American University of Beirut
Faculty of Arts and Sciences
Department of Education

Course Number and Title:
EDUC 252 The Teaching Mathematics in Elementary School

1. Course Learning Outcomes

This course is based on the idea that mathematics teaching and learning are problem solving activities. The giving and taking of information is not sufficient for success in either. Success requires the ability to collect, interpret, organize, and select useful information and the ability to think independently, flexibly, creatively, and logically in order to solve the infinite variety of novel problems that one faces in these two domains. The activities and assignments in this course are designed to motivate you to apply a point of view about how elementary school mathematics might be learned by children and how you can facilitate that learning. The field experience provides an opportunity for you to use what you are learning in EDUC 252 with children. The schools where you will be a guest also have developed a point of view about the learning and teaching of mathematics. Therefore, you may be confronted with different points of view about teaching and learning that you will need to consider. This is normal and will always be part of your development as a professional. The specific goals for the course are listed below. It is important to note that these goals are developed over a professional career. In one semester, we can only lay the foundation for this development. However, the strength of that foundation is directly related to your commitment and effort to accomplish such goals. Specifically, it is expected that through this course you will be able to:

- Plan for and carry out sound mathematics instruction;
- Understand ways in which research can be applied in instructional practice;
- Reflect critically on your own teaching and the teaching of others;
- Reflect critically on your own understanding of the nature of mathematics and mathematical activity;
- Reflect critically on elementary curriculum materials;
- Deepen your understanding of elementary mathematics topics (number and operations, ratio and proportion, algebraic thinking, measurement);
- Understand how children's mathematics differs from teachers' mathematics;
- Begin to articulate your own flexible model of how mathematics is learned and what classroom-based factors influence student learning;
- Design assessment of student learning that provides a multi-faceted portrait of what students understand and can do, and what they do not, and that can be used to guide your creation of environment conducive to the children's learning of mathematics; and
- Recognize the value of collaboration with peers

2. Resources Available to Students

Required text

Van de Walle, J. (2004). Elementary and Middle School Mathematics: Teaching Developmentally. Fifth Edition, Longman/Addison Wesley.

Optional Materials

NCTM Membership (www.nctm.org)
NCTM Standards (Principles and Standards for School Mathematics)
Lebanese Curriculum
Curriculum materials available in SMEC Library

Articles and Artifacts

Articles from relevant journals and other materials will be distributed in class (generally) at least one week prior to the due date, unless it is an in-class reading or activity.

3. Grading Criteria

Grading

The grading scale used will be the standard scale for Arts & Sciences. There will be no curve as all grades are standards-based. Your grade will be determined as follows:

Participation	10%
Classroom Observation Hours + Residency	10%
Final Portfolio and Presentation	20%
Math Tasks Curriculum Project	15%
Learning Log + Quizzes	15%
Analysis of Teaching Project	15%
Planning, Teaching, Reflecting Project	15%

Major Assignments

1. Classroom Observation Hours, Residency and Student Teaching Portfolio

As part of your elementary teaching program, you are required to spend a MINIMUM of 2 hours per week observing mathematics classrooms and orienting yourself to the school environment in which you are placed. You are encouraged to observe and participate beyond the minimum in order to ensure that you gain the most from your field experience during this semester. You are also required to compile a portfolio of your field experiences. Your portfolio will contain at least the minimum requirements as explained in The Student Teacher Portfolio for Field Experiences document. Portfolio reflection

prompts will be given to you early in the semester. In addition, you are expected to do a 3-day residency in the school to which you are assigned. This will occur early in the semester and you will be given special instructions by your EDUC 252/257 instructors. The residency is a vital part of your experience. To accomplish this you may need to arrange to miss/make up some of your university course class time.

2. Math Tasks Curriculum Project

In this project you will use the Levels of Cognitive Demand introduced during the first few class meetings to analyze the mathematical tasks presented in a unit of study from an elementary school curriculum (you are encouraged to analyze the curriculum used at the school in which you complete you practicum, but other curricula are available in the SMEC library). Your professor must approve the unit you select.

