EDML 4372–001: Mathematics in the Middle Grades

Tuesdays 9 AM–12 noon, TH 111, Fall 2017

Instructor Information

Instructor: Dr. Christopher Kribs
Office: PKH483 (mailbox in math ofc)
Office Hours: after class & by appt.
Phone: (817)272-5513, fax 272-5802
email: kribs@uta.edu, *web:* mathed.uta.edu
Profile: https://mentis.uta.edu/explore/profile/christopher-kribs

Course Content: Curriculum standards, methods, and effective teaching practices as proposed by the National Council of Teachers of Mathematics for the middle level; the organization of mathematics content with an emphasis on using manipulatives and technology to teach math. This course is aligned with the Association for Middle Level Education's 2012 Middle Level Teacher Preparation Standards, available online at http://www.amle.org

Course Information

Prerequisites: acceptance into mid-level certification program, plus EDUC 2101, EDML 4300, EDTC 4301

> NOTE: Students should already be familiar with some basics of education, including lesson plans, resources, classroom management, and school culture, which should have been addressed in prerequisites. The instructor will be happy to work with any students who have questions on these matters, but they will not be a principal topic of conversation in class.

Required course materials: Required readings (see bibliography on last page) are available online or at the UTA Libraries. Course activities are available in PDF on the class web page. For long-term reference, the following methods text is highly regarded:

> John A. Van de Walle, Karen Karp, Jennifer M. Bay-Williams, *Elementary and middle school mathematics: teaching developmentally*, Allyn & Bacon, 2010. ISBN 0205573525.

Course home page: http://mathed.uta.edu/kribs/4372.html
AMLE Standards: http://www.amle.org/AboutAMLE/ProfessionalPreparation/AMLEStandards.aspx.
Last day to withdraw: November 1

Learning Outcomes: This course is designed to prepare future middle grades school teachers *pedagogically* to teach math. After completing this course, students will be able to:

- demonstrate knowledge about the NCTM standards and the TEKS.
- reflect upon their experiences observing classroom teachers and teaching students in an actual middle grades setting.
- demonstrate competency in a hands-on approach with emphasis on middle grades students being active participants in their own learning.
- demonstrate awareness of learner-centered proficiencies via the TExES exam.
- analyze and value the mathematical thinking of students.
- consider the role of student thinking in making instructional decisions.
- define and select mathematical objectives and activities for their students.

Grading: The grade for this course is determined by the following four components, using the traditional ten-point scale (90–100=A, 80–89=B, etc.):

- 25% Preparation & Participation
- 25% Student interview
- 25% Case study
- 25% Lesson paper

A calendar for this course is given on the last page of this syllabus.

Course policies

Attendance: "At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students academic performance, which includes establishing course-specific policies on attendance." This course follows department and program precedent by taking attendance, via a sign-in sheet. Attendance & participation in our class activities are crucial, as most of what I hope you will take with you from this course will happen in our classroom. It is *the student's responsibility* to sign in each week, and to follow up with the instructor as necessary. Each student is allowed one absence for reasons of health, religion, time conflicts, etc. without penalty. Arriving substantially late or leaving early counts as half an absence. Each absence beyond the one allowed will reduce the final grade by one letter grade, even if you notify me in advance.

Written Assignments: With the exception of examples of student work, written assignments are expected to be typed and use correct grammar and punctuation. (Diagrams, equations, etc. may of course be hand-drawn.) No cover pages required, 2-sided printing OK. Handwritten texts may be returned ungraded.

All major assignments (i.e., excluding reflections) must also be uploaded to Tk20.

Each student is allowed one late submission during the semester. The paper must be submitted before the beginning of the class period following that in which it was due. Papers not submitted by the end of class time on the due date are considered late. The first late paper submitted will be the only one graded.

Each student is allowed one electronic submission during the semester. Electronic submissions must be complete and not missing any ancillary materials such as student work necessary for grading. (If the electronic submission is made late, then it is both the only late paper allowed and the only electronic submission allowed.) This does not include drafts sent for consultation prior to submission.

Please be sure to follow directions/answer the question that is asked. (This is where most points are lost.) Also, bear in mind you must explain yourself *clearly* in order to get credit for what you *mean* to say.

Rewrite: Each student is allowed to submit one revised paper for a regrade, under the following terms: The revised paper and the graded original must be turned in together at the penultimate class meeting. The new grade replaces the original. Students should consult with the instructor before submitting a revised paper.

1. Preparation & Participation

You are expected to come to class prepared, and to participate in our class discussions, in both small and large groups. Preparation includes reading the assigned texts, making notes on them in order to be able to participate effectively in class discussions, and bringing all necessary materials and texts to class with you.

