spatial_2-Back_Instructions.pptx for more information.

Values in the "TME_" variables are provided as recorded and some abnormal times exist. For example, there are outlier instances due to technical issues that resulted in timer malfunction and the times are high or no values are provided when the student responded to the item. For one case in the MS1 a student had completed just the hearts task, and for the subsequent flowers and mixed tasks the student received -9 values across the timing variables. For the TMC_ variables, if the student got the item incorrect (i.e., corresponding COR variables are coded 0) or answered the item in less than 200ms (i.e., corresponding TME_ variables are less than 200ms), the TMC_ variables are coded as -9 for the Hearts and Flowers and as system missing for the 2-Back.

3. ILF Companion Files

In addition to the current document, four ILF companion files are provided to support users in understanding how items were presented to students and how the items performed psychometrically.

- **MGLS_MS1_Math_Item_Images** – this PDF contains facsimiles of the MS1 math items as they appeared on screen. The images are organized by the form and the order in which items were presented.
- **MGLS_MS2_Math_Item_Images** – this PDF contains facsimiles of the MS2 math items as they appeared on screen. The images are organized by the form and the order in which items were presented.
- **MGLS_MS1_MS2_Reading_Sample_Item_Type_Images** – this PDF contains facsimiles of select reading items for each item type as they appeared on screen.
- **MGLS_Math_and_Reading_Items_User_Guide** – this Excel file contains a complete list of math and reading items, in separate tabs, and includes item ID, form and order of administration, item prompt, response options and answer key, and selected psychometric properties for each assessment item. This file also identifies math items that performed differently across rounds (MS1 vs MS2) and across administration settings (in-school vs out-of-school). (See section 6 below.)
- **MGLS_MS1_MS2_EF_HeartsFlowers_Instructions** – this PowerPoint file contains images of the instructions as they appeared on screen for the Hearts and Flowers executive function task.
- **MGLS_MS2_EF_Spatial_2-back_Instructions** – this PowerPoint file contains images of the instructions as they appeared on screen for the Spatial 2-back executive function task.

4. Merging the ILF with the main dataset

Each ILF data file provides one record per student, where the MS1 ILF contains all of the student's MS1 assessment variables as one record and the MS2 ILF contains all of the student's MS2 assessment variables as one record. These data can be merged with the main student file, should users want to examine assessment responses in parallel with other data such as student demographics, survey responses, or assessment composite variables. The key variable to merge the ILF with the main student file is STUID. On the MS1 ILF and the MS2 ILF by design there are variables with the same names on each file for items that were administered in both data collection rounds. If users want to conduct analyses using both the MS1 and MS2 ILFs they will need to combine the records from each file into one concatenated dataset in order to analyze a particular item, as a column, across both rounds. This is a long file format in which the user will likely want to add a variable to indicate round before combining the two years of data. More information about the variables shared across two rounds are described in section 5 below.

5. Item Occurrence over Rounds

Users can reference the MGLS_Math_and_Reading_Items_User_Guide.xlsx spreadsheet containing the items used in the MGLS academic assessments. All items administered in the assessments are listed along with their presence and order by form. On the "MGLS Math Items" tab, the order in which items

appeared within and/or across a router or a second-stage form is represented by consecutive numbering in columns labeled Router, 2.1 Low, 2.2 Mid, or 2.3 High. In math there is some overlap of items in second-stage forms within and across rounds and between the MS1 and the MS2 routers. On the ”MGLS Reading Items” tab, the order in which items appeared within and/or across a router or a second-stage form is represented by 0.## (router), 1.## (low), 2.## (mid), or 3.## (high) in columns labeled as MS1 (Form.Order) and MS2 (Form.Order). In reading, the MS1 router and the MS2 router were largely the same except that some vocabulary items were added to the MS2 router. The items used in MS2 reading-second stage forms are all unique to those forms. The spreadsheets are sorted in order from the MS1 router on. Users can sort the spreadsheet as needed to see each form’s items together or in some other way in preparation for use in reports or analyses. Both math and reading readme tabs are included to provide more detail as to the content of each column on the items tabs.

6. Math Item Performance Variability by Round and Setting

Some math items performed differently at MS1 versus MS2, and across in-school and out-of-school settings. Users can find details on this in the MGLS_Math_and_Reading_Items_User_Guide.xlsx, and in Chapter 4 of the *MGLS:2017 Psychometric Report*. Exhibit 4 presents a summary of the items, the round or setting at which they performed differently, and the assessment forms on which they were administered at each round.

Exhibit 4 Common math items scored as unique items across different administration round or setting

Item	Administration round or setting	MS1 form	MS2 form
EE101	MS1 and MS2	Router	Router
EE112	MS1 and MS2	Second-stage form 2.3 (high)	Second-stage form 2.3 (high)
F026	MS2	†	Second-stage form 2.1 (low) and form 2.2 (mid)
F040a	MS1 and MS2	Router	Second-stage form 2.1 (low)
NS065	MS2 in-school and MS2 out-of-school	†	Router
NS072	MS1, MS2 in-school, and MS2 out-of-school	Second-stage form 2.3 (high)	Router
RP035	MS1, MS2 in-school, and MS2 out-of-school	Second-stage form 2.3 (high)	Second-stage form 2.2 (mid) and form 2.3 (high)

† = Not applicable

NOTE: All data from the main study administrations (MS1 and MS2) were concurrently calibrated with Bayesian priors for three groups: (1) MS1, (2) MS2 in-school administration, and (3) MS2 out-of-school administration. MS2 students who took only the router in out-of-school administration attempted only 14 items.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Middle Grades Longitudinal Study of 2017–18 (MGLS:2017), spring 2018 and spring 2020.