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Differentiated Instruction and Implications for UDL Implementation

Effective Classroom Practices Report

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Differentiated Instruction and Implications for UDL Implementation

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Introduction

Not all students are alike. Based on this knowledge, differentiated instruction applies an approach to teaching and learning that gives students multiple options for taking in information and making sense of ideas. Differentiated instruction is a teaching theory based on the premise that instructional approaches should vary and be adapted in relation to individual and diverse students in classrooms (Tomlinson, 2001). The model of differentiated instruction requires teachers to be flexible in their approach to teaching and adjust the curriculum and presentation of information to learners rather than expecting students to modify themselves for the curriculum. Many teachers and teacher educators have recently identified differentiated instruction as a method of helping more students in diverse classroom settings experience success. This report examines information on the theory and research behind differentiated instruction and the intersection with Universal Design for Learning (UDL), a curriculum designed approach to increase flexibility in teaching and decrease the barriers that frequently limit student access to materials and learning in classrooms (Rose & Meyer, 2002). We begin with an introduction to differentiated instruction by defining the construct, then identifying components and features; additionally, we provide a sampling of applications. Next, we introduce UDL and the linkages with differentiated instruction both in theory and with specific lesson examples. The report concludes with a listing of Web resources for further information and explicit examples.

This report on differentiated instruction and UDL begins with an introduction to differentiated instruction in which we provide the definition, a sampling of considerations and curriculum applications, and research evidence for effectiveness. The second part of the paper, the discussion moves to UDL applications of differentiated instruction. UDL is a theoretical approach that is based on research from the neurosciences and effective teaching practices. This portion develops an understanding of UDL and proceeds to identify the theoretical and teacher practice levels. Our document concludes with general guidelines for the implementation of UDL and a list of Web resources that provide further information about differentiated instruction.

The literature review in this paper is also available as a stand alone document, with annotated references. Look for it on the Effective Classrooms Practices page of the National Center for Accessing the General Curriculum's Web site
http://www.cast.org/ncac/index.cfm?i=2876

Definition

To differentiate instruction is to recognize students' varying background knowledge, readiness, language, preferences in learning and interests, and to react responsively. Differentiated instruction is a process to teaching and learning for students of differing

abilities in the same class. The intent of differentiating instruction is to maximize each student's growth and individual success by meeting each student where he or she is, and assisting in the learning process.
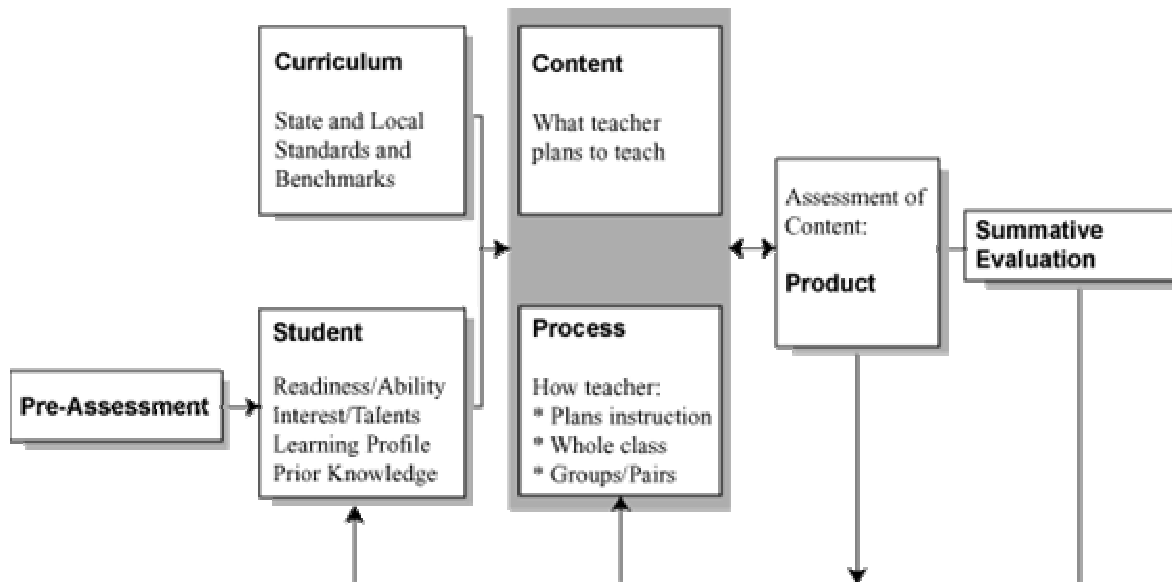
(adapted from Oaksford, L. & Jones, L., 2001)