The purpose of the project is three-fold:

- to provide you with an opportunity to explore in depth a curriculum unit and to see how a particular mathematical idea or set of ideas is developed from the beginning to the end of an entire unit; and

- to engage you in the process of analytical reflection on the extent to which currently available curricula are designed to engage students in high level mathematical thinking and reasoning and
- to engage you in thinking carefully about how the cognitive demands of mathematical tasks can be changed in order address different goals for student learning.

The 4 components of the project are described below and should be completed in the order specified:

1. Select a unit/chapter from the curriculum of choice—preferably Grades 2-6. Be sure to show the unit you have selected to your instructor before continuing with the project in order to be sure that the one you have selected will provide an appropriate basis for this project. [You are encouraged to identify a chapter or unit that you will be covering during your student teaching in the spring, or a unit you are interested in teaching.]

2. Answer the following set of questions:

    a. What percentage of tasks/exercises have cognitive demands that fall in the category of memorization? Provide at least two examples of tasks that you considered to focus students' attention on memorization and explain why they are good examples.

    b. What percentage of tasks/exercises have cognitive demands that fall in the category of procedures without connections? Provide at least two

examples of tasks that you considered to focus students' attention on procedures without connections and explain why they are good examples.

c. What percentage of tasks/exercises have cognitive demands that fall in the category of procedures with connections? Provide at least two of tasks that you considered to focus students' attention on procedures with connections and explain why they are good examples.

d. What percentage of tasks/exercises have cognitive demands that fall in the category of doing mathematics? Provide at least two examples of tasks that you considered to focus students' attention on doing mathematics and explain why they are good examples.

3. Write a reflective commentary about what kinds of cognitive demands are represented in the unit and the extent to which the unit would engage students in high level thinking and reasoning. Be as specific as possible.

4. Select two tasks that you would categorize as focusing students' attention on procedures without connection to concepts, meaning or understanding. At least one of your two tasks should have a context (i.e., it should be a word/story problem).

   For these two tasks answer the following:

   a. Solve the task.

   b. What is the mathematical procedure on which the task is intended to focus students' attention?

   c. What other mathematical concepts or processes underlay the task?

   d. Show an example of how the demands of the task could be altered to focus students' attention on procedures with connections. You must actually write a new version of your task. Show at least two ways to solve your new task.

   e. Show an example of how the demands of the task could be altered to focus students' attention on doing mathematics. You must actually write a new version of your task. Show at least two ways to solve your new task.

3. Analysis of Teaching Project

The main purpose of this project is to help you develop the ability to analyze, critically reflect on, and learn from reformed-oriented mathematics teaching as conveyed on videotape, in print form, or from direct observation. Since this ability develops gradually, the course project includes several parts, each of which will provide you with

the opportunity to critically examine a teaching episode. In this way, we hope that the project will support and reflect your development over the entire semester.

Specifically, this project will consist of several informal opportunities to analyze teaching and two extended analyses and reflections, one early in the semester, and one later in the semester. The extended analyses will follow a similar format. As you observe or read, you will take notes on events that take place in the instructional example, notes that will be used to analyze the mathematical ideas, the children's understanding of these ideas, and how teaching supported (or did not support) students' understanding. On the basis of this analysis, you will write a short paper (4-5 double-spaced pages, Times or Times New Roman 12pt font) in which you will discuss and integrate these three aspects and elaborate on them using the readings, class experiences, and of course - your personal history as a learner of mathematics. Remember that the process of writing the paper is an opportunity to extend your thinking—it is not simply reporting what happened or repeating thoughts expressed in class.

As you will come to recognize, observing, analyzing, and writing about teaching-learning situations is a significant task. We assume that as the course progresses, and with your instructor's feedback as to how to improve your synthesis of information learned, the parts of the project will be improved. Consequently, there are two aspects to the grading for the project:

1. The final grade for the project will be given at the end of the semester based on the instructor's evaluation of both the quality of your analysis/synthesis of teaching-learning situations, and the extent to which you have shown improvement over time. Grading will be on thoroughness, depth of thought, and your ability to integrate readings, class experiences, the mathematics content, and ideas about how children think about, and might respond to the mathematics instruction observed.

