



Distributed Teacher and Leader Education

Mathematics Student Teacher Candidate Work Sample for Student Learning (TCWSSL)

Introduction

Educators today place a high premium on knowledge of standards and assessment and on the ability to design instruction which links these together to enhance student learning. The work sample is designed to help teacher candidates grow professionally by focusing on the complex relationship among standards, assessment and instruction, and to help them learn how to systematically apply pedagogical theory to classroom practice. The work sample also provides the Mathematics Education Program with an important source of evidence that candidates have met our graduation standards and that they are capable of effectively applying the knowledge and skills learned at the University to promote student learning in classroom settings.

Core Elements

The basic principles underlying the work sample are that students learn best when:

- the teacher fully understands the teaching-learning context;
- the teacher sets significant and challenging learning goals that address national (NCTM) standards and the New York Common Core Standards for Mathematics, including the Standards for Mathematical Practice;
- the teacher uses pre-assessments and multiple assessment modes aligned with learning goals at key points in the instructional sequence to monitor student learning and to modify instruction according to student needs;
- the teacher plans lessons and selects instructional strategies that take into account pre-assessment findings, learning goals, and the different abilities, resources and needs of the students;
- the teacher uses ongoing analysis of student understanding and knowledge to make instructional decisions and to modify lessons and lesson plans;
- the teacher uses assessment data to analyze student learning and provides appropriate and useful feedback to students, parents, and colleagues; and
- the teacher is a reflective practitioner: the teacher reflects upon his or her own teaching and practices in order to adapt instruction, improve student learning, and promote professional growth.

Each of these core elements will be addressed in a section of the work sample.

I. The Setting: Contextual Factors

While different schools may be similar with respect to the basic mathematics courses they offer, the setting for learning varies greatly from district to district, from school to school within a particular district, and from classroom to classroom within a particular school. The more teachers know about the school, the district, and its community, the better equipped they will be to successfully address the needs of the school and its students. Using the prompts below, describe the community, the school, and the students in the classroom where the work sample unit will be taught. You will be asked to synthesize and apply the information below.

A. Community

Describe the school and local community and explain how its characteristics may impact teaching and learning. Focus on:

1. the school district (its location, number of schools, communities included in the district, etc.),
2. the socio-economic (home prices, income, stability) and ethnic/racial profile of the community.
3. student demographics (total number of students enrolled in the district, projected trends in student enrollment, the percentage of students classified as special education/504, and the percentage of ESL students and their levels of English proficiency),
4. the resources of the district and its support of education, (include per-pupil expenditures for general education and special education),
5. the performance of the school on state assessments, including, as appropriate:
 - a. percent of high school students earning a diploma;
 - b. percentage of students earning passing scores on mathematics Regents exams;
 - c. percentage of students earning scores of mastery on Regents exams;
 - d. performance on Eighth Grade Assessments.

Much of this information can be found in the report cards issued yearly for each school. These are available at <http://www.emsc.nysed.gov/repcrd2005/>. More detailed information about community demographics and school funding, including information on high needs districts, can be found at <http://www.emsc.nysed.gov/stateaidworkgroup/home.html>.

B. School, Classroom, and Individual Students

1. Describe the school (size, organization plan, ability grouping, scheduling patterns, disciplinary policies, etc.). Obtain a copy of any Teacher or Student Handbooks if available. Obtain school and classroom discipline policies and school safety and emergency procedures, and include these in the work sample.
2. Describe the racial and ethnic profile of the school population, and the sample of students.
3. Describe the physical layout of the classroom(s) in which you are teaching, indicate whether you are required to share this classroom with other teachers, and describe the technology and other resources available.

4. Describe the school climate and any issues relating to student behavior
5. Identify the specific class that will comprise the participants in the work sample and discuss the composition of that class. Be sure to take into account students with individual education plan (IEP) modifications, students with limited English proficiency, and any other relevant student characteristics.
6. Provide a description of the shared social and socio-mathematical norms in this classroom.

C. Describe how you anticipate that the data and characteristics presented in subsections A and B above would influence instructional design, your teaching, and assessment.

