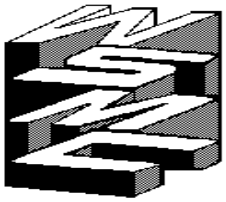
2011 Team Project Question for the WSMC State Mathematics Contest



Learn This!

It has been said that the best way to really learn something is to teach it. In this project teams will investigate selected topics from the Washington State mathematics curriculum in grades 8-10, and one topic taken from the new "Common Core Standards" in mathematics. (The "Common Core Standards" have been proposed for the nation as a whole.) You will distill your understanding of what is most important and devise ways for students to develop both conceptual understanding and procedural proficiency in each topic. Teams will create Web-based learning guides for their selected topics and explain their thinking. This is your chance to write the book!

Below is a list of selected topics taken from the Washington State Learning Standards for mathematics. (http://www.k12.wa.us/Mathematics/Standards.aspx) There are four topics listed for each level or course. Each is identified with its performance expectation code (e.g., "6.1.A" is the code for part A of the first performance expectation in grade six.) and a brief explanation. Your team must select <u>two topics</u>. In addition there is one topic taken from the "Functions" component of the "Common Core Standards" in mathematics (http://www.corestandards.org/the-standards/mathematics). <u>Every team</u> will be required to address this topic. Thus there are a total of three topics that your team will address.

WA State Standards (Pick <u>two</u> from the 16 choices given here.)	**Middle school**	division of fractions 6.1.D	add, subtract, multiply and divide negative integers 7.1.B	proportional relationships 7.2.H	Pythagorean theorem and the distance formula 8.2.G
	Algebra I	exponential functions and equations A1.1.E	slope and intercepts of a linear function A1.4.C	solve quadratic equations by completing the square and w/ the quadratic formula A1.5.D	correlation of data in scatter plots: strong, weak, positive or negative A1.6.E:
	Geometry	distinguish between inductive and deductive reasoning G.1.A	Basic compass and straight edge constructions w/ parallel & perpendicular lines G.2.C	basic applications of trig ratios: sine, cosine, and tangent G.3.E	derive and apply formulas for arc length and area of a sector of a circle G.6.A
	Algebra II	applications of quadratic functions A2.1.C	solve problems involving inverse variation A2.1.E	relationship between exponential and log functions A2.4.A	use laws of exponents to simplify and evaluate numeric and algebraic expressions A2.2.B:
Common Core Standards (Each team does this one.)	**Functions** > Linear, quadratic & exponential models, <u>Part 1 only</u>	Part 1 (Don't worry about parts 2-5.) "Distinguish between situations that can be modeled with linear functions and with exponential functions…" This comes from the new "Common Core Standards." http://www.corestandards.org/the-standards/mathematics/high-school-functions/linear-quadratic-and-exponential-models/			

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For each of the three topics selected by your team you will create a Web-based learning guide designed to enable a student at the appropriate grade level to begin to develop both conceptual understanding and procedural proficiency with that topic. (For discussions of conceptual understanding and procedural proficiency, see page iii of the Introduction to the *Washington 6-12 Mathematics Standards*. (http://www.k12.wa.us/Mathematics/Standards.aspx) You are advised to read the entire introduction.) In order to do this you will have to decide what is most important about that topic and what are the most valuable skills that result from understanding it.

5E Each learning guide must have the five parts described here. (These parts come from the "5 E Learning Cycle Model" used in science education.)

Engage: an introduction to the topic that will "hook" the learner;
Explore: activities designed to enable the learner to build conceptual understanding of the topic. This lays the foundation for the development of procedural proficiency;
Explain: activities aimed at solidifying understanding and building procedural proficiency (skill) with the topic;
Elaborate: activities that allow learners to deepen their understanding and make connections to applications of the topic and to other aspects of mathematics;
Evaluation: provide some way(s) for the learner to assess their understanding and procedural proficiency (skill) with the topic.

Format your web-based learning guide this way:
1. Create an introductory Web page that tells a user what you are doing, explains the 5E structure of the learning guides, specifies the grade level or course for each learning guide, and provides clear links to the three individual learning guides, and to the WSMC Team Project Site (http://WSMCTeamProject2011.wikispaces.com).

Create learning guides for each of the three topics. The learning guides must address all five "Es" described above. Consider having separate pages (or sets of pages) for each of them. You may also want to include a brief annotated bibliography (set of external links) for each topic.

As a result of your guide a diligent student of average ability should have a chance to develop conceptual understanding and be given a vehicle for the development of procedural proficiency. That means they will grasp the concept and have a chance to become good at the skill. For example, with division of fractions, as a result of working with your learning guide the student:

- understands what it means to divide fractions;
- can visualize the process;
- can explain his or her thinking when asked questions about the process;
- recognizes situations in the world where the topic or process is applicable, and;
- can do a sheet of problems quickly and with a high degree of success.

For each topic/learning guide, your team is limited to a maximum of 1,000 words, 30 graphics and two videos (All content, including the graphics and videos must be your own.) These may be spread across a maximum of ten (10) linked web pages that make up the site for that learning guide. You may have as many links to external Web resources as you like. The project will be judged primarily on the mathematical content, not the professionalism of the Web design. Nevertheless, the site must work and present a useful learning environment. You will submit the link to your website to Dr. Mark Roddy (mroddy@seattleu.edu) by **12 noon on Feb. 21, 2011**.