Figure 1. Learning Cycle and Decision Factors Used in Planning and Implementing Differentiated Instruction

Identifying Components/Features

According to the authors of differentiated instruction, several key elements guide differentiation in the education environment. Tomlinson (2001) identifies three elements of the curriculum that can be differentiated: Content, Process, and Products (Figure 1). These are described in the following three sections, which are followed by several additional guidelines for forming an understanding of and developing ideas around differentiated instruction.

- *Several elements and materials are used to support instructional content.* These include acts, concepts, generalizations or principles, attitudes, and skills. The variation seen in a differentiated classroom is most frequently in the manner in which students gain access to important learning. Access to the content is seen as key.

- *Align tasks and objectives to learning goals.* Designers of differentiated instruction view the alignment of tasks with instructional goals and objectives as essential. Goals are most frequently assessed by many state-level, high-stakes tests and frequently administered standardized measures. Objectives are frequently written in incremental steps resulting in a continuum of skills-building tasks. An objectives-driven menu makes it easier to find the next instructional step for learners entering at varying levels.

- *Instruction is concept-focused and principle-driven.* The instructional concepts should be broad-based, not focused on minute details or unlimited facts. Teachers must focus on the concepts, principles and skills that students should learn. The content of instruction should address the same concepts with all students, but the degree of complexity should be adjusted to suit diverse learners.

Process

- *Flexible grouping is consistently used.* Strategies for flexible grouping are essential. Learners are expected to interact and work together as they develop knowledge of new content. Teachers may conduct whole-class introductory discussions of content big ideas followed by small group or paired work. Student groups may be coached from within or by the teacher to complete assigned tasks. Grouping of students is not fixed. As one of the foundations of differentiated instruction, grouping and regrouping must be a dynamic process, changing with the content, project, and on-going evaluations.

- *Classroom management benefits students and teachers.* To effectively operate a classroom using differentiated instruction, teachers must carefully select organization and instructional delivery strategies. In her text, How to Differentiate Instruction in Mixed-Ability Classrooms (Chapter 7), Carol Tomlinson (2001), identifies 17 key strategies for teachers to successfully meet the challenge of designing and managing differentiated instruction.

Products

- *Initial and on-going assessment of student readiness and growth are essential.* Meaningful pre-assessment naturally leads to functional and successful differentiation. Incorporating pre and on-going assessment informs teachers so that they can better provide a menu of approaches, choices, and scaffolds for the varying needs, interests and abilities that exist in classrooms of diverse students. Assessments may be formal or informal, including interviews, surveys, performance assessments, and more formal evaluation procedures.

- *Students are active and responsible explorers.* Teachers respect that each task put before the learner will be interesting, engaging, and accessible to essential understanding and skills. Each child should feel challenged most of the time.

- *Vary expectations and requirements for student responses.* Items to which students respond may be differentiated so that different students can demonstrate or express their knowledge and understanding in different ways. A well-designed student product allows varied means of expression and alternative procedures and offers varying degrees of difficulty, types of evaluation, and scoring.

Additional Guidelines That Make Differentiation Possible for Teachers to Attain

- *Clarify key concepts and generalizations.* Ensure that all learners gain powerful understandings that can serve as the foundation for future learning. Teachers are encouraged to identify essential concepts and instructional foci to ensure that all learners comprehend.