On most days when there is not a major assignment due, you will write a short (about one page) reflection in response to a prompt given below, in preparation for either class discussion or one of the major assignments. Some involve "action research" reports in which you write about your own students' mathematical reasoning. You will often discuss your responses in class, in both small and large group, so turn them in at the end of class; I will respond to them in writing and return them at our next class.

Your reflections will serve to document your preparation for class each day (and your growth over time); your preparation and participation grade will be based half on your reflections (entries should be complete and on target each week before class) and half on your participation in class discussions (I expect participation in large-group discussion at least ten of the sixteen times we will meet).

Participation includes raising questions of your own as well as responding to others', and being prepared to contribute by having read each week's assigned readings and bringing both the readings and your notes on them. When you think you have no answers to share, ask a question, because chances are you're not the only one who has it. If you have difficulty speaking up in *large* group, write down a few questions before class which arose for you during the readings. When working in *small* groups, it is often useful to have the following roles assigned, to make sure the group does not stagnate: (1) facilitator/moderator, (2) recorder, (3) speaker (for the group, in whole-class discussions), (4) materials coordinator. Small groups should always have three or four members.

Of course, participation also includes appropriate, professional behavior (e.g., paying respectful attention while others are speaking, not working on outside projects, not browsing the internet, e-mail, or social media in class). If at any time you are unsure how you are being graded in these areas, please ask your instructor.

Reflections

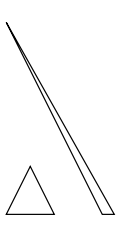
1. *Definitions of even.* (i) Write your own definitions for "odd" and "even". (ii) Ask several students to define these words (use age-appropriate vocabulary, but be careful not to use suggestive terms). Report their responses verbatim, and then compare them with your own.
2. *Mini-interview.* Interview a single student to see to what extent (s)he can articulate (and, as appropriate, justify) generalizations about the result of adding two odd numbers. Use age-appropriate terms. This assignment should serve as a dry run for the student interview assignment, so see that portion of the syllabus for the general format, but keep in mind that this mini-interview should cover only one question and thus be much smaller in scope.
3. *Shape of a problem.* Outside of class, solve the "Pentominoes" problem (p. 10 coursepack). (Do not seek help from the Internet, as this paper is not about the answers, but about the problem-solving process.) Then write a reflection describing **only** the different *phases* through which you passed in working on it. What realizations or decisions triggered shifts from each phase to the next? **Do *not* present the solution**—just identify the points when you changed your approach somehow.
4. *Mini-case study.* Pose, to a group of K–8 students, a single question similar to those in the cases we have read or seen, or from one of our class discussions. (Make sure it is appropriate to the students' grade level.) Write about your question, what you expected, and what actually happened. Did anything surprise you? Please describe specific examples of what your students say and do. Examining the work of a few students in detail may be more helpful than trying to incorporate the responses of every student. Think of this as a dry run for the case study.
5. *Role of conjecture.* What is conjecture's role in problem solving? What is its value (if any) in problems that are never fully solved? (Consider MATH 1330's Poison and Stamps problems.)
6. *Analyzing multiplication strategies.* Each of the following three computations uses a nontraditional multiplication algorithm to reach a correct answer. For each computation, give a rigorous (justified) analysis including answers to the following questions:

   (1) Is it mathematically sound?
   (2) If so, how far can it be extended?
   (3) Based upon the skills required and not required (relative to the traditional algorithm), what motivated the approach?

   (a)
   ```
     2 4
   x 6 4
   -----
     2 5 6
+ 1 2 8
-------
   1 5 3 6
   ```

   (b)
   ```
   7 2 5
       x   8
   -------
     6 6 0
+ 5 1 4 0
---------
   5 8 0 0
   ```

