Automating Item Specifications from Range ALDs to Support Item Writing

By Christina Schneider, Jing Chen, and Garron Gianopulos

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nwea

Overview

- Why
- Process
- Demonstration

Why an Automated Process for Item Specifications?

- One benefit to using principle assessment design (PAD) is that test score interpretations can be engineered to provide formative feedback to teachers using range achievement level descriptors (RALDs).
- Items and tests that are built around RALDs better reflect what is taught, improving the utility and validity of scores.
- Even though PAD has high potential to improve assessment, PAD can be more costly to implement than traditional approaches.

Why an Automated Process for Item Specifications?

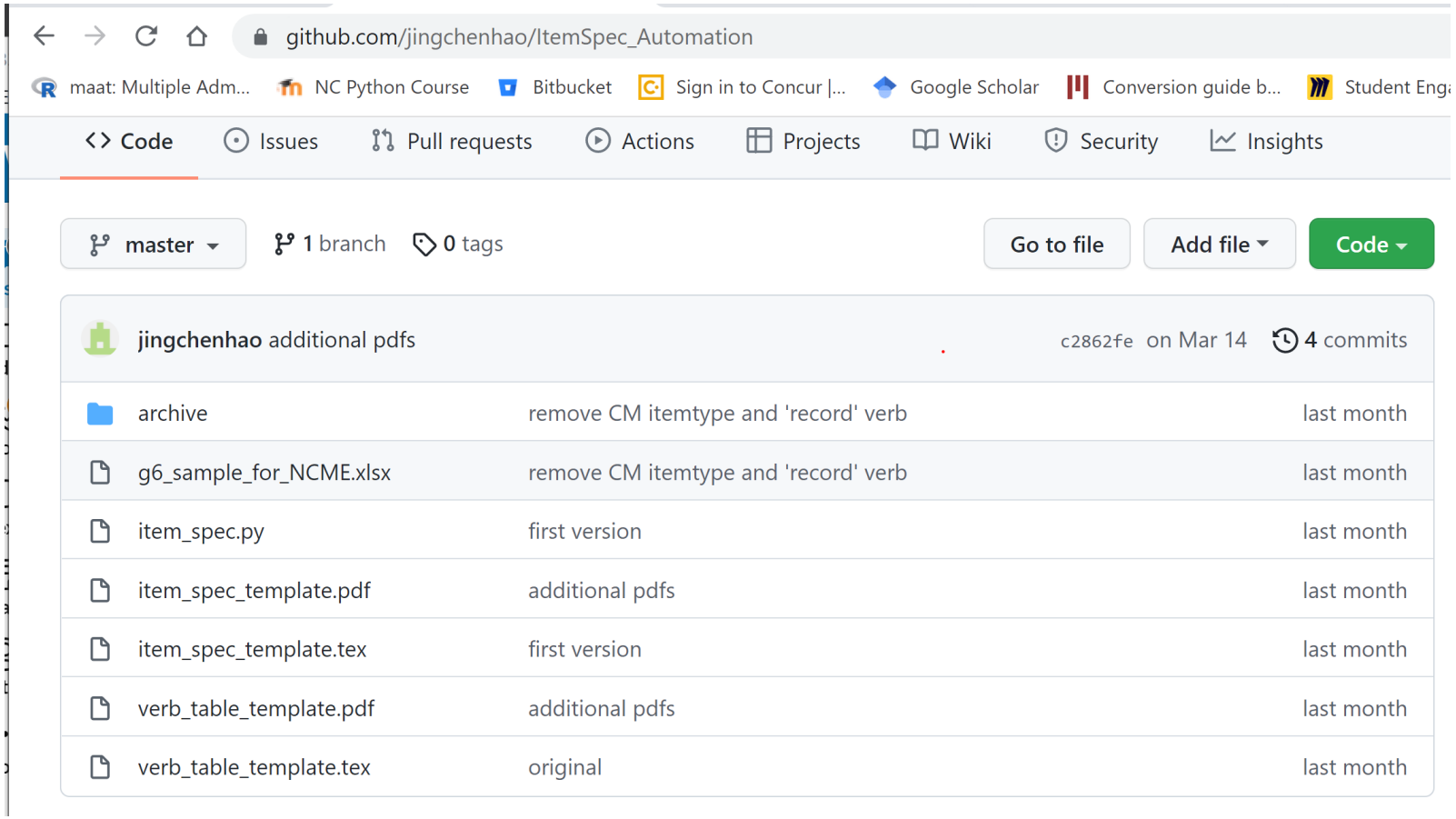
- To reduce costs, we developed a process to automatically generate item specifications.
- Item templates can be created so that any iteration in the PAD will automatically ramify into downstream documents.
- This automation helps content experts create item templates/item specifications more efficiently.