- *Use assessment as a teaching tool to extend rather than merely measure instruction.* Assessment should occur before, during, and following the instructional episode, and it should be used to help pose questions regarding student needs and optimal learning.

- *Emphasize critical and creative thinking as a goal in lesson design.* The tasks, activities, and procedures for students should require that they understand and apply meaning. Instruction may require supports, additional motivation, varied tasks, materials, or equipment for different students in the classroom.

- *Engaging all learners is essential.* Teachers are encouraged to strive for the development of lessons that are engaging and motivating for a diverse class of students. Vary tasks within instruction as well as across students. In other words, an entire session for students should not consist of all drill and practice, or any single structure or activity.

- *Provide a balance between teacher-assigned and student-selected tasks.* A balanced working structure is optimal in a differentiated classroom. Based on pre-assessment information, the balance will vary from class-to-class as well as lesson-to-lesson. Teachers should ensure that students have choices in their learning.

Evidence of Effectiveness as a Classroom Practice

Differentiation is recognized to be a compilation of many theories and practices. Based on this review of the literature of differentiated instruction, the "package" itself is lacking empirical validation. There is an acknowledged and decided gap in the literature in this area and future research is warranted.

According to the proponents of differentiation, the principles and guidelines are rooted in years of educational theory and research. For example, differentiated instruction adopts the concept of "readiness." That is, the difficulty of skills taught should be slightly in advance of the child's current level of mastery. This is grounded in the work of Lev Vygotsky (1978), and the zone of proximal development (ZPD), the range at which learning takes place. The classroom research by Fisher et al., (1980), strongly supports the ZPD concept. The researchers found that in classrooms where individuals were performing at a level of about 80% accuracy, students learned more and felt better about themselves and the subject area under study (Fisher, 1980 in Tomlinson, 2000).

Other practices noted as central to differentiation have been validated in the effective teaching research conduced from the mid 1980's to the present. These practices include effective management procedures, grouping students for instruction, and engaging learners (Ellis and Worthington, 1994).

While no empirical validation of differentiated instruction as a package was found for this review, there are a generous number of testimonials and classroom examples that authors of several publications and Web sites provide. Tomlinson reports individual cases of settings in which the full model of differentiation was very promising and teachers using differentiation have written about improvements in their classrooms. (See the links to learn more about differentiated instruction).

Applications to General Education Classroom Settings

The design and development of differentiated instruction as a model began in the general education classroom. The initial application came to practice for students considered gifted but whom perhaps were not sufficiently challenged by the content provided in the general classroom setting. As classrooms have become more diverse, differentiated instruction has been applied at all levels for students of all abilities.

Many authors of publications about differentiated instruction, strongly recommend that teachers adapt the practices slowly, perhaps one content area at a time. Additionally, these experts agree that teachers should share the creative load by working together to develop ideas and menus of options for students. A number of Web sites have been created in that include lessons to illustrate what teachers have created for instruction using the model of differentiated instruction. Several web sites are listed in a later section of this report.

Differentiated instruction is an instructional process that has excellent potential to positively impact learning by offering teachers a means to provide instruction to a range of students in today's classroom situations. The next section of this report introduces the reader to the theory and research behind Universal Design for Learning (UDL). We then investigate the links and connections between UDL and differentiated instruction. Additionally, we identify methods and materials that may be implemented to support the implementation of differentiated instruction in concert with the principles of UDL. Finally, a set of guidelines for UDL implementation are provided including a listing of Web resources to provide further information on the concepts presented in this report.

An Introduction to Universal Design for Learning Applications

Universal Design for Learning is a theoretical framework developed by CAST to guide the development of curricula that are flexible and supportive of all students (Dolan & Hall, 2001; Meyer & Rose, 1998; Pisha & Coyne, 2001; Rose, 2001; Rose & Dolan, 2000; Rose & Meyer, 2000a, 2000b, 2002; Rose, Sethuraman, & Meo, 2000). The concept of UDL was inspired by the universal design movement in architecture. This movement calls for the design of structures that anticipate the needs of individuals with disabilities and accommodate these needs from the outset. Universally designed structures are indeed more usable by individuals with disabilities, but in addition they offer unforeseen benefits for *all* users. Curb cuts, for example, serve their intended use of facilitating the travel of those in

wheelchairs, but they are also beneficial to people pushing strollers, young children, and even the average walker. And so, the process of designing for individuals with disabilities has led to improved usability for everyone.

