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Abstract

The authors examine the literature that sets the foundation for a lesson design cycle for differentiating instruction in inclusive classrooms. Use the cycle to differentiate at the four design points of understanding the learners, delineating content and materials, assessing what learners know, and differentially arranging teaching/learning activities.

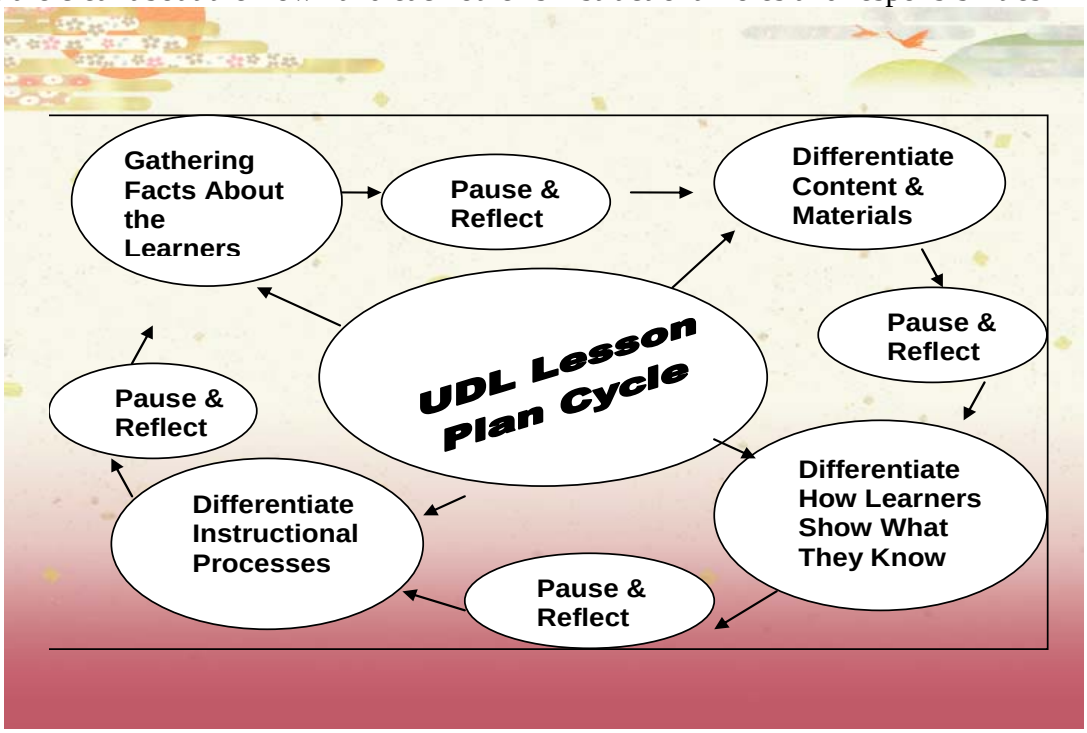
Quality of teacher instruction is a key component of both NCLB and IDEIA. The scientific evidence for strategies that elementary, middle school, and high school teachers can use to differentiate instruction in inclusive classrooms has been well established (Hall, 2002; Meyer & Rose, 2002; Thousand, Villa, & Nevin, 2006; Udvari-Solnar, 1996). In this paper, the authors describe the components for universal design for differentiating instruction in inclusive classrooms; describe the components of a lesson planning cycle to differentiate instruction inclusive classrooms; describe the essential components of and critique examples of lesson plans to differentiate instruction in inclusive classrooms at 3 levels: elementary, middle, and high school; and discuss implications for general and special education teacher preparation.

Given state and district curriculum standards and the demands of an increasingly diverse learner population, how can meaningful learning activities both address the standards and the educational needs of all of the students in the class without the need to retrofit lessons and units? An alternative to retrofitting is universal design, "… a concept that refers to the creation and design of products and environments in such a way that they can be used without the need for modifications or specialized designs for particular circumstances" (Fortini & Fitzpatrick, 2000, p. 581). Curb cuts, an example of universal design, are expensive to add after the fact but cost virtually nothing if designed in from the start. Universal Design for Learning is the application of the universal design concepts to education so that curriculum can be accessed without the need for specialized modifications and adaptations for particular students. Universal Design for Learning provides a way for educators to view diversity in children as a strength instead of a problem. Wiggins and McTighe (2005), the originators of the backward design approach to curriculum and unit development, agree that good curricular and instruction planning begins with the identification of worthwhile, desired results – things worth knowing and doing and understandings that are likely to endure and transfer to other tasks and settings.