II. Learning Goals

Part of the work sample involves the design of a plan for the implementation of a 2-4 week unit of standards-based instruction. The plan itself should be based on the New York State Common Core Standards for Mathematics, with explicit focus on the Standards for Mathematical Practice. It should consist of a sequence of interrelated lessons organized around one or more essential questions and a small number of content standards. The essential questions, factual information, concepts, and skills necessary to address the content standards and Standards for Mathematical Practice should be included. Please provide the following details.

In this section, you should:

1. Identify the unit that will be the basis for your work sample. Describe the fundamental concepts and big ideas around which you are planning this unit and briefly explain how the individual lessons develop your students' procedural fluency, conceptual understanding, and problem solving or reasoning skills embedded in these essential questions
2. Based on your pre-assessment of the students (see below) identify 4-6 learning goals for the unit. These will form the basis for your assessment of student learning
3. Use a chart or other graphic organizer to illustrate the alignment of your learning goals with the Common Core Standards, including the Standards for Mathematical Practice.
4. Explain briefly why you think that these learning goals are appropriate for your students.

More specifically, this part should identify:

A. Details about the unit of instruction:

1. Topic to be taught
2. Domain(s) of the CCSS being addressed
3. Targeted grade level
4. Length of the unit

B. Having identified the Domain(s) of the unit, discuss:

1. The Standards to be addressed within each domain
2. The Standards for Mathematical Practice to be addressed
3. Some big mathematical ideas whose importance extends beyond the unit
4. Some essential questions to guide student inquiry and focus instruction on uncovering the important ideas of the content in the unit
5. The academic language and specialized vocabulary to be addressed.
6. Desired understandings to be achieved
7. Key procedural fluency, conceptual knowledge and reasoning or problemsolving skills that you expect students to acquire upon completion of the unit
8. Connections between the unit and the rest of the course
9. Connections between the unit and the real world, if appropriate
10. Connections between the unit and students' interests

C. Include an appropriate chart, table, or other graphic organizer.

III. Assessment

Well-designed formative assessments can be used to diagnose prior knowledge, to check for understanding, to monitor progress, to prompt adaptations to teaching strategies, and to evaluate learning. Formative assessments are important because they enable the teacher to diagnose what students have and have not learned, to understand student misconceptions, and, on the basis of this knowledge, to modify instruction accordingly. Formative assessment may be informal, such as evaluation of student answers to teacher or student questions, evaluation of a whole-class discussion, feedback from a writing task, or observation of students as they work on a class activity.

The first component of the assessment plan should be a pre-assessment, conducted in order to determine what students do and do not know before teachers define the learning goals of the unit. The instructional design portion of the unit plan should take into account knowledge gaps and misconceptions that the pre-assessment might have revealed, as well as the subject matter that has been mastered by students. The summative component of the assessment plan for the unit should correlate with the learning goals of the unit. The assessment plan should employ multiple forms of assessment. Some assessment might include a complex performance task (e.g. a multi-staged problem solving task) that shows a student has internalized a targeted concept. Such an assessment needs to be accompanied by a rubric, so that the student is aware of what he or she needs to do on the performance assessment to be successful. Other assessments might include tests, quizzes, open-ended questions that require an academic response in writing, observational or discussion checklists, and student self-assessment. It is also important to provide opportunities for self and/or peer assessment, for ongoing feedback to students, and for student revisions.

In summary, the assessment section of the project should:

- A. Include a pre-assessment designed to establish a baseline of prior student knowledge, knowledge gaps and/or misconceptions. The pre-assessment might include a quiz, or might be based on a set of structured questions that are explored in a whole-class setting. In the pre-assessment that you design for this unit, include the instruments that you will use to assess the students' prior knowledge of the questions, key procedural fluency, conceptual knowledge and reasoning or problem solving skills specified in Work Sample II, Section B (items 1-6). The data collected from the pre-assessment will not only be used to design an instructional plan, but also in your analysis of students' learning in Section V.
- B. Provide a description of the entire assessment plan for the unit with an appropriate justification of why you think your assessment instruments will measure what you claim they will. Include an assessment that solicits evidence of students' use of academic language and specialized vocabulary. A graphic organizer might be useful.
- C. Include copies of all of your assessment instruments (tests, checklists, rubrics, set of probing questions, etc.). Include clear references for all resources and materials that you adopt and/or adapt. Include a rubric or scoring guide for one of your major assessments that establishes clear criteria for various performance levels.
- D. Include explicit assessment of the relevant Standards for Mathematical Practice that are addressed in this unit.
- E. Indicate how your assessments will be modified for diverse learners, such as English Language Learners, in order to meet the needs of all of your students, including those with IEP's or 504 plans.
- F. You will be asked, in section V, to evaluate the progress of 3-5 students of different academic backgrounds, in addition to evaluating the progress of the entire class.