Similarly, but uniquely, UDL calls for the design of curricula with the needs of all students in mind, so that methods, materials, and assessment are usable by all. Traditional curricula present a host of barriers that limit students' access to information and learning. Of these, printed text is particularly notorious. In a traditional curriculum, a student without a well-developed ability to see, decode, attend to, or comprehend printed text is compelled to adapt to its ubiquity as best as he or she can. In contrast, a UDL curriculum is designed to be innately flexible, enriched with multiple media so that alternatives can be accessed whenever appropriate. A UDL curriculum takes on the burden of adaptation so that the student doesn't have to, minimizing barriers and maximizing access to both information and learning.

The UDL framework guides the development of adaptable curricula by means of 3 principles (Figure 2). These 3 principles parallel 3 fundamentally important learning components and 3 distinct learning networks in the brain: recognition, strategy, and affect (Rose & Meyer, 2002). The common recommendation of these 3 principles is to select goals, methods, assessment and materials in a way that will minimize barriers and maximize flexibility. In this manner, the UDL framework structures the development of curricula that fully support every student's access, participation, and progress in all 3 essential facets of learning.

Principles of the Universal Design for Learning Framework

Principle 1:
To support recognition learning, provide multiple, flexible methods of presentation

Principle 2:
To support strategic learning, provide multiple, flexible methods of expression and apprenticeship.

Principle 3:
To support affective learning, provide multiple, flexible options for engagement.

Figure 2. The three UDL principles call for flexibility in relation to three essential facets of learning, each one orchestrated by a distinct set of networks in the brain.

Critical to successfully implementing UDL theory is the use of digital materials. Digital materials, unlike the conventional pedagogical mainstays, speech, printed text, and printed images, have an inherent flexibility. They can be modified in a host of ways, depending on the needs of the student. This flexibility makes it feasible to customize learning materials and methods to each individual.

For teachers wondering *how* to customize the curriculum, CAST has devised three sets of broad teaching methods that support each of the 3 UDL principles (Figure 3, Rose & Meyer, 2002). These teaching methods draw on knowledge of the qualities of digital media and how recognition, strategic, and affective networks operate. For example, the first Teaching Method to support recognition learning is to *provide multiple examples*. This teaching method takes advantage of the fact that recognition networks can extract the defining features of a pattern and differentiate it from similar patterns simply by viewing multiple examples. Although presentation of multiple examples might be challenging in a classroom limited to printed text and hard copy images, digital materials enable the assembly, storage, and maintenance of a large collection of examples in the form of digital text, images, sound, or video – all in the modest space of a classroom. This is one example of how digital materials and UDL Teaching Methods can facilitate the successful implementation of UDL.

The UDL Teaching Methods will anchor the upcoming discussion where we will highlight the ways in which virtual reality and computer simulations align with each of the 3 UDL principles. Within the context of these teaching methods, we'll show how virtual reality and computer simulations can support individualized instruction of recognition, strategic, and affective learning.

Network-Appropriate Teaching Methods

To support diverse recognition networks:

- Provide multiple examples

- Highlight critical features

- Provide multiple media and formats

- Support background context

To support diverse strategic networks:

- Provide flexible models of skilled performance

- Provide opportunities to practice with supports

- Provide ongoing, relevant feedback

- Offer flexible opportunities for demonstrating skill

To support diverse affective networks:

- Offer choices of content and tools

- Offer adjustable levels of challenge

- Offer choices of rewards

- Offer choices of learning context

Figure 3. To help teachers support learners' diverse recognition, strategic, and affective networks, CAST has developed three sets of UDL teaching methods. These teaching methods can be used to make the curriculum more flexible and broadly supportive.