Collectively, we have extensive experience with teachers who use universal design for learning requires teachers in inclusive classrooms. They exhibit collaborative and creative dispositions and actions in order to inventing new ways to facilitate curriculum access for all students. The Differentiating Instruction through Universally Designed Learning template is an effective tool for facilitating collaborative and creative thinking among co-teachers as they go through the decision-making steps of the Differentiating Instruction through Universally Designed Learning Lesson Planning Cycle. For more detailed information about implementing this cycle and template, see Thousand, Villa, & Nevin (2007).

The authors of the template for the lesson plan provides suggestions for how inclusive classroom teachers might think about essential questions at each of the four design points (i.e., students, content, product, process) as well as to pause and reflect about individual students who may need unique supports at each design point. Because this is a lesson plan template ideally crafted and executed by two or more teachers, one of the four "*Process of Instruction*" columns includes the four types of co-teaching arrangements a teaching team can use (Villa, Thousand, & Nevin, 2004). Additionally,

the lesson plan format leads you to an *implementation phase* where co-teachers are asked to make decisions about what each co-teacher will do before, during and after the lesson to ensure that the delivery and assessment of content occurs as planned. Collaboratively deciding how to answer these questions ensures that all partners in the co-teaching venture are clear about their own and each other's instructional roles and responsibilities



Differentiated Instruction through Universally Designed Learning Planning Cycle

The lesson plan template ends with a *reflection phase* that includes questions for co-teachers to consider about when they will meet to reflect upon and evaluate the effectiveness of their efforts to differentiate instruction. They can reflect on to what extent they each engaged fully and systematically in a recurring *planning-analysis-reflection cycle* that promotes co-teachers' communication with one another and to evaluate the overall effectiveness of their instruction. Of course, the implementation of any lesson gives co-teachers new facts about their students as they observe student performance during the lesson and examine their products and performances. This information, then, enables teachers in inclusive classrooms to make even better differentiation decisions as they embark on their next lesson. The informative, recursive nature of the lesson planning cycle emphasizes how the lesson planning steps feed back into the "Gathering Facts About the Learners" step of the cycle. [See attached lesson plan.)

Evaluate the lesson plan developed by Chang's teachers

PLANNING PHASE: Lesson Topic and Name: _____ Content Area(s) Focus: _____ _____				
Facts about the Student Learners				
Content (What will students learn?)		*Products (How will students show success?)*		
Process of Instruction (How will students be instructed?)				
Instructional Formats	Instructional Arrangements	Instructional Strategies	Social and Physical Environment	Coteaching Approach(es)
IMPLEMENTATION PHASE: Date(s) of the lesson?_____ Who are the coteachers?_____ _____ _____ _____ _____ What does each coteacher do before, during, and after implementing the lesson?				
Coteacher Name:				
What are the specific tasks that I do BEFORE the lesson?				
What are the specific tasks that I do DURING the lesson?				
What are the specific tasks that I do AFTER the lesson?				
REFLECTION PHASE:				

The Differentiating Instruction through Universally Designed Learning Lesson Plan Template

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Thousand, J. S., Villa, R. A., & Nevin, A. I. (2007).). *Differentiated instruction: Collaborative planning and teaching for universally designed learning.* Thousand Oaks, CA: Corwin Press.

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Appendix

Bibliography of 5 Key Research Papers related to Differentiated Instruction using UDL Principles