Process for Producing Test Specification Tables

- Inputs:
  - g6_sample_for_NCME.xlsx
  - Item_spec_template.TeX
  - Verb_table_template.TeX
- Process file
  - Item_spec.py
- Output files
  - Item_spec_updated.TeX (One file per Indicator_ID)
  - Verb_table_updated.TeX

Github

- https://github.com/jingchenhao/ItemSpec_Automation



G_6_sample_for_NCME.xlsx

- All tab

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Goal_ID**	**Subgoal_ID**	**Indicator_ID**	**goal**	**subgoal**	**IND**	**ALD1**	**ALD2**	**ALD3**	**ALD1_mdok**	**ALD2_mdok**	**ALD3_mdok**
2	MA 6.1	MA 6.1.1	MA 6.1.1.a	MA 6.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.	MA 6.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among fractions, decimals, percents, and integers within the base-ten number system.	MA 6.1.1.a Determine common factors and common multiples using prime factorization of numbers with and without exponents.	Identifies the prime factorization for a whole number less than 100 without exponents. Identifies common multiples for a given pair of prime numbers.	Determines the prime factorization for a whole number less than 100 with exponents. Determines the prime factorization for a whole number greater than 100 with or without exponents. Determines either common factors or common multiples for two whole numbers both less than 100 when presented with or without their prime factorization. If provided, the prime factorization can be with or without exponents. At least one of the numbers should be a composite number.	Determines common factors and common multiples for two whole numbers both less than 100 when presented with or without their prime factorization. If provided, the prime factorization can be with or without exponents. At least one of the numbers should be a composite number. Determines the greatest common factor or least common multiple for two whole numbers presented with or without their prime factorization. If provided, the prime factorization can be with or without exponents. Determines common factors or common multiples for two whole numbers with at least one greater than 100 when presented with or without their prime factorization. If provided, the prime factorization can be with or without exponents. At least one of the numbers should be a	1	1	2
	MA 6.1	MA 6.1.1	MA 6.1.1.b	MA 6.1 NUMBER:	MA 6.1.1 Numeric	MA 6.1.1.b	Represents a non-	Represents a non-negative	Represents more than one way to	1	2	3