Differentiated Instruction and the Three Universal Design for Learning Principles

Differentiated instruction is well received as a classroom practice that may be well suited to the three principles of UDL. The following section looks at the three network appropriate teaching methods, recognition, strategic and affective, in order to address the ways in which differentiated instruction coordinates with UDL theory. Certain instructional techniques have been found to be very effective in supporting different skills as students learn. Differentiated instruction is designed to keep the learner in mind when specifying the instructional episode.

Recognition learning. The first UDL principle focuses on pattern recognition and the importance of providing multiple, flexible methods of presentation when teaching patterns – no single teaching methodology for pattern recognition will be satisfactory for every learner. The theory of differentiated instruction incorporates some guidelines that can help teachers to support critical elements of recognition learning in a flexible way and promote every student's success. Each of the three key elements of differentiated instruction, content, process, and product, supports an important UDL Teaching Method for individualized instruction of pattern recognition.

The content guidelines for differentiated instruction support the first UDL Teaching Method for recognition networks, *provide multiple examples,* in that they encourage the use of several elements and materials to support instructional content. A teacher following this guideline might help students in a social studies class to understand the location of a state in the union by showing them a wall map or a globe, projecting a state map, or describing the location in words. Also, while preserving the essential content, a teacher could vary the difficulty of the material by presenting smaller or larger, simpler or more complex maps. For students with physical or cognitive disabilities, such a diversity of examples may be vital in order for them to access the pattern being taught. Other students may benefit from the same multiple examples by obtaining a perspective that they otherwise might not. In this way, a range of examples can help to ensure that each student's recognition networks are able to identify the fundamental elements identifying a pattern.

This same use of varied content examples supports a second recommended practice in UDL methodology, *provide multiple media and formats*. A wide range of tools for presenting instructional content are available digitally, thus teachers may manipulate size, color contrasts, and other features to develop examples in multiple media and formats. These can be saved for future use and flexibly accessed by different students, depending on their needs and preferences.

The content guidelines of differentiated instruction also recommend that content elements of instruction be kept concept-focused and principle-driven. This practice is consistent

with a third UDL Teaching Method for recognition, *highlight critical features*. By avoiding any focus on extensive facts or seductive details and reiterating the broad concepts, a goal of differentiated instruction, teachers are highlighting essential components, better supporting recognition.

The fourth UDL Teaching Method for recognition is to *support background knowledge*, and in this respect, the assessment step of the differentiated instruction learning cycle is instrumental. By evaluating student knowledge about a construct before designing instruction teachers can better support students' knowledge base, scaffolding instruction in a very important way.

Strategic learning. People find for themselves the most desirable method of learning strategies; therefore, teaching methodologies need to be varied. This kind of flexibility is key for teachers to help meet the needs of their diverse students, and this is reflected in the 4 UDL Teaching Methods. Differentiated instruction can support these teaching methods in valuable ways.

Differentiated instruction recognizes the need for students to receive *flexible models of skilled performance*, one of the four UDL Teaching Methods for strategic learning. As noted above, teachers implementing differentiated instruction are encouraged to demonstrate information and skills multiple times and at varying levels. As a result, learners enter the instructional episode with different approaches, knowledge and strategies for learning.

When students are engaged in initial learning on novel tasks or skills, *supported practice* should be used to ensure success and eventual independence. Supported practice enables students to split up a complex skill into manageable components and fully master these components. Differentiated instruction promotes this teaching method by encouraging students to be active and responsible learners, and by asking teachers to respect individual differences and scaffold students as they move from initial learning to practiced, less supported skills mastery.

In order to successfully demonstrate the skills that they have learned, students need *flexible opportunities for demonstrating skill.* Differentiated instruction directly supports this UDL Teaching Method by reminding teachers to vary requirements and expectations for learning and expressing knowledge, including the degree of difficulty and the means of evaluation or scoring.