2. The evaluation of each paper will be based on the 5-level rubric presented below. To increase the likelihood of learning from one part to the next, all students, and particularly those whose feedback indicate the need for substantial improvement, are encouraged to discuss the feedback with their instructor (following the first analysis paper, you will have many opportunities to practice critical analysis of teaching during the semester in order to help prepare you for the second analysis for this project).

Rubric for Evaluating the Analyzing Teaching Project

Each paper will be evaluated using a five-level rubric as described below. The purpose in evaluating your work in this manner is to give you a sense of the quality of your work and to help you to identify areas which need improvement.

3.5-4.0-Advanced

This rating indicates that you are on a good trajectory. Specifically, you have:

- identified key aspects of the teaching episode -- mathematical ideas, children's understanding of these ideas, and teaching related to children's understandings -- for the focus of your analysis;

- integrated related readings and personal experiences in a manner which supports your analysis; and

- produced a well-written document -- one that is grammatically and technically correct, well organized, and coherent.

2.6-3.4-Proficient

This rating indicates that you have done a good job meeting all or most of the requirements of the assignment, but one of the above areas needs improvement or polishing or your presentation of ideas (organization, grammar, etc) could be improved. (Your instructor will identify the area that needs attention and provide specific feedback that will assist you in writing subsequent papers.)

1.6-2.5-Partially Proficient

This rating indicates that you are off to a good start, but that substantial improvement is needed in one or two of the three areas addressed above or your presentation of ideas needs substantial work. (Your instructor will identify the area that needs attention and provide specific feedback that will assist you in writing subsequent papers.)

0.1-1.5-Novice

This rating indicates that you need substantial improvement in two or three of the areas addressed above. (Your instructor will identify the areas that need attention and provide specific feedback that will assist you in writing subsequent papers).

0-No Grade

This rating indicates that you need substantial improvement in all of the areas addressed above or that you turned nothing in or that the assignment was received late with no alternative arrangement made in advance.

4. Planning, Teaching, Reflecting Project

The purpose of this assignment is to provide you with an opportunity to experience the teaching cycle first hand by planning a lesson, teaching the lesson to children in your pre-student teaching placement, and reflecting on your teaching following the lesson. The assignment will consist of three parts, each of which corresponds to one of the phases in the teaching cycle.

Part 1 -- Planning the Lesson

You should begin to plan the lesson no later than during the **8th week** of the term. In planning the lesson you must decide what concept you want to teach, the relevant knowledge the children in the classroom to which you have been assigned have related to this concept, and the mathematical task or activity that you intend to use in order to facilitate student learning of this concept. You will have to consult with your cooperating teacher in selecting a topic to teach.

As part of the planning process you must:

- Get approval from your EDUC 252 instructor on the concept you want to teach and the task or activity you intend to use. By the deadline in the syllabus you should send an e-mail message or make an appointment with your instructor in which you describe the concept and the task you plan to use. Following the receipt of this information, your instructor will indicate whether your concept and task have been approved or whether additional revisions are required. **If your concept is not accepted, continued communication with your instructor is required until agreement is reached.**

- Develop a lesson plan for teaching this concept to a small group (or to a whole class if necessary) after you have received approval from your instructor.

Part 2 -- Teaching the Lesson

You should teach the lesson during the **10th or 11th week** of the term if possible. Ideally, the lesson should be taught to a small group since you will be able to have more significant interactions if you are teaching a small number of students (4-6 is ideal, but other numbers are fine). **Circumstances may dictate that you have to teach the whole class and that is fine too.**

Ideally the lesson should be videotaped. If you cannot arrange to have the lesson videotaped, talk to your instructor. You should discuss this with the cooperating teacher **early in the term** so that you will have sufficient time to obtain the permission. You will also need to make arrangements for borrowing video equipment.

Part 3 -- Reflecting on Your Teaching

Following the lesson you should watch the videotape of the class and consider the following questions:

- What were the mathematical ideas that you intended for children to learn as a result of engaging in the task or activity that you had planned? How did the task promote the children's learning of these ideas?
- What did the children in the class actually learn from engaging in this task or activity? Can you cite specific evidence of student learning?
- How did you as the teacher facilitate or inhibit student learning? Can you cite specific evidence of what you did or said that supported or inhibited student learning? Be self-critical.