   (c)
   ```
   1 2 9 0
       x   4 0 3
   -------------
     3 6 2 7 0
+ 4 8 3 6 0
-----------
   5 1 9 8 7 0
   ```
7. *Assessing problem solving.* The case study "Right or Wrong" in this week's readings involves the grading of two student papers to the same problem. Begin by reading only the first page, including the papers by Chris and Pat. Develop an explicit 5-point grading scale or rubric for scoring responses **to this specific problem only** (not a generic one), and write a paragraph explaining what you think the most important issues involved in this problem are. Then apply your scale to both papers, and write a short paragraph explaining why each paper received the grade (0–5) you assigned it. Finally, read the rest of the case study, and write a paragraph in which you respond either to the issues raised in the last page of the study, or to the scores the teachers in the study gave these papers.
8. *Lesson draft.* See lesson paper description (items 1–3). These 3 paragraphs should run 1 page total.
9. *Deconstruction and rescaling.* (i) Write a formal deconstruction (see p. 14 coursepack) of the focal problem from your lesson paper, and (ii) (re)structure it at least two different ways (that is, change the presentation, *not* the problem itself), for students at slightly higher and lower levels (pp. 15–17, coursepack). Include the original and both restructured prompts.
10. *Defining area.* (a) Is the definition of "area" in your dictionary good enough to explain the meaning of the term to someone who had never heard the concept before? If not, how does it fail? Imagine you have a student with the learning disability "unidimensia", where they persistently think of everything in terms of length only (e.g., they think a skinny triangle "takes up more room" than a fat one). Try to write a definition of "area" that will work even on such a student. Also be sure to distinguish area from volume. (b) How could you compare two triangles such as those at right to determine which is bigger?



2. Student interview

In order to develop (or strengthen) the habit of attending to student thinking in detail, you will conduct an interview with a student from your class to assess her/his understanding of a specific mathematical topic. You may choose the student and topic, but the interview should involve a major topic from this course. (Do not use order of operations—it's purely procedural!) Begin by obtaining all necessary permissions to conduct and record (audio or video) the interview; explain to all interested parties (including the student!) that you need the student's help for a class in which you are studying how students learn, and that this interview will not affect the student's grades; it will just help you understand how the student thinks. (Recording the interview will keep you from needing to make detailed notes during it.)

Before the interview, get a copy of recent written work by the student showing her/his ability to reason and problem-solve (the work need not be error-free, but there should be enough progress made to discuss the problem). Make sure the student is familiar with the paper, and begin the interview by asking him/her to explain the work, including what difficulties s/he encountered.

Continue the interview by asking further questions about the mathematical topic involved (see the handout on interviewing tips on the course web site). You will need to use both pre-prepared questions and ad hoc follow-up questions to develop a coherent line of questioning. Remember that *in order to determine the limits of a student's knowledge, you must continue until you reach a question which the student either cannot answer or answers incorrectly for reasons other than a simple careless error.* You should be able to do this without making the student feel badly.

After the interview, use your recording to make a more detailed analysis of the student's thinking, with regard to both problem-solving abilities and knowledge of the particular mathematical topic. Begin with a brief introduction to provide context. Give an overall narration of the interview (e.g., say what specific tasks or problems you asked the student to work on). Use specific details or quotes to support your analysis. Conclude your write-up with an explicit summary of what the student knows, what the student does not know, and what the student is ready (or needs) to work on next (see interview tips handout for more).

3. Case study

During the course we will read and discuss in class several case studies, all describing events in other teachers' classrooms. For this assignment, you are to write a short (roughly 3–5 pages) case study describing a mathematical discussion involving one or more students, similar to these cases. A case is neither a complete transcript of a lesson nor as prefabricated as an interview, although it should include direct quotes and dialogue from students.

You must base your case on a conversation for which you were present, and preferably in which you were involved, but it could come out of a lesson you observed, or a conversation among two or more students. You may choose to narrow in on one or two students, or on one small group, or you may describe a whole-class conversation. Most important is that the episode illustrate some aspect of children's mathematical thinking.

In writing your case study, begin by describing briefly the class's larger context (including grade level) and the mathematical topic; then describe the relevant parts of the conversation in as much detail as you can manage. Include what you are thinking as you work with the students. Finish up by summarizing your evaluation of the students involved and saying what issues and questions you still have after this conversation. Include an analysis of the students' thinking, and questions the case raises for you. *It is important that your reflection address teaching issues beyond the one topic and set of students involved*, in order to document your ability as a reflective practitioner to make connections that inform your teaching practice more broadly.

We will discuss the writing of cases in more detail before they are due, but you are encouraged to begin sooner if you have a good conversation fresh in your mind. I will be glad to help you.