Authors	Abstract
Cramer, E., Nevin, A., Salazar, L., & Landa, K. (2006). Co-teaching in an urban, multicultural setting: Research report. *Florida Educational Leadership* (fall).	This case study focuses on describing the journey of an urban team of a general and a special educator who were co-teachers for the same students with whom they were promoted from 3rd to 4th grade. The teachers wanted to determine the effects that the continuity of teachers had on student achievement and the co-teacher relationship. Reading and social skills showed strong gains for the special education students. Recommendations for successful co-teaching are discussed. These researchers have described the differentiation that can occur within a co-teaching environment where students from culturally and linguistically diverse environments learn together with their general education teacher and their special educator. The looping co-teachers in this diverse, urban setting were found to be a success based upon the professional growth of the teachers and the reading and writing achievement of the students. While this case study only illustrates one example of how to implement such a team, there are lessons to be learned from the carefully planned supports and intense training that the co-teachers received. Overall, the social progress and academic achievement of the students with disabilities coupled with the progress of the general education classmates who looped encouraged both the co-teachers as well as administrators and the parents of the children to continue co-teaching arrangements. Another aspect of impact besides student achievement is the extent to which co-teachers apparently learned from each other. Improvements in differentiating instruction, providing accommodations, understanding the scope and sequence of the general education curriculum, and problem solving were reported by the co-teachers in this study
Liston, A. (2006). Co-teaching approach to differentiate instruction in urban multicultural secondary education settings. Derived from a dissertation accepted by Argosy University and included in a paper presented at American Association for Colleges of Teacher Education, San Diego, CA (with E. Cramer, A. Nevin, & J. Thousand) in February 2006.	San Diego Unified School District (SDUSD) to adopt a collaborative approach known as co-teaching at comprehensive school sites where students with disabilities attend. In co-teaching relationships, a general educator, the master of content, is partnered with a special educator, the master of access. Subsequent to audiotaped interviews to elicit experiences of co-teachers in four schools where co-teaching training had been provided, participants completed the Stages of Concern Questionnaire (SoCQ) developed by Hord, Rutherford, Huling-Austin, and Hall (1987). Based on an analysis of the data collected from these multiple sources, the status of the co-teaching instructional delivery approach was summarized for the target population (general and special education co-teachers at four selected SDUSD secondary schools that had implemented the co-teaching instructional delivery approach for a period of not less than one year). This study verified that the co-teaching approach to differentiate instruction necessitates secondary schools to re-work the traditional secondary instructional model by rescheduling coursework, supports, and other services. The typical roles of classroom educators must be modified. Newly formed co-teaching teams must experience ongoing professional development, shared planning time, and a collaborative spirit to resolve the ongoing challenges of teaching in today's diverse classroom. When given the appropriate resources and supports, co-teachers can differentiate their instruction so as to positively impact the social and academic achievement of students. Conversely, when co-teaching team resources and supports are not endorsed, relationships, instruction, and achievement are negatively impacted. The results of this study suggest that to fully put into practice the co-teaching approach to differentiate instruction in high school classrooms, competent leadership must guide and interconnect the following factors: (a) a systematic implementation framework that includes operative policies and procedures, (b) a reorganization of resources, training, and coaching, (c) implementation monitoring, and (d) ongoing revisions for improvement.

Authors	Abstract
Garrigan, C. M., & Thousand, J. S. (2005, Summer). Enhancing literacy through co-teaching. *New Hampshire Journal of Education, 8*,56 – 60.	Co-teachers who differentiated instruction in a California school reported academic gains in literacy for students with and without disabilities. Garrigan and Thousand (2005) used the STAR Early Literacy system, a computer assisted instructional program that was developed based on principles of universal design for learning to meet the needs of advanced learners, challenged learners, and English Language learners. The differentiated instruction arranged by the co-teachers made it possible for students with and without disabilities to thrive: "*…the literacy performance of the four students with identified disabilities increased dramatically over the five months of the co-teaching intervention. …. Pre-post intervention gains exceeded what might be expected, given their low starting performances*" (p. 59).
VanDerhayden, A., & Burns, M. (2005). Using curriculum-based measurement to guide instruction: Effect on individual and group accountability scores. *Assessment for Effective Intervention, 30*(3), 15-31.	One powerful reason to differentiate assessments is the cumulative benefits that come from adding multiple opportunities to demonstrate that learning is occurring. Students who have had frequent opportunities to speak, act out, demonstrate, and draw their understanding of concepts may be less anxious about using another mode to show what they know (e.g., pencil and paper tests). Differentiated assessment is a way to synthesize one's knowledge. For example, Vanderhayden and Burns (2005) implemented a curriculum-based measurement system to track mathematics progress of k-6 students. The data, collected on a bimonthly basis, were used to track mastery at each skill level. Daily data were collected to track specific instructional interventions when needed. Results suggested that children made significant progress within one school year and the school significantly increased Stanford-9 mathematics scores after implementing the program.
Dolan, R., Hall, T., Banerjee, M., Chun, E., & Strangman, N. (2005, Feb.). Applying principles of universal design to test delivery: The effect of computer-based read-aloud on test performance of high school students with learning disabilities. *Journal of Technology, Learning, and Assessment, 3*(7).	The results of this pilot study provide preliminary support for the potential benefits and usability of digital technologies in creating universally designed assessments that more fairly and accurately test students with disabilities. A particular problem for students with disabilities is the nature of current large-scale assessments which are laden with construct-irrelevant factors including access barriers, response barriers, and so on. Testing accommodations such as the read-aloud have led to improvement, but research findings suggest the need for a more flexible, individualized approach to accommodations. In this pilot study, principles of Universal Design for Learning were applied to create a prototype computer-based test delivery tool that provides students with a flexible, customizable testing environment with the option for read-aloud of test content. Two contrasting methods were used to deliver two equivalent forms of a National Assessment of Educational Progress United States history and civics test to ten high school students with learning disabilities. In a counterbalanced design, students were administered one form via traditional paper-and-pencil (PPT) and the other via a computer-based system with optional text-to-speech (CBT-TTS). Test scores were calculated, and student surveys, structured interviews, field observations, and usage tracking were conducted to derive information about student preferences and patterns of use. Results indicated a significant increase in scores on the CBT-TTS versus PPT administration for questions with reading passages greater than 100 words in length. Qualitative findings supported the effectiveness of CBT-TTS, which students generally preferred over PPT.