You are encouraged to watch the tape and discuss these questions with one or more of your peers in the class. Having another person observing the lesson and/or the tape can be very helpful since she or he will not be as close to the experience and will bring another perspective to the discussion.

Following your reflection, you will write a paper which includes the following sections:

1. An analysis of the mathematical ideas (concepts) towards which the teaching was directed.
2. An analysis of children's understanding of those ideas.
3. An analysis of the teaching that took place and the role of the task in promoting learning.
4. An analysis of what you learned from this experience, including any insights on how this experience will influence future use of tasks to teach other concepts.

The analysis paper should include references to course readings and should provide sufficient information about the teaching to facilitate the readers understanding of the points being made. Note: The paper should be written in such way that understanding what occurred during the episode does **not** depend on watching the videotape, that is, your instructor should be able to make sense of your learning experience without seeing it. The final lesson plan (including a copy of the main task or activity), the videotape, and the analysis paper are due by the **due date listed in the final syllabus**.

---

5. Learning Logs & Quizzes

The learning log is designed to be an ongoing collection of your day to day work in the course and your own self-assessment of that work, as well as a record of your growth in understanding during the course. The assignments are intended to stimulate you to think and reason independently about the key issues and mathematical ideas and relationships embedded in the daily assignments you will complete in the course. You are always expected to explain your thinking and reasoning as carefully and completely as you can, and whenever appropriate, you are expected to refer to course readings or your own experience observing in your practicum classroom. **YOU ARE REQUIRED TO TURN IN TWO COPIES OF EACH LEARNING LOG WHEN IT IS DUE.**

YOU MUST KEEP YOUR LEARNING LOGS AFTER THEY ARE GRADED FOR INCLUSION IN YOUR PORTFOLIO. Each assignment will be graded using a 0-4 scale (as described below) and feedback will be provided by the professor. Points will be awarded at the end of the semester **based on grades of individual learning log assignments as well as growth over time in the quality of the work produced**.

Occasionally your instructor will present you with brief "drop quizzes" designed to check the extent to which you are keeping up with the material covered in the course. You are advised to keep current with your reading and all written assignments, as well as to participate and take notes in class. All of this will ensure your good performance on quizzes.

General Rubric for Learning Log Assignments

3.6-4.0 Advanced

The student demonstrates thoughtful individual reflection and sound reasoning about all the key issues, skills, concepts, or relationships that are the focus of the assignment. The student's ideas or analytical approaches with respect to the key issues are creative, original, accurate and complete. When appropriate, the student is able to relate the assignment to course readings, class discussion, and/or his/her own experience. The quality of mathematical communication is outstanding. Grammar, spelling, and organization are excellent. The student goes far beyond the minimum requirements.

2.6-3.5 Proficient

The student demonstrates thoughtful individual reflection and reasoning about all of the key issues, skills, concepts, or relationships that are the focus of the assignment. There may be minor errors in reasoning or mild lack of clarity, but the quality of reasoning is generally sound and the quality of mathematical communication is high. There may be minor flaws in grammar, spelling, and organization of ideas.

1.6-2.4 Partially Proficient

The student demonstrates a sound understanding of some of the key issues, skills, concepts or relationships that are the focus of the assignment; however, the student demonstrates little evidence of thoughtful reasoning or explanations are vague or confusing or unclear. Also the student does not relate their reasoning or reflections to the course readings or observational experiences. Grammar, spelling, and organization are very flawed (more than 5 errors).

0.1-1.5 Novice

The student does not demonstrate a sound understanding of the majority of the key issues, skills, concepts or relationships that are the focus of the assignment. There are substantial errors in reasoning or the student has used an inappropriate approach to completing the assignment. Grammar, spelling and organization are extremely flawed (more then 10 errors).

0 No Grade

No work is turned in or the assignment is late or the student does not attempt to address at least half of the key issues, skills, concepts or relationships that are the focus of the assignment or the student's work contains no reasoning or communication of their solutions or thoughts and ideas. The assignment contains plagiarized ideas.