4. Lesson paper

In this course we will study the teaching and learning of K–8 mathematics. To document your ability to plan, deliver, and reflect upon instruction, you will develop, teach and document an exemplary lesson, and give a short (5-minute) presentation to the class on it. The lesson draft (Reflection 8) includes items 1–3 below. The final lesson paper you submit must include *all* of the following components, clearly identifiable, distinct, and in the order given, *including items 1–3* (revised if necessary following Reflection 8):

1. Select or develop a rich mathematics problem intended for use with the students you teach. You may use or adapt a problem from class materials, but be sure it is appropriate for the target audience. (Say where you got it from, and, if you have used it before, in what capacity, and what you learned from it.) Be deliberate and thoughtful. Do not simply select a set of exercises from a textbook—choose a central, high-cognitive-demand task around which to build a significant problem-solving experience. The best lessons tend either to integrate multiple strands of mathematics to illustrate connections, or to address significant conceptual issues within a single strand as a summative activity following multiple experiences in developing and exploring a concept. Give the full prompt.
2. Write a paragraph explaining what concepts from this course are entailed in this problem. (You may use deconstruction to identify them, but write here in paragraph form.) Justify why the central task has a high cognitive demand, and what you hope to achieve through it. Situate in a learning trajectory.
3. Add a short (1 paragraph) narrative summary of how you plan to use the problem in a lesson.
4. Write a lesson plan in outline form. Include *all* data necessary for someone else to teach the lesson, e.g., prerequisite knowledge, all student prompts, important discussion points, and closure activities.
5. Teach the lesson to your students (see me if this is problematic). Then write a one-page reflection on how the lesson went, including what strategies students used to approach the problem, what ideas were raised in its discussion, and to what extent your students' understanding of the underlying concepts—or ability to apply them—changed as a result of the lesson. Be specific.

   If your cooperating teacher will not allow you to teach it as you believe it should be taught, write the lesson plan nevertheless as you believe it *should* be taught (this is documentation of your ability to design an *exemplary* lesson), and then address in your reflection any digressions from the lesson plan.
6. Make a one-page handout (you may use front and back if necessary, but it *must* fit on one sheet) summarizing your lesson for the class. Include the problem, grade level, mathematical topics addressed, and anything your colleagues would need to know in order to use the lesson, including how to avoid proceduralizing, and (briefly) any difficulties the students tended to encounter. The handout should *not* be the same as your lesson plan (select details!), and must be turned in with the main paper.
7. Give a brief (5-minute) presentation to the class, using the handout, at our last class meeting.

I encourage you to discuss this project with me as you develop it. A preliminary draft of items 1–3 is due as Reflection 8. Final documentation is due at Session 14 (so that I can return it to you), *including a handout*, with the presentations to be given during finals week.

Additional preparation for class discussions (not to turn in):

D2 Review your notes on the hippos/rhinos/Utopia problem from Math 1330 (3 versions of the same problem, choose the one you solved) and be ready to discuss how defining variables carefully was key to solving the problem.

Also find your notes on the following Math 1330 problems for week 3's class discussion: Chickens & Rabbits; Pool Tiles *or* Toothpick Squares; and Clock Arithmetic.

D4 Review your notes from any of the following Math 1330 problems which your class solved: Poison, Pentominoes, Regular Tessellations of the Plane, Painting the Cube, Close to 100.

D5 *Defining operations.* (i) Write your own (informal is fine) definitions for the four arithmetic operations. (ii) Ask several students to define or explain one or more of the four (use age-appropriate vocabulary, but be careful not to use terms like putting together and taking away, which already do most of the defining). Report their responses verbatim, and then compare them with your own definitions.

D10 *Defining fraction and decimal.* Ask several students to define or explain what fractions are (use age-appropriate vocabulary, but be careful not to use suggestive terms like part-whole). Do the same for decimals (clarify you don't mean just a dot). Report their responses verbatim, and then compare them with your own working definitions for these terms.

D14 *Defining "middle".* How would you define the center of a circle? of a square? of a parallelogram? How would you define the center of a scalene triangle? of the state of Texas?

Bibliography

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[FDRP] Carne Barnett, Donna Goldenstein, and Babette Jackson (Eds.) *Fractions, decimals, ratios, & percents*, Heinemann, Portsmouth NH, 1994.

William S. Bush (ed.) (2000). *Mathematics assessment: cases and discussion questions for grades 6–12.* Reston, VA: NCTM. pp. 20–23, 36–39.

Richard Caulfield, Shelly Sheats Harkness, and Robert Riley (2003). Surprise! Turn routine problems into worthwhile tasks, *Mathematics Teaching in the Middle School [MTMS]* 9(4): 198–201.

Alfinio Flores, Subtraction of positive and negative numbers, *MTMS* 14(1): 21–23, Aug 2008.

M.K. Gavin and L.J. Sheffield, A balancing act: making sense of algebra, *MTMS* 20(8): 461–466, April 2015.

Eric J. Knuth, Martha W. Alibali, Shanta Hattikudur, Nicole M. McNeil, and Ana C. Stephens, The importance of equal sign understanding in the middle grades, *MTMS* 13(9): 514–519, May 2008.