Affective learning. Differentiated instruction and UDL Teaching Methods bear another important point of convergence: recognition of the importance of engaging learners in instructional tasks. Supporting affective learning through flexible instruction is the third principle of UDL and an objective that differentiated instruction supports very effectively.

Differentiated instruction theory reinforces the importance of effective classroom management and reminds teachers of meeting the challenges of effective organizational and instructional practices. Engagement is a vital component of effective classroom management, organization, and instruction. Therefore teachers are encouraged to offer choices of tools, adjust the level of difficulty of the material, and provide varying levels of

scaffolding to gain and maintain learner attention during the instructional episode. These practices bear much in common with UDL Teaching Methods for affective learning: *offer choices of content and tools, provide adjustable levels of challenge, and offer a choice of learning context.* By providing varying levels of scaffolding when differentiating instruction, students have access to varied learning contexts as well as choices about their learning environment.

Examples of UDL and Differentiated Instruction

The focus of the previous sections was to describe ways in which differentiated instruction supports the three principles of UDL and aligns with UDL teaching practices. Here, we present actual lesson plans employing differentiated instruction. The first is a product of a school that is working with CAST, and the second is from work outside of CAST. Each exemplifies applications of UDL in differentiated instruction. In the example from CAST, we highlight the ways that differentiated instruction is used to implement UDL teaching methods. In the second, we identified UDL features implemented in a well designed differentiated instruction lesson in mathematics and recommend ways in which UDL could be applied to make an even more accessible, more flexible lesson.

CAST gathering evidence: [The Life Cycle of Plants](#) from the [Planning for All Learners (PAL) toolkit](#). This lesson is a two-day instructional plan that is a part of a larger unit designed by a first grade teacher for a diverse class of students. Before teaching the lessons presented on this Web site, the teacher introduced students to science concepts around the growth of seeds through oral presentation and in-class experiments. This lesson enabled the teacher to discuss, display and increase student understanding of the science content and concepts.

The lesson plan addresses McRel, Massachusetts State and local District standards in Science and English Language Arts, by teaching students the necessary environmental variables about growth in plants, and the tools, skills and strategies required to do so. Student choice and access flexibility in the lesson exemplify applications of UDL. Table 1 contains a listing of UDL features made possible by elements of differentiated instruction employed in this lesson.

-TABLE 1 -

UDL Features of the CAST PAL Toolkit Model
Gathering Evidence: Life Cycle of Plants

UDL Teaching Method	Supportive Differentiated Instruction Feature(s)
Provide multiple examples.	In preparation for this lesson, the teacher created multiple examples of finding and identifying seeds. Additionally, the teacher provided several examples of finding appropriate texts to complete the assignment. Students have multiple examples of texts from which to find information about the life cycle of seeds. As another example, fast growing seeds were planted in the classroom, giving

	students the opportunity to observe the seed life cycle.
Highlight critical features.	Teacher provides critical information for the lesson through oral presentation and highlights critical features in written form, then monitors students to check their focus on important features of the lesson. Additionally, by having texts available in digital format, the teacher or students may literally highlight critical features of the text in preparation of lesson assignments.
Provide multiple media and formats.	The teacher located several (4-5) resources, in this case books of different reading difficulty, containing the same science constructs on seed life cycles. The books were then made available digitally as well as on audio tape for flexible accessibility. Thus, materials were available in a variety of media and formats.
Support background context.	Several levels of preparation were designed to support background context: • Before this assignment the teacher and students found seeds in a variety of vegetables and fruits. In this way, the concept of seeds was brought out of the abstract; students had experiences seeing and finding seeds from a range of plants. • Careful instruction was organized to teach students the concept of finding a book that is "just right," helping students to find a book that is challenging, yet not too difficult. This, helped keep students work and learn in their "zone of proximal development" when obtaining background information for the lesson.
Provide opportunities to practice with support.	• Students had the option to work in selected pairs as they search for answers to the science questions. • During guided practice and independent practice portions of each lesson, the teacher provides supports by checking and prompting.
Offer flexible opportunities for demonstrating skill.	The design of this lesson allows students varied approaches throughout the lesson. Students may select their best or preferred type of working situation and means for responding.