4. Schedule

Tentative

Week	Scheduled Topic
1	Introduction & Syllabus Foundational Ideas Teaching Cycle
2	Mathematical Tasks Framework
3	Number and Place Value *Note: in week 3 or 4 students will complete a 3-day residency in the field, class sessions will be made up at a later date*

4	Number and Place Value
5	Number and Place Value
6	Rational Numbers Relating Fractions Decimals and Percents
7	Relating Fractions, Decimals and Percents Operations and Computation
8	Operations and Computation
9	Ratio and Proportion
10	Ratio and Proportion
11	Algebraic Thinking
12	Algebraic Thinking Measurement
13	Measurement
14	Measurement
15	Literature Connections
16	Assessment

5. Course Policy (if any)

Attendance

In accordance with AUB policy, the expectation is that you will be present, on time, and prepared for every class meeting. Attendance is expected at all scheduled class meetings. Just as any professional teacher does in school, in the event of an emergency or other special circumstances, please contact the instructor in advance if you will not be present in class for any reason. It is your responsibility to arrange for turning in (on time) any assignments due. You must notify the instructor directly via e-mail or telephone. ***Sending a message through another student is not acceptable.***

Overall, missing more than the equivalent of one week will be considered excessive and will result in a lower grade for the course. If you miss more than one week you will forfeit your potential to earn an A in the course. If you miss two full weeks you will forfeit your potential to earn a B in the course. If you miss three weeks, you will forfeit your potential to earn a C in the course. If you miss more than three weeks you will be in grave danger of failing the course. Tardiness may be accumulated as an absence at the discretion of the professor. **If there is a special circumstance regarding your ability to attend classes or to arrive on time, it is your responsibility to inform the professor (in advance) and make special arrangements as appropriate.**

Class Participation

All students are expected to complete in-class assignments and to participate in class discussions and activities in a reflective and professional manner. Average performance requirements include the following:

- Being prepared for class (including completion of reading and writing assignments in advance, bringing all needed materials to class, etc.)

- Being on time for class
- Listening respectfully to others
- Occasionally contributing to discussions in a professional and thoughtful manner
- Occasionally asking questions of the instructor or fellow students when appropriate

To obtain a higher than average rating for participation, you must surpass these minimal requirements (i.e., participate and raise thoughtful questions on a regular basis).

Late Assignments

Assignments are generally due at the beginning of class. It is your responsibility to make sure that the professor receives your assignments. In general, late assignments will receive a grade of "zero." Feedback will be given, but the assignment will not be graded.

In the case of extenuating circumstances, extensions may be granted at the discretion of the professor. It is your responsibility to assess your own schedule and time limitations and anticipate problems well in advance. Last minute extensions will rarely be granted, and only in the most grave circumstances. If you find yourself overwhelmed, the best thing to do is to talk to your professor and try to make arrangements that will enable you to do your best on all assignments. Please be advised that last minute computer/printing problems will not be accepted as extenuating circumstances, so it is best to complete assignments as early as possible in order to avoid computer problems in a time crunch.

Writing Standard

The quality of your ideas as well as your presentation will be taken into consideration when assigning grades. As a teacher you are expected to produce written documents that are easily read, well organized, clearly understood, grammatically correct, and include no spelling errors. You are encouraged to use grammar and spell-check capabilities of your word-processor, and to ask your peers to proofread your papers prior to submitting them to the professor. In accordance with AUB policy, your grade on any assignment may be reduced if you fail to attend to these aspects of your written assignments. In addition, plagiarism will not be tolerated. Be sure to cite any outside sources you incorporate into your written assignments. If any portion of an assignment is plagiarized, you may be given a zero on the assignment and further action may be taken.

Academic Integrity

Cheating in any form (including plagiarism) is a serious offense and will not be tolerated. Whenever referring to the work of others or using another's ideas, you must cite your sources. If you are caught either passing in someone else's work as your own OR knowingly allowing someone else to take your work and pass it in as their own, you will be given a ZERO on the assignment and further action may be taken in accordance with AUB policy.