Christopher M. Kribs-Zaleta, Oranges, posters, ribbons, and lemonade: concrete computational strategies for dividing fractions, *Mathematics Teaching in the Middle School* 13(8): 453–457, April 2008.

Deborah Schifter, Virginia Bastable, and Susan Jo Russell. *Developing Mathematical Ideas.* Parsippany, NJ: Dale Seymour/Pearson.

[BST] *Building a System of Tens (Number and Operation, Part 1) Casebook*, 1999.

[EFS] *Examining Features of Shape Casebook*, 2002.

[MMO] *Making Meaning for Operations (Number and Operation, Part 2) Casebook*, 1999.

[MSP] *Measuring Space in One, Two, and Three Dimensions Casebook*, 2002.

[RAO] *Reasoning Algebraically about Operations (Number and Operations, Part 3) Casebook*, 2006.

Margaret S. Smith, Amy F. Hillen, and Christy L. Catania, Using pattern tasks to develop mathematical understandings and set classroom norms, *MTMS* 13(1): 38–44, Aug 2007.

Margaret Schwan Smith and Mary Kay Stein, Selecting and creating mathematical tasks, *Mathematics Teaching in the Middle School* 3(5): 344–350, Feb 1998.

Jenny K. Tsankova and Karmen Pjanic, The area model of multiplication of fractions, *Mathematics Teaching in the Middle School* 15(5): 281–285, Dec 2009.

Calendar

A tentative schedule with topics is given below (subject to updating). As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course.

Date	Wk	Topic	Readings/Cases Due	Homework Due
Aug 29	1	Overview	*none* (RAO17 in class)	—
Sep 05	2	Defining	RAO5, Knuth, Gavin, (D2)	R1*
Sep 12	3	Representations	Smith 2007, Flores, RAO25,30	R2*
Sep 19	4	Problem solving	Smith & Stein, MMO21, (D4)	R3
Sep 26	5	Deconstructing & modifying	Caulfield et al.	R4*
Oct 03	6	Generalization and proof	RAO4,10,19,31,32	R5
Oct 10	7	The arithmetic operations	(D5)	Interview*
Oct 17	8	Computational fluency	Baek,BST16,17,RAO27,MMO25	R6
Oct 24	9	Classroom norms & assessment	Ball, Bush36	R7
Oct 31	10	Fractions & decimals	MMO18–19, (D10)	R8
Nov 07	11	Operating on fractions	MMO20–22, FDRP7, Tsankova	Case study*
Nov 14	12	Dividing fractions	Kribs, MMO27,28	R9
Nov 21	13	Units	MSP18, Bush20	R10
Nov 28	14	Geometry	EFS32,33, MSP10,11, (D14)	Lesson paper*
Dec 05	15	Measurement	MSP21,23,24	[Rewrite]
Dec 12	16	Final presentations	—	—

Asterisks * denote assignments requiring interaction with students. Numbers in readings indicate case numbers or chapters. See bibliography for further details of readings.

UTA COLLEGE OF EDUCATION POLICIES

University Mission:

The mission of The University of Texas at Arlington is to pursue knowledge, truth and excellence in a student-centered academic community characterized by shared values, unity of purpose, diversity of opinion, mutual respect and social responsibility. The University is committed to lifelong learning through its academic and continuing education programs, to discovering new knowledge through research and to enhancing its position as a comprehensive educational institution with bachelor's, master's, doctoral and non-degree continuing education programs.

College Mission:

The mission of the UTA College of Education is to develop and deliver educational programs that ensure the highest levels of teacher and administrator preparation and performance. As a recognized contributor to the field of education, the College engages in effective teaching, quality research, and meaningful service. The College is committed to diversity and to the advancement of active teaching and learning in all educational environments and at all levels.

Core Values:

Diversity	Learner-Centered	Collaboration	Research-Based
Field Experience	Life-Long Learning	Excellence	Technology

Conceptual Framework:

The work of the College of Education is grounded in constructivism as a theory of teaching and learning and is done in a spirit of expectation that all involved in the College of Education, whether candidate, faculty or administrator, will hold the following as important: *Excellence, Student-Centered Environments, Research, Collaboration, Diversity, Technology, Field Experiences* and *Life-Long Learning*.

Partners for the Future serves as the theme of the College of Education and epitomizes the understanding that it takes a village of partners to insure the future of education for all.