IV. Instructional Design

Using your knowledge of the teaching-learning context and the results of your pre-assessment, design a 2-4 week unit of instruction which will help all of your students achieve the standards-based learning goals outlined in your Work Sample. Use Lesson 1 to open the unit with an essential question designed to engage the students, and use the last lesson to evaluate student learning. In addition, this section of the work sample should include:

1. All lesson plans of the unit, sequentially numbered, written in a structured lesson format, and bearing a header with the title of the lesson

2. All supplementary materials used in the unit. Copies of worksheets, handouts, and any other instructional materials should be included.
3. Clear references (date, author, publisher, place of publication) for all external resources and materials utilized in the unit.

A. The individual lesson plan should include:

1. Content that is appropriate for the students and for the time available
2. Content that requires and facilitates inquiry, mathematical reasoning, and problem solving.
3. Tasks structured to develop students' attention to the Standards for Mathematical Practice.
4. Materials that are relevant and appropriate for the goals of the unit and the needs of students with diverse backgrounds
5. Plan for student activities that is detailed and specific. Write what the students will be doing.
6. Tasks that are likely to interest and engage diverse learners and to foster increased understanding
7. Tasks that build on one another, and are structured for systematic development of learning
8. Attention to language and vocabulary
9. Learning experiences that allow equitable access
10. Tasks that are considered in relation to the needs of English language learners and students with specific learning needs and which address different students' prior knowledge and readiness
11. Tasks that are well-scaffolded
12. Evidence of provisions for modeling of key performances, and skills
13. Tasks that allow for individual and collaborative work
14. Multiple forms of instruction that are used in ways suited to the content and specified goals
15. Multiple forms of assessment
16. A concise closure component

B. The instructional design should form a coherent, connected sequence from the first to the last day of the unit and should include the following components:

1. Multiple forms of instruction. Some forms to include could be: lecture, small-group or whole-class discussion, peer presentation, Socratic dialogue, use of manipulatives, and writing activities. Each form of instruction should be used in ways suited to the content and specified goals.
2. Include at least two lessons in which the students investigate mathematical ideas, make and try to prove conjectures, and engage in mathematical argumentation.
3. If appropriate, some form of technology that is used creatively to support student learning by providing scaffolding and tools (visualizations, simulations, etc.); opportunity for feedback, reflection, and revision;

- opportunities for building connections to real world communities, or for building interdisciplinary connections
4. A minimum of four homework assignments not drawn directly from a textbook. Include components that require academic writing. Include homework assignments that require students to make and test conjectures.
 5. Explain how homework assignments support development of the Standards for Mathematical Practice.
 6. Formal and informal assessments
 7. If appropriate, include tasks that expose connections between the targeted concept and its role in the history of mathematics or its practical applications, and which allow for further discussions or explorations

V. Analysis

The purpose of this section is to show that you are able to analyze your own teaching and your students' learning. This section should be written in the context of your implemented unit plan.

A. In order to analyze the class as a whole, use the pre-assessment data and the assessment at the end of the unit to discuss student learning with respect to the unit learning goals, including both content standards and Standards for Mathematical Practice. If possible, use quantitative and qualitative methodology to assess student learning by comparing pre-test to post-test results, and by analyzing other assessments used during the course of the unit. Include copies of all assessment tools used. Organize your summary with graphs, charts, or other visual organizers.