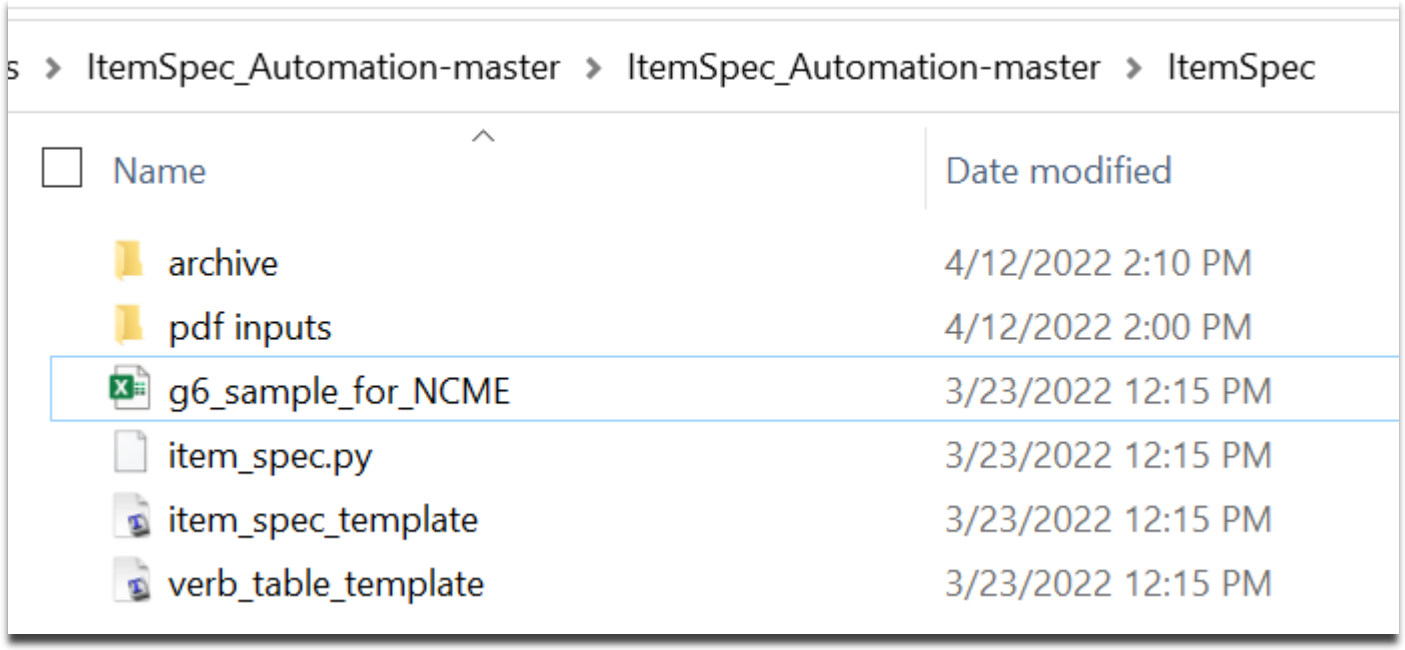
G_6_sample_for_NCME.xlsx

+ verb tab

	A	B	C	D	E	F	G	H	I	J	K	L
1	Verbs	Constructed Response	Equation Editor	Gap Match or Graphic Gap Match	Graphing	Hot Text	Multiple Choice	Text Entry	Definition			
2	Compares	x	x	x		x	x	x	To examine in order to note the similarities or differences.			
3	Converts						x	x	Change in form.			
4	Determines			x	x		x	x	Solving a routine problem that includes applying multiple concepts or decision po			
5	Evaluates	x		x			x	x	Evaluates solving for a value or about evaluating reasonableness of a solution; t			
6	Explains	x	x	x		x	x		To give the meaning or interpretation of; expound; or justify.			
7	Identifies			x			x		Recall, recognize a property or procedures to solve a routine one-step problem.			
8	Orders			x			x		The arrangement of values or symbols in relation to each other according to a pa			
9	Represents	x		x	x	x	x	x	Select or show an example of a graphic or solution to show conceptual understar			
10	Uses	x	x	x	x	x	x	x	Uses is often paired with another verb (uses to determine, write, or explain)			