Co-teaching Universal Design Lesson Plan Template: Middle Level Mathematics for Rosa and Classmates

PLANNING PHASE:

Lesson Topic and Name: Algebra 1 Content Area(s) Focus: 20 topics

Facts about the Student Learners

Who are our students and how do they learn?
Several students prefer learning in small group and partner activities, only a few prefer to work alone, and about ½ the class prefers hands-on concrete learning activities.

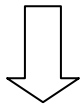
What are our students' various strengths, languages, cultural backgrounds, learning styles, and interests?
Students include a multicultural mix of Hispanic/Spanish speakers, Anglos, African Americans, Asian Americans.

What are our students' various Multiple Intelligences (i.e., verbal-linguistic, logical-mathematical, visual/-spatial, musical, bodily kinesthetic, interpersonal, intrapersonal, naturalist)?
About 1/5 of the learners a verbal-linguistic, 1/10 are logical-mathematical, 1/10 are musical, 1/5 are bodily kinesthetic (football, basketball, and swimming teams), and so on.
[ALSO See Table 11.1 "Self-Evaluation Rubric" for Mid-term Evaluation of Algebra I content completed by the class.]

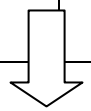
What forms of communication (e.g., assistive technology) do our students use? **All students are computer-literate and have access to email and internet.**

Pause and Reflect About Specific Students

Are there any students with characteristics that might require differentiation in the content, product, or process of learning?
Rosa is an English language learner (as are at least 4 others); Rosa's ability to read in English is about 2 years below the level of difficulty for the Algebra textbook. In addition, Rosa may need support for impulsivity control (use of inappropriate language wl frustrated).



Content **(What will students learn?)**	**Products Showing Student Success** **(How will students convey their learning?)**
What are the academic and/or social goals? **Applying algebra 1 concepts (academic) in a way that contributes to solving problems (social interaction)** What content standards are addressed? **California Standards: Mathematics: Algebra 1** **[Also See Table 11.2.]** Differentiation Considerations: In what order will concepts and content be taught? **Simultaneous review and expansion of current skills in 20 different topics** What multi-level and/or multi-sensory materials do the co-teachers need to facilitate access to the content? **Hands-on learning centers (e.g., computer modeling for displaying algebraic functions)** What multi-level goals are needed for all students to meaningfully access the content? **Rosa has social goals related to appropriate language in class, anger management, and/or impulsivity control.** Pause and Reflect About Specific Students Are there any students who require unique or multi-level objectives or materials? **No.**	In what ways will the learning outcomes be demonstrated? **A menu of options related to preferences in learning styles** [See Tables 11.3 for an example of one of the learning stations.] Differentiation Considerations: What are multiple ways students can demonstrate their understandings (e.g., Multiple Intelligences, multi-level and/or multi-sensory performances)? What authentic products do students create? **Skits of famous mathematicians from around the world & how they use algebra 1 concepts; visual graphic representations of algebraic functions; responses to constructivist question-and-answer procedures; etc.** What are the criteria teacher(s) use to evaluate the products? **Process Evaluation (Exit Slip shown in Table 11.6)** **Outcome Evaluation (Post tests and authentic project outcomes)** Pause and Reflect About Specific Students Are there any students who require unique ways of showing what they know? **Yes; it's apparent that Rosa can express her knowledge using drama and artistic expression better than traditional pencil-paper testing.**