Then select 3-5 students of different academic backgrounds on the basis of characteristics which you believe to be relevant to student achievement (language proficiency, ability level, learning style, etc.) and track their learning during the unit. For each individual student:

1. Indicate grade level, gender, and the characteristic that was used to select the student. Do not identify students by name.
2. Explain which instructional strategies were most and least effective for each individual student, and give possible reasons for learning outcomes.
3. Describe how each student utilized their his or her assessment results during the unit and how each student utilized the feedback provided by teacher or peers in order to analyze his or her own learning or to identify relevant strengths and weaknesses.

- B. Reflect on the data gathered for the whole class and for individuals. Discuss your students' achievements on the basis of a comparison between pre- and post-tests, teacher's notes, students' homework, and journals, and attention to classroom dialog. Discuss the implications of this analysis on the future teaching of the same unit, and on the resulting student learning.
- C. Thorough unit planning and lesson planning is essential if a teacher is to deliver effective instruction. One still anticipates occasions requiring modifications of some aspects of the original plan, even after adjustments resulting from pre-assessment have been made and an actual lesson has begun. Recall two different times during the unit when a student's response or reaction motivated you to modify your original design for instruction. Cite specific examples for each case.

VI. Self-evaluation and Reflection.

- A. Evaluate each of the lessons taught during the unit. Address at least the following in your evaluation:
 - 1. Alignment among the learning goals, instruction, and assessment
 - 2. Evaluation of the mathematical tasks used
 - 3. Evaluation of the sequencing of tasks
 - 4. Evaluation of the motivation that the activities/tasks provoked
 - 5. Evaluation of students' classroom participation and engagement with mathematics
 - 6. Evaluation of students' attention to the eight Standards for Mathematical Practice
 - 7. Evaluation and reflection, where appropriate, on the role of technology in the unit. If technology was not appropriate, reflect on this.
 - 8. Identification of the lessons' strengths and weaknesses
 - 9. Identification of unanticipated events that affected the lesson and the students' attention and performance
 - 10. Discussion of classroom management issues and the effectiveness of the teacher's responses to these issues
 - 11. Evaluation of time management and smooth transitions among activities
 - 12. Evaluation of the diversity of types of student-teacher and student-student interactions
- B. Reflecting on the analysis done in Part VI above:
 - 1. Describe how planning and teaching the unit has helped you to grow professionally. Some areas to consider are: assessment, differentiation of

instruction, content knowledge, teaching strategies, time management, questioning techniques, and development of the Standards for Mathematical Practice.

2. Identify where improvement is needed to in order for you to become a more accomplished classroom teacher. Explain how any identified weaknesses affected instruction. Identify specific professional development activities that could help remediate these weaknesses.
3. Identify areas in which teaching was particularly strong. Provide evidence to support these assertions.

Note: The work sample should be submitted in both hard and electronic copy, the latter on a CD

Scoring Rubric for the Mathematics Teacher Candidate Work Sample (TCWSSL)

Indicators	Inadequate	Meets Standards	Exemplary
Knowledge of learning theory and methodology of teaching school mathematics as evident from the narrative	Narrative displays little knowledge of learning theory and methods of teaching school mathematics.	Narrative displays satisfactory knowledge of learning theory and methods of teaching school mathematics.	Narrative displays extensive knowledge of learning theory and methods of teaching school mathematics.
Clear, concise, and thorough response to prompts	Response demonstrates little or no insight into the material addressed. Response is not relevant or not detailed.		Response demonstrates significant insight into the material addressed. Response is clearly articulated, demonstrating sophisticated understanding of concepts.
Appropriate insight of material addressed, appropriate understanding of concepts, to include theoretical knowledge, knowledge of national and state standards, and knowledge of curricular materials	Response does not demonstrate insight into the material addressed. Demonstrates poor understanding of concepts, including theoretical knowledge, knowledge of national and state standards, and knowledge of curricular materials.	Response demonstrates significant insight into the material addressed. Demonstrates understanding of concepts, including theoretical knowledge of national and state standards, and knowledge of curricular materials.	Response demonstrates significant insight into the material addressed. Demonstrates sophisticated understanding of concepts, including theoretical knowledge, of knowledge of national and state standards, and of curricular materials.