Tk20

The College of Education is appeased to announce the adoption of Tk20, a comprehensive data management system that will provide us with powerful tools to manage our growth and streamline our processes to enable us to meet your needs more efficiently and effectively. As with other course materials, you will need to subscribe to the program for a one-time only, non-refundable cost of $100. You may purchase your subscription online from a link provided on the system's website or from the UT Arlington Bookstore as you would a textbook or other course materials. Please visit https://www.uta.edu/coed/academics/tk20/ for more information.

Professional Dispositions Statement

Each student/candidate in the College of Education of UT Arlington will be evaluated on Professional Dispositions by faculty and staff. These dispositions have been identified as essential for a highly-qualified professional. Instructors and program directors will work with students/candidates rated as "unacceptable" in one or more stated criteria. The student/candidate will have an opportunity to develop a plan to remediate any digressions.

PROFESSIONAL DISPOSITIONS GUIDELINES

The following Professional Dispositions Guidelines are to be followed by all students and candidates in CoEd. The standards referenced are those of the Texas Administrative Code.[1] *Students and candidates are responsible for identifying and following professional standards and policies for their particular state.*

- **Professional Demeanor: TAC Standards 1.9, 1.10, 2.1 through 3.9**
- Demonstrates respect and consideration for the thoughts and feelings of others (diverse populations, school personnel, university personnel, PreK-16 students).
    - Demonstrates kindness, fairness, patience, dignity and respect in working with others.
    - Accepts decisions made by institutional authority.
    - Treats others in a just and equitable manner.
- Maintains composure and self-control.
    - Responds positively to constructive criticism.
    - Follows appropriate channels of communication/authority.
    - Reacts professionally (calm and patient) when under stressful situations.

- **Professional Practices: TAC Standards 1.1 through 3.9**
- Complies with class and program requirements
    - Attends classes, trainings, and field experiences.
    - Arrives on time and remains for the duration.
    - Is prepared, engaged, and meets deadlines.
- Demonstrates academic integrity and honesty.
- Maintains appropriate confidentiality at all times.
- Demonstrates compliance with all laws and regulations.
- Demonstrates compliance with University policies and Texas Education Agency (TEA)/professional specialty program area standards[2]

- **Professional Appearance: TAC Standards 1.7, 1.10, 2.5**
- Displays personal appearance and/or hygiene appropriate for professional settings.

- **Professional Language/Communication: TAC Standards 1.1, 1.7, 1.9, 1.10, 1.11. 2.1, 2.3 through 2.5, 2.7, 3.1 through 3.6, 3.8, 3.9**
- Uses appropriate and professional language and conduct.
- Works effectively, collaboratively, and equitably with others.
- Receives feedback in a positive manner and makes necessary adjustments.
- Uses electronic and social media appropriately, e.g., texting, Facebook, Linked-In.
- Follows school and state regulations in electronic contacts made with PreK-12 students, parents, administrators, professors and others professionals.
- Uses UT Arlington email as official university form of electronic communication and information.
- Uses respectful electronic communication etiquette in course related materials and correspondence, such as in Blackboard and email.

1Texas Administrative Code, Ethics and Standard Practices for Texas Educators can be found at: http://info.sos.state.tx.us/pls/pub/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=19&pt=7&ch=247&rl=2 .

2Specialty areas as in KINE must access and follow their discipline-specific professional and ethical standards. Non-Texas residents are responsible to follow the guidelines for ethical behavior published by their home state.

University of Texas at Arlington
College of Education
Conceptual Framework

The conceptual framework of the UT Arlington College of Education was developed collaboratively and has evolved over time. Following the identification of a set of core values held by all involved in the preparation of candidates enrolled in the College, members of the University, PK-12 districts, higher education institutions, and area business and foundation communities worked together to develop a shared vision for education.

All activities in the College are guided by the premise that we are Partners for the Future, committed to fostering critical, creative thinkers prepared to engage meaningfully in a dynamic society. This premise is characterized and distinguished by three core values: Professionalism, Knowledge, and Leadership. Research, Diversity, and Technology are themes woven throughout each core value. The College mission, core values, and themes serve as the coherent thread running through all professional programs, guiding the systematic design and delivery of clinical/field experiences, course curricula, assessments, and evaluation. The Conceptual Framework consists of six interrelated and interacting components, which are viewed as essential contexts for the shaping of informed, skilled, and responsible partners:

- The first core value, **Professionalism**, represents the contention that candidates develop an expertise and specialized knowledge of their field. A high quality of work, standard of professional ethics and behaviors, as well as work morale and motivation are all necessary factors of a developed interest and desire to excel in job performance.
- The second core value, **Knowledge**, represents candidate theoretical or practical understanding of a subject. In today's world, candidate knowledge includes not only academic content mastery, but also skills such as critical thinking, communication, technology literacy, and collaboration, each required for success in college, life, and career.
- The third core value, **Leadership**, represents candidate ability to organize, assist, and support others in the achievement of a common task. Candidates develop and refine their leadership skills within the context of their interactions with PK-20 students, curricula, faculty, and other professionals.