Process of Instruction (How students engage in learning)				
Instructional Formats	Instructional Arrangements	Instructional Strategies	Social and Physical Environment	Co-teaching Approach(es)
Considerations Adapting Lectures? **Yes** Activity-based? **Yes** Experiential? **Yes** Group investigation? **Yes** Computer/web-based? **Yes** Stations? **Yes** Community referenced learning? **No** Service learning? **No**	Considerations Cooperative learning structures? **Yes [See Table 11.5 for accountability system.]** Other? (Tutorial, teacher-directed small group) **Yes.**	Considerations Choose research-based strategies? **Yes—constructivist teaching in math [See Table 11.4 for CGI elements.]** Apply concepts from multiple intelligences theory? **Yes.** Use Taxonomies? **Application and synthesis of learning**	Considerations Room arranged? Use of spaces outside of class? **Yes—media (library) and computer lab** Social norms? **Yes—explicit instruction in how to be a partner learner** Positive behavior supports? **Yes—especially for resolving disagreements agreeably** **Self-monitoring appropriate remarks**	Options Supportive? **Media and Computer lab personnel** Parallel? **Learning Station monitoring shared co-equally** Complementary? **No** Team Teaching? **No** Students as Co-teachers? (e.g., peer tutors and cooperative learning structures under instructional arrangements) **Yes**

Pause and Reflect About Specific Students

What student-specific teaching strategies do select students need? What specific systems of supports (e.g., assistive technology), aids (e. personal assistance, cues, contracts), or services (e.g., counseling) do select students need?

Rosa was scheduled to see the school counselor once every other week to learn appropriate language to express frustration (and request help and assistance) as well as to express her feelings and sadness about leaving family members behind in Nicaragua wh her family fled to USA (survivor guilt).

IMPLEMENTATION PHASE:

Who are the Co-teachers: Jupp Dondero Media Computer Lab

What is/are the date(s) of the lesson? **January 20–February 20**

What does each co-teacher do before, during, and after implementing the lesson?

Co-teacher Name →	Jupp	Dondero	Media/Library	Computer Lab
What are the specific tasks that I do BEFORE the lesson?	Check availability of materials.	Check availability of materials.	Check with Jupp re suitability of materials for the Mathematicians Project.	Check with Dondero re matching textbook and state standard to software.
What are the specific tasks that I do DURING	Use CGI and information from Exit Slips to tutor	Use CGI and information from Exit Slips to tutor specific	Monitor and assist students to access appropriate	Monitor and assist students' use of the software to model

the lesson?	specific topics.	topics.	information.	algebra functions.
What are the specific tasks that I do AFTER the lesson?	Collect & Review Exit Skips.	Collect & Review Exit Slips.	Collect Exit Slips and send to Jupp or Dondero.	Collect Exit Slips and send to Jupp or Dondero.

REFLECTION PHASE:

Where, when, and how do co-teachers debrief and evaluate the outcomes of the lesson?

Daily de-briefings

How did students do?

End of month re-evaluation of student mastery of topics.

Were needs of the learners met?

Increased participation at every learning station; increased competence; increased positive mental attitudes about algebra

What are recommendations for the design of the next lesson(s)?

Students want to meet people in the 'real world' who use Algebra 1 concepts. Teachers are in the process of identifying various professionals and blue collar workers who might be willing to participate with student study groups.