Organization and Accuracy of Presentation	Demonstrates poor organization, lack of accuracy, poor spelling, or incorrect grammar and usage.	Text is satisfactory and well organized. Demonstrates acceptable grammar, usage and spelling.	Text is highly organized and accurate. Demonstrates mastery of spelling, grammar and usage.
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A score of “Inadequate” on any element of the Mathematics TCWSSL requires that the work be revised.

Section I- The Setting: Contextual Factors

	(1)	(2)	(3)
A. Community			
Provide a description of the school and the local community. Focus on:			
Location of the school and the district			
Resources of the district and its support of education			
Socio-economic and linguistic profile of the community			
Performance of the school on state assessments			
Percentage of students classified as Special Education/504			
Percentage of ESL students and their level of English proficiency			
B. School, Classroom, and Individual Students			
Description of the school (size, organizational plan, ability grouping, scheduling patterns, disciplinary policies, etc.)			
Description of the racial and ethnic profile of the school population, and the sample of students			
Description of the physical layout of the classroom(s) in which you are teaching, statement of whether you are required to share this classroom with other teachers, and the technology and other resources available			
Description of the school climate and any issues relating to student behavior			
Identification of the specific class that will comprise the participants in the work sample and discussion of the composition of that class. Inclusion of discussion of take into account students with individual education plans (IEP) modifications, students with limited English proficiency, and any other relevant student characteristics			

Description of the shared social and socio-mathematical classroom norms.			
C. Data's Potential Influence on Instructional Design and Assessment			
Description of how the data and characteristics presented in subsections A and B above influence instructional design, your teaching, and assessment.			
Total score			

Section II- Learning Goals

	(1)	(2)	(3)
A. Details about the unit of instruction:			
Topic to be taught			
Domain(s) of the CCSS being addressed			
Targeted grade level			
Length of the unit			
B. Having identified the domain(s) of the unit, discuss:			
The content standards within each domain to be addressed			
The Standards for Mathematical Practice to be addressed.			
The academic language and specialized vocabulary addressed			
Some big ideas whose importance extends beyond the unit			
Some essential questions to guide student inquiry and focus instruction for uncovering the important ideas of the content in the unit			
Desired understandings to be achieved			
Key procedural fluency, conceptual knowledge, and reasoning or problem solving skills that you expect students to acquire upon completion of the unit			
Connections between the unit and the rest of the course			
Connections between the unit and the real world, if appropriate			
Connections between the unit and students' interests			
C. Include an appropriate chart, table, or other graphic organizer			
Total score			

Section III- Assessment

	(1)	(2)	(3)
A. Pre-assessment			
Includes an appropriate pre-assessment to determine students' prior knowledge			
B. Assessment Plan includes:			
Assessment that reflects the goals for student learning			
Plan includes an assessment that solicits evidence of students' use of academic language and specialized vocabulary.			
A description of the entire assessment plan for the unit and justification for the choice of assessment instruments			
Formal and informal assessments that are used to diagnose knowledge, check for understanding, monitor progress, adapt teaching and evaluate learning			
Clear criteria for assessing understanding and performance to which students can aspire			
Opportunities for self and/or peer assessment			
Opportunities for ongoing, shared feedback to students and for revisions of work			
C. Assessment instruments			
Includes copies of all assessment instruments (tests, checklists, sets of probing questions, etc.)			
Includes a rubric or scoring guide for one of your major assessments with clearly established criteria for various performance levels			
Includes clear references for all resources and assessment instruments you adopt or adapt			
D. Standards for Mathematical Practice			
Inclusion of assessment that explicitly assesses the Standards for Mathematical Practice			
E. Assessment and modifications for diverse learners			
Indication of possible modification of your assessment instruments for diverse learners			
Total score			