The additional three components of the model, Research, Diversity, and Technology, represent themes woven into the core values:

- **Research** encompasses the investigation of ideas and theories with the purpose of discovering, interpreting, and developing new systems, methods, and support for knowledge, behaviors, and attitudes.
- **Diversity** is an indispensable component of academic excellence. A commitment to diversity means a dedication to the inclusion, welcome, and support of individuals from all groups, encompassing the various characteristics of persons in our community such as race, ethnicity, national origin, gender, age, socioeconomic background, religion, sexual orientation, and disability.
- **Technology** is emphasized throughout all programs and is used to support and improve content delivery and student learning.

All components lead to the achievement of one goal–the development of informed and responsible Partners for the Future–who are committed to fostering analytical, innovative thinkers prepared to engage meaningfully in a dynamic society.

STANDARDS RELATED TO EDML 4372

I. State K-12 Curriculum Standards (TEKS)

Texas Essential Knowledge and Skills Subchapter 111A: Elementary School Mathematics. Texas Education Agency, 2012. http://ritter.tea.state.tx.us/rules/tac/chapter111/ch111a.html

Texas Essential Knowledge and Skills Subchapter 112B: Middle School Mathematics. Texas Education Agency, 2012. http://ritter.tea.state.tx.us/rules/tac/chapter111/ch111b.html

II. Texas (TEA) Educator Certification Standards

Full details are online at
http://tea.texas.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=2147484170&libID=2147484169

Mathematics Standard I--Number Concepts: The mathematics teacher understands and uses numbers, number systems and their structure, operations and algorithms, quantitative reasoning and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.
Mathematics Standard II--Patterns and Algebra: The mathematics teacher understands and uses patterns, relations, functions, algebraic reasoning, analysis and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.
Mathematics Standard III--Geometry and Measurement: The mathematics teacher understands and uses geometry, spatial reasoning, measurement concepts and principles and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.
Mathematics Standard IV--Probability and Statistics: The mathematics teacher understands and uses probability and statistics, their applications and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.
Mathematics Standard V--Mathematical Processes: The mathematics teacher understands and uses mathematical processes to reason mathematically, to solve mathematical problems, to make mathematical connections within and outside of mathematics and to communicate mathematically.
Mathematics Standard VI--Mathematical Perspectives: The mathematics teacher understands the historical development of mathematical ideas, the interrelationship between society and mathematics, the structure of mathematics and the evolving nature of mathematics and mathematical knowledge.
Mathematics Standard VII--Mathematical Learning and Instruction: The mathematics teacher understands how children learn and develop mathematical skills, procedures and concepts; knows typical errors students make; and uses this knowledge to plan, organize and implement instruction to meet curriculum goals and to teach all students to understand and use mathematics.
Mathematics Standard VIII--Mathematical Assessment: The mathematics teacher understands assessment and uses a variety of formal and informal assessment techniques appropriate to the learner on an ongoing basis to monitor and guide instruction and to evaluate and report student progress.
Mathematics Standard IX--Professional Development: The mathematics teacher understands mathematics teaching as a profession, knows the value and rewards of being a reflective practitioner, and realizes the importance of making a lifelong commitment to professional growth and development.

III. TExES Certification Exam Competencies

Mathematics 4-8 competencies, aligned with the TEA standards above, correspond to TExES exams 114, 115, 211, and 807. Full details are given at http://cms.texes-ets.org/index.php/download_file/1060/