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Offer choices of content and tools.	The teacher organized the lesson at multiple points for choice of tools:
	• choice of resource materials,
	• choice of access (text, digital, audio), and
	• choice of response style.
Offer adjustable levels of challenge.	The teacher offers multiple texts, representing a range of difficulty levels, and different means to access these texts. This helps to ensure that researching the answers to science questions is appropriately challenging for each student. For example, if decoding were challenging, the student could use a simpler text and/or access the information via audio or digital read-aloud.
Offer choices of learning contexts.	Throughout the lesson the teacher has organized several choices that help diversify the available learning contexts:
	• students can select from a variety of methods to respond to the science questions (written, scribed, recorded),
	• students can opt to work independently or with a partner during the assignment completion portion of the lesson, and
	• students can select the "right book" based on difficulty and/or interest.

Association for Supervision and Curriculum Development *differentiating instruction Web site **Differentiated Instruction Lesson Example**, grade 6 mathematics.* This Web site hosted by the Association for Supervision and Curriculum Development (ASCD) contains a number of lessons that illustrate different teachers' examples of how to use the principles of differentiated instruction. We have selected a mathematics lesson for 6th grade focusing on the concept of patterns.

This instructional approach to teaching mathematics patterns has several exciting UDL features (see Table 2). Through the use of clearly stated goals and the implementation of flexible working groups with varying levels of challenge, this lesson helps to break down instructional barriers. We have identified additional ways to reduce barriers in this lesson even further by employing the principles of UDL teaching methods and differentiated instruction. We provide Table 3 with recommendations of employing teaching methods of UDL to support this lesson. Please note that we are not making generalized recommendations for making this lesson more UDL, but instead are focusing on ways that differentiated instruction, specifically, can help achieve this goal.

-TABLE 2 -

UDL Elements in a Differentiated Instruction Mathematics Lesson

UDL Teaching Method	Differentiated Instruction Features
Provide multiple examples.	The teacher provides multiple examples through the story of *The King's Chessboard* and other math problems.
Highlight critical features.	The teacher highlights critical features of the mathematics in the story by stopping and calculating the amount of rice accumulating and using a t-table to do so.
Provide multiple media and formats.	The teacher reads the story aloud and students have the story to read. The numbers are represented in the story and on the t -table.
Support background context.	Teachers analyze or pretest students for key preskills and background knowledge.
Provide ongoing, relevant feedback.	In cooperative groups, students may receive feedback from the teacher and from peers.
Offer choices of content and tools.	Students are assigned to one of three groups tiered by difficulty; all students are working on the same task but with varying supports.
Offer adjustable levels of challenge.	Varied supports in the working groups alter the level of independence and difficulty in solving the task.

-TABLE 3 -

**UDL Strategies to Further Minimize Lesson Barriers in a
Differentiated Instruction Lesson Plan for Mathematics**

Barrier	UDL Strategy
Deducting/constructing numeric functions.	Provide different demonstrations or models of how to use the tools employed in the lesson. Scaffold how to use the t-table and visualize the chessboard.
Students write an exit card to explain the mathematical story.	Provide alternative formats for students to express their interpretation of the story and the mathematical implications. For example, speaking, creating a diagram, numerical representations.

The Locker Problem.	Consider background knowledge for students entering this mathematical problem. What range of supports could be made available to provide the informational knowledge so that students can focus on the problem solving component?

Recommendations for Implementation at the Classroom Level

Although UDL applications of differentiated instruction already exist, they are admittedly hard to come by. Even with such models available, teachers face challenges in implementing them: the challenges of shifting away from traditional views of intelligence and traditional reliance on print media, the challenge of acquiring and mastering new technology, and the challenge of garnering support from the school system. The following sections offer recommendations that can help teachers overcome each one of these challenges.