Prepare Input Files

- Place all files from Github into one folder
- Create archive folder

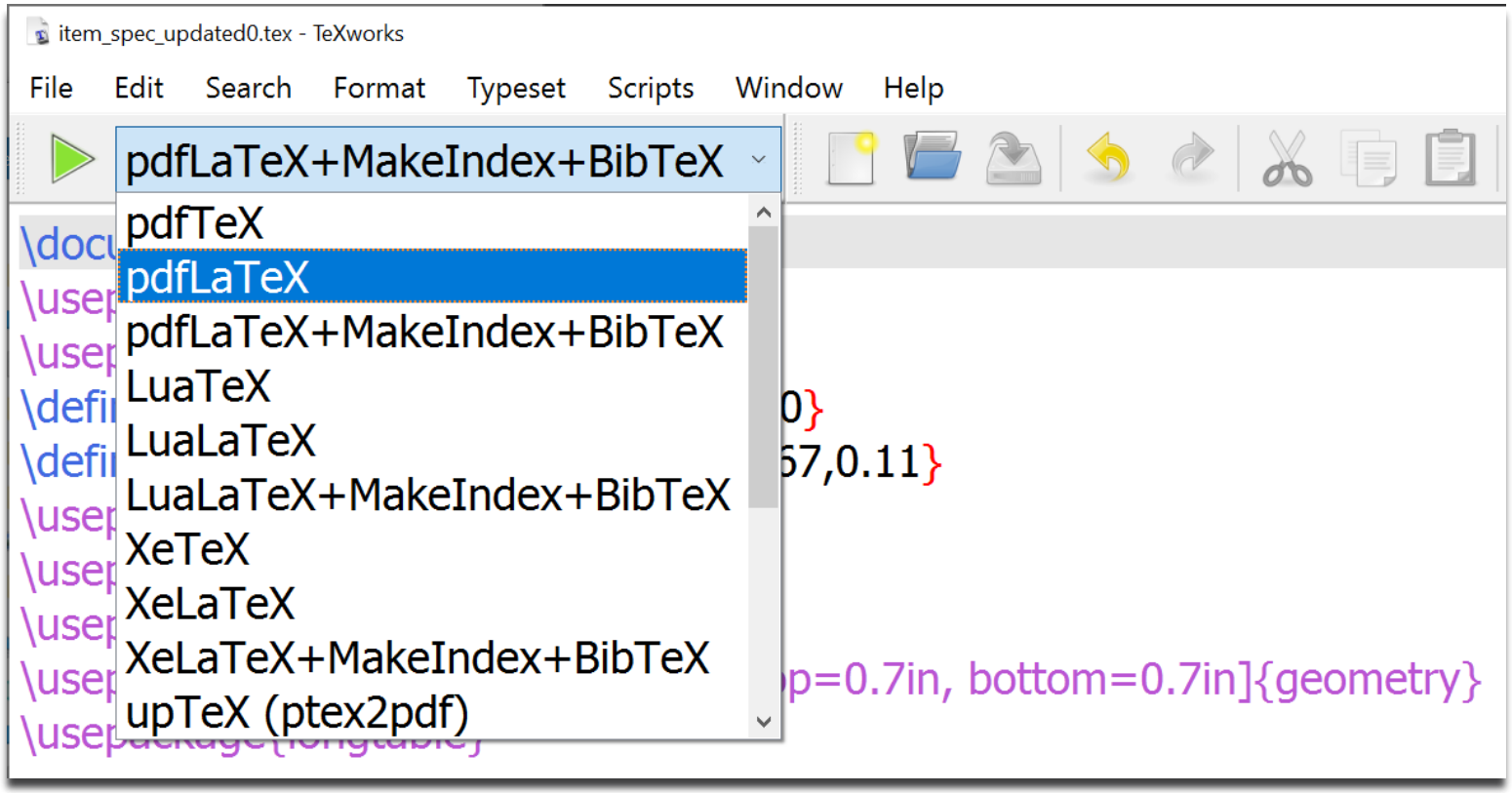


Run Python Code

- Open the python code (item_spec.py) in jupyter notebooks, spyder, or your preferred environment for python.
- If necessary, install the packages: Jinja2, pandas, numpy and os
- Update the base_path
- run