SUPPLEMENTARY MATERIALS used in this lesson attached

Table 11.1 Teacher-Developed Mid-Year Academic Self-Assessment for Algebra 1*

Directions: You have studied these topics so far this year in Algebra 1. Please evaluate your performance in each topic.	1	2	3	4	5
TOPIC	*I have no clue what this is.*	*I recognize the term but could not do this on my own.*	*With a toolkit and some guidance, I can do this.*	*With a toolkit, I can do this on my own.*	*I know this and can explain to others.*
1. Operations with integers					
2. Area, perimeter of rectangles, triangles, circles					
3. Setting up Guess and Check (Estimate) Tables					
4. Solving probability problems					
5. Using a table to graph an equation					
6. Graphing linear equations					
7. Finding the slope of a line					
8. Finding the slope between 2 points					
9. Using slope and y-intercept to graph a line					
10. Distributive property					
11. Multiplying using generic rectangles					
12. Solving equations in 2 variable					
13. Simplifying expressions by combining terms					
14. Solving systems of equations by substitution					
15. Solving proportions by cross-multiplying					

16. Solving equations using “fraction busters”					
17. Graphing quadratic equations (parabolas)					
18. Applying the Pythagorean Theorem					
19. Simplifying radicals (square roots)					
20. Factoring polynomials w/ diamonds/generic rectangles					

SOURCE: The rubric was adapted from one created by Carrie Kizuk, math co-teacher at Twin Valley High School, Morgantown, PA; used with permission.

Table 11.2 Key Mathematics Standards Guiding the UDL Lessons

Topic	Standard
1. Operations with integers	Standard 13
2. Area, perimeter of rectangles, triangles, circles	Standard 1
3. Setting up Guess and Check (Estimate) Tables	Standard 24 (reasoning)
4. Solving probability problems	Standards not available for this grade level*
5. Using a table to graph an equation	Standards not available for this grade level*
6. Graphing linear equations	Standard 6
7. Finding the slope of a line	Standard 7
8. Finding the slope between 2 points	Standard 7
9. Using slope and y-intercept to graph a line	Standard 6
10. Distributive property	Standards not available for this grade level*
11. Multiplying using generic rectangles	Standards not available for this grade level*
12. Solving equations in 2 variables	Standards not available for this grade level*
13. Simplifying expressions by combining terms	Standard 4
14. Solving systems of equations by substitution	Standard 9
15. Solving proportions by cross-multiplying	Standards not available for this grade level*
16. Solving equations using “fraction busters”	Standard 12
17. Graphing quadratic equations (parabolas)	Standard 14 and 21
18. Applying the Pythagorean theorem	Standard 19
19. Simplifying radicals (square roots)	Standard 20
20. Factoring polynomials w/ diamonds/generic rectangles	Standard

*Indicates differentiation of instructional goals

Table 11.3 A Sampler of Mathematicians Around the World

Teresa Edwards (African American) applies mathematics concepts to study and recommend solutions to environmental problems. Ada Lovelace, British mathematician (daughter of Lord Byron, the famous poet), is considered to be the founder of Scientific Computing. Mary Ross (Native American-Cherokee) is a senior advanced systems staff engineer who contributed to the development of the Poseidon and Trident missiles. Julio Rey Pastor (Spain and Argentina) invented n-dimensional geometry. Daniel Bentil (Professor at the University of Vermont from Ghana) studies the interface of applied mathematics and the biomedical sciences. Chinese mathematician Zhao Shuang created geometrical figures to prove the Pythagorean theorem—1700 years ago!

Table 11.4 Elements of Cognitive Guided Instruction

1. Problem solving is the focus of instruction –teachers guide students to select and define a problem and then decide how they would solve the problem.
2. Teachers guide students to select many problem-solving strategies to solve the problem.
3. Students communicate with their instructor and peers as to how they solved the problem.
4. Teachers notice the problem-solving strategies used by students and use that knowledge to plan instruction, provide explicit feedback, and stimulate new thinking patterns

Table 11.5 Formative Assessment for Cooperative Learning Group Activities

EXIT SLIP*

Directions: Before you leave class today, please fill in the date, the name of the Learning Station, And each member of the group who participated today.

***

Learning Station: Date:

	S1	S2	S3	S4	S5	S6
One new thing I learned today . . .						
One thing I have a question about . . .						
One contribution I made today . . .						
One thing you should know is . . .						

SOURCE: *Credits: Carrie Kizuk, math co teacher at Twin Valley High School, Morgantown, PA, created the cooperative group-learning rubric; adapted for this classroom, and used with permission.