Section IV- Instructional Design

	(1)	(2)	(3)
A. Instructional lessons include:			
Content appropriate for the students and the time available			
Content that requires and facilitates inquiry, mathematical reasoning, and problem solving.			
Tasks structured to develop students attention to the Standards for Mathematical Practice.			
Materials that are relevant and appropriate for the goals of the unit and the needs of students with diverse backgrounds			
Plans for the student activities is detailed and specific			
Tasks that are likely to interest and engage diverse learners and to foster increased understanding			
Tasks that build on one another, and are structured for systematic learning			
Attention to language and vocabulary.			
Learning experiences that allow equality of access			
Tasks that are considered in relation to the needs of English language learners and students with specific learning needs, and which address different students' prior knowledge and readiness			
Tasks that are well-scaffolded			
Evidence of provisions for modeling of key performances and skills.			
Tasks that allow for individual and collaborative work.			
Multiple forms of instruction, used in ways suited to the content and specified goals			
Multiple forms of assessment			
A concise closure component			
B. The instructional design should form a coherent, connected sequence from the first to the last day of the unit, and includes the following components:			
Multiple forms of instruction. Some forms to include could be: lecture, small-group or whole-class discussion, peer presentation, Socratic dialogue, use of manipulatives, and writing activities. Each form of instruction should be used in ways suited to the content and specified goals.			
Inclusion of at least two lessons in which students investigate mathematical ideas, make and prove conjectures, and engage in mathematical argumentation.			

If appropriate, inclusion of some form of technology that is used creatively to support student learning by providing scaffolding and tools; opportunity for feedback, reflection and revision; opportunities for building connections to real world communities or for building interdisciplinary connections.			
A minimum of four homework assignments other than those drawn from a textbook. Include components that require academic writing. Include homework assignments that require students to make and test conjectures.			
Explanation of how homework assignments support development of the Standards for Mathematical Practice.			
Formal and informal assessments			
If appropriate, tasks that expose connections between the targeted concept and its role in the history of mathematics or its practical applications, and which allow for further discussions or explorations			
C. The entire instructional unit includes:			
All lesson plans of the unit, sequentially numbered, written in a structured lesson format, and bearing a header with the title of the lesson			
All supplementary materials used in the unit. Copies of worksheets, handouts, or other instructional materials are included.			
Clear references (date, author, publisher, place of publication) for all of the resources and materials to be used with the unit.			
Total score			

Section V- Analysis

	(1)	(2)	(3)
A. Analysis of the entire group of students includes:			
A quantitative comparison between pre- and post-assessment data			
If appropriate, a component that depicts student learning based on qualitative data (e.g. teacher's notes, excerpts from writing assignments, student interviews, surveys, etc.)			
Interpretation of results, including both content standards and Standards for Mathematical Practice			
All assessment instruments used			
Graphic organization of findings			

B. Analysis of individual students includes:			
Description of individual characteristics: grade level, gender, language proficiency, other			
Identification of most effective strategies for each individual student			
Identification of least effective strategies for each individual student			
Interpretation of assessment data and individual student learning			
Interpretation of the role of feedback for each individual student for his/her learning			
C. Discuss implications for student learning and future teaching of the same unit			
D. Discuss possible modifications of the unit			
Include two examples of situations that required change of your original lesson plan			
E. Explain how your analysis of assessments inform your future instruction with the class and with individual students.			
Total score			

Section VI- Self Evaluation and Reflection

	(1)	(2)	(3)
A. Evaluation of success of the lessons with respect to:			
Alignment among learning goals, instruction, and assessment			
Evaluation of the mathematical tasks used			
Evaluation of the sequencing of tasks			
Evaluation of the motivation that the activities/tasks provoked			
Evaluation of students' classroom participation and engagement with class activities			
Evaluation of students' attention to the eight Standards for Mathematical Practice			
Evaluation and reflection , where appropriate, on the role of technology in the unit (if technology is not appropriate, reflect on this)			
Identification of the lesson's strengths and weaknesses			
Identification of unanticipated events that affected the lesson and the students' attention and performance			
Discussion of classroom management issues and the effectiveness of the teacher's responses to these issues			
Evaluation of time management and smooth transition among activities			

Evaluation of the diversity of types of student-teacher and student-student interactions			
B. Reflection on Analysis in Part VI includes:			
Assessment of one's own professional growth			
Identification of specific areas where improvement is needed			
Reflection on how identified weaknesses affected instruction			
Identification of professional development activities that could help remediate these weaknesses			
Examples of particular strengths of teaching			
Total score			