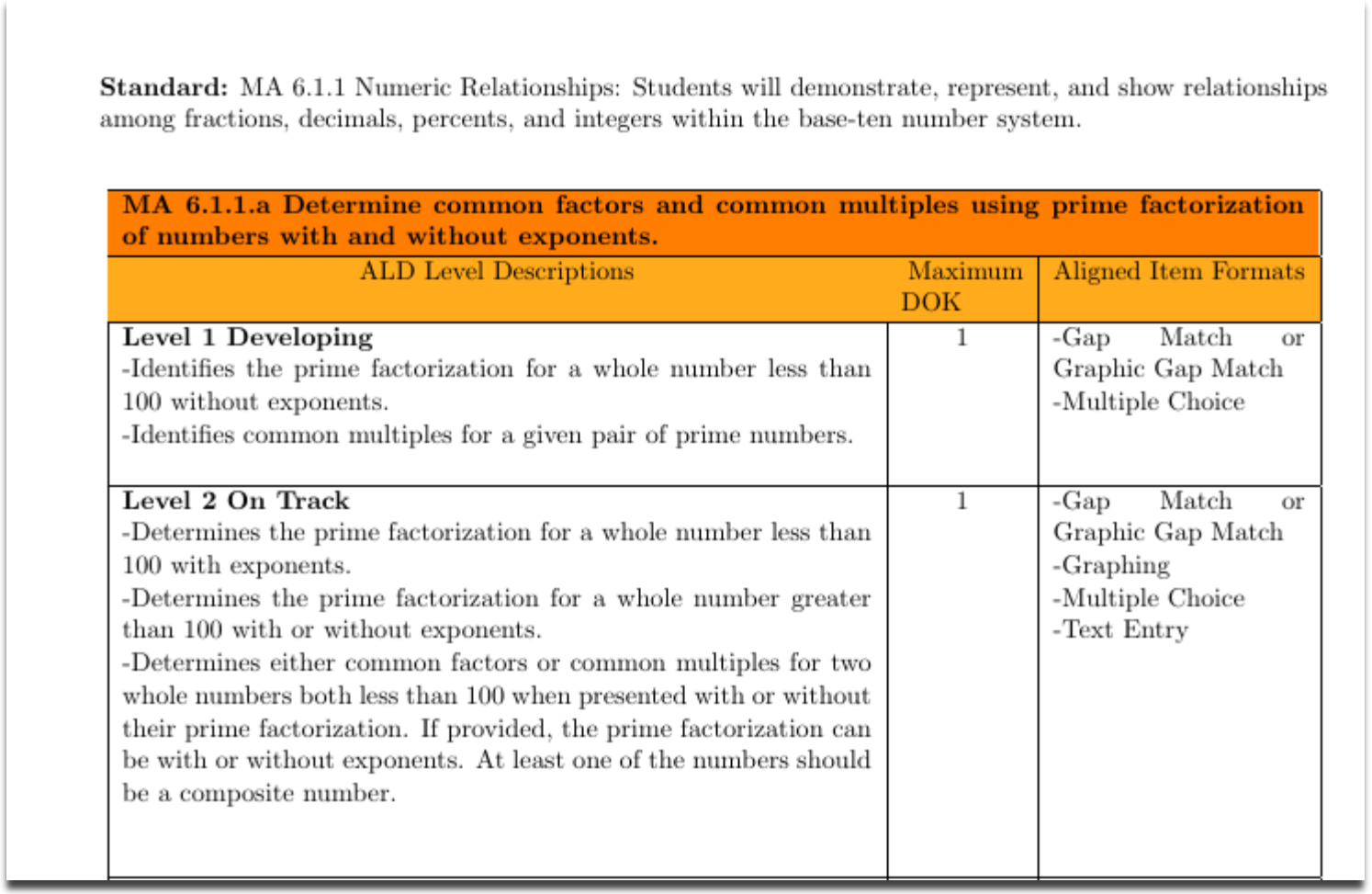
Convert TeX Files to PDF

- Open the TeX files in TeXworks or your preferred latex typesetter software package
- Select pdfLaTeX
- run



Output

- Convert each TeX file
- Combine pdfs into one file using Adobe



Standard: MA 6.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among fractions, decimals, percents, and integers within the base-ten number system.

MA 6.1.1.a Determine common factors and common multiples using prime factorization of numbers with and without exponents.

ALD Level Descriptions	Maximum DOK	Aligned Item Formats
Level 1 Developing -Identifies the prime factorization for a whole number less than 100 without exponents. -Identifies common multiples for a given pair of prime numbers.	1	-Gap Match or Graphic Gap Match -Multiple Choice
Level 2 On Track -Determines the prime factorization for a whole number less than 100 with exponents. -Determines the prime factorization for a whole number greater than 100 with or without exponents. -Determines either common factors or common multiples for two whole numbers both less than 100 when presented with or without their prime factorization. If provided, the prime factorization can be with or without exponents. At least one of the numbers should be a composite number.	1	-Gap Match or Graphic Gap Match -Graphing -Multiple Choice -Text Entry

Github Repository

+ https://github.com/jingchenhao/ItemSpec_Automation

Thank you!

Christina Schneider: Christina.Schneider@cambiumassessment.com
Jing Chen: Jing.Chen@nwea.org
Garron Gianopulos: Garron.Gianopulos@nwea.org