Competency 001: The teacher understands the structure of number systems, the development of a sense of quantity and the relationship between quantity and symbolic representations.
Competency 002: The teacher understands number operations and computational algorithms.
Competency 003: The teacher understands ideas of number theory and uses numbers to model and solve problems within and outside of mathematics.
Competency 004: The teacher understands and uses mathematical reasoning to identify, extend and analyze patterns and understands the relationships among variables, expressions, equations, inequalities, relations and functions.
Competency 005: The teacher understands and uses linear functions to model and solve problems.
Competency 006: The teacher understands and uses nonlinear functions and relations to model and solve problems.
Competency 007: The teacher uses and understands the conceptual foundations of calculus related to topics in middle school mathematics.
Competency 008: The teacher understands measurement as a process.
Competency 009: The teacher understands the geometric relationships and axiomatic structure of Euclidean geometry.
Competency 010: The teacher analyzes the properties of two- and three-dimensional figures.
Competency 011: The teacher understands algebra and geometry through the Cartesian coordinate system and demonstrates knowledge of transformational geometry.
Competency 012: The teacher understands how to use graphical and numerical techniques to explore data, characterize patterns and describe departures from patterns.
Competency 013: The teacher understands the theory of probability.
Competency 014: The teacher understands the relationship among probability theory, sampling and statistical inference and how statistical inference is used in making and evaluating predictions.
Competency 015: The teacher understands mathematical reasoning and problem solving.
Competency 016: The teacher understands mathematical connections within and outside of mathematics and how to communicate mathematical ideas and concepts.
Competency 017: The teacher understands how children learn and develop mathematical skills, procedures and concepts.
Competency 018: The teacher understands how to plan, organize and implement instruction using knowledge of students, subject matter and statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) to teach all students to use mathematics.
Competency 019: The teacher understands assessment and uses a variety of formal and informal assessment techniques to monitor and guide mathematics instruction and to evaluate student progress.

IV. NCTM-CAEP Standards for Mathematics Teacher Preparation

available in full at http://www.nctm.org/uploadedFiles/Standards_and_Positions/CAEP_Standards/NCTM%20CAEP%20Standards%202012%20-%20Middle%20Grades.pdf

Standard 1: Content Knowledge
Standard 2: Mathematical Practices
Standard 3: Content Pedagogy
Standard 4: Mathematical Learning Environment
Standard 5: Impact on Student Learning
Standard 6: Professional Knowledge and Skills

V. AMLE Standards

PRINCIPLE C: INSTRUCTIONAL PRACTICE

Standard 4: Middle Level Instruction and Assessment
Middle level teacher candidates understand, use, and reflect on the major concepts, principles, theories, and research related to data-informed instruction and assessment. They employ a variety of developmentally appropriate instructional strategies, information literacy skills, and technologies to meet the learning needs of all young adolescents (e.g., race, ethnicity, culture, age, appearance, ability, sexual orientation, socioeconomic status, family composition).

Element a. Content Pedagogy: Middle level teacher candidates use their knowledge of instruction and assessment strategies that are especially effective in the subjects they teach.

Element b. Middle Level Instructional Strategies: Middle level teacher candidates employ a wide variety of effective teaching, learning, and assessment strategies. They use instructional strategies and technologies in ways that encourage exploration, creativity, and information literacy skills (e.g., critical thinking, problem solving, evaluation of information gained) so that young adolescents are actively engaged in their learning. They use instruction that is responsive to young adolescents' local, national, and international histories, language/dialects, and individual identities (e.g., race, ethnicity, culture, age, appearance, ability, sexual orientation, socioeconomic status, family composition).

Element c. Middle Level Assessment and Data-informed Instruction: Middle level teacher candidates develop and administer assessments and use them as formative and summative tools to create meaningful learning experiences by assessing prior learning, implementing effective lessons, reflecting on young adolescent learning, and adjusting instruction based on the knowledge gained.

Element d. Young Adolescent Motivation: Middle level teacher candidates demonstrate their ability to motivate all young adolescents and facilitate their learning through a wide variety of developmentally responsive materials and resources (e.g., technology, manipulative materials, information literacy skills, contemporary media). They establish equitable, caring, and productive learning environments for all young adolescents.

VI. Alignment of Standards to Course Calendar

The NCTM-CAEP Standards are broad and overarching, and thus every class session touches in some way on them all (although Standard 1 is highlighted more on Weeks 7,8,10-15, Standards 2 and 3 on Weeks 1-6, Standards 4 and 5 on Week 9, and Standard 6 on Week 16). Similarly with those for AMLE. TExES competencies (and their corresponding TEA standards) align as follows:

Week	1,2,5,9	3	4	6	7,8	10	11,12	13	14	15
Comp	16-19	1,3,4,12,16	11,15	3-6,15,16	2	1	2	1,8	9,10	10

Note that most mathematics content standards (including TExES competencies 7,13,14) are meant to be addressed in MATH courses (namely 1302, 1308, 1330, 1331, 1332, 4350, 4351).

PROFESSIONAL TRAVEL: Students desiring to miss a class session in order to attend an education-related conference or other professional event must contact the course instructor at least two weeks in advance to discuss this request. The decision as to whether to excuse the missed class is entirely up to the instructor, and is based on the student's current academic standing in the course, the feasibility of making up missed content, and the extent to which attendance at the event is required or optional. Students are responsible for any work they miss due to an absence.