Learn about Universal Design for Learning. The first and most basic step toward successfully implementing UDL is self-education. Although UDL has been more than a decade in the making, it is a new approach and one that challenges many traditional educational perspectives and practices. Before teachers can implement UDL effectively, they may need to learn a different way of looking at their students and the materials that they use in the classroom. CAST has been working to disseminate UDL widely, and, consistent with the framework itself, have developed multiple avenues (direct and indirect, self-driven and trainer-taught, through text, speech, and interactive activities) through which individuals can learn about UDL and develop the skills necessary to put it into practice.

- *Visit the CAST Web site.* The CAST Web site devotes a large section to Universal Design for Learning. Here visitors will find an articulation of UDL, discussions of its core concepts, descriptions of UDL research projects, a listing of tools and resources that support UDL, and ideas and examples for implementing UDL.

- *Read CAST publications.* CAST has a range of publications highlighting UDL and UDL practice, including Teaching Every Student in the Digital Age (Rose & Meyer, 2002). The companion Web site to the book provides an evolving set of resources and classroom examples, including interactive activities and an online community where visitors can ask questions and engage in discussion about UDL.

- *Enroll in an institute.* Professional development institutes by CAST teach professionals about the challenges of improving access to and progress participation in the general education curriculum and how to make the curriculum accessible for all learners.

- *Talk to others.* The Teaching Every Student section of the CAST Web site includes an online community where teachers can communicate, collaborate and obtain support from other educators who are exploring and teaching with UDL.

- Find more information and engage in discussion about universal design and increasing access for students with disabilities at the Web site for the Access Center (www.k8accesscenter.org) a national technical assistance center that is funded by the U.S. Department of Education, Office of Special Education Programs to make elementary and middle school curriculum more accessible to students with disabilities.

Inventory and build technology support. Technology, in particular digital media, makes UDL implementation practical and achievable in a diverse classroom. Digital materials make it possible for the same material to be flexibly presented and accessed – even adapted on a student-to-student basis.

Although we recommend that teachers try to build a library of digital materials, it is important to point out that UDL implementation can proceed successfully across a range of technology availability. The amount of technology available to teachers varies extensively - limited by district and school resources, both monetary and otherwise. Fortunately, a fairly simple step such as digitizing print materials can greatly ease UDL implementation. The 1996 United States copyright additions (Chapter 1 of Title 17 Section 121 of the United States Code), the Chafee Amendment, gives authorized entities the freedom to digitize otherwise proprietary materials for individuals that have disabilities that impede access to the printed version. An authorized entity is a nonprofit organization or governmental agency that has a primary mission to provide specialized services relating to training, education, or adaptive reading or information access needs of blind or other persons with disabilities. This provision makes special education teachers eligible to digitize printed text materials, a step that can help to diversify the presentation of materials for students with disabilities.

Another inexpensive but instrumental option for supplying a classroom with digital materials is the World Wide Web – a tremendous source of free digital material and much of this material is in a multimedia format, which can greatly improve access to students.

Having more digital media unquestionably enables teachers to implement UDL in a more extensive way. Teachers who have greater financial resources and district support can supplement their materials with innovative products such as multimedia composition tools (e.g., HyperStudio, Kid Pix, PowerPoint), graphic organizer software (e.g., Inspiration, Kidspiration), text-to-speech and text-to-image programs (e.g., CAST eReader, Pix Reader, Pix Writer, Intellitalk II), CD-ROM storybooks (e.g., Reader Rabbit's Reading Development Library), and learning software (e.g., 7th Level's Great Math Adventure, Edmark's various learning games).

Whether teachers are able to invest in the purchase of a lot of technology or not, UDL can proceed effectively. But taking inventory is an important step toward setting a realistic course of action. By inventorying the resources they have available to them, teachers can

determine the level of UDL implementation appropriate to their classroom. For example, visit the school media center and get an idea of computer and projection systems available to teachers and students. Find out if these tools are portable or fixed, this implies where instruction may take place. Check into scheduling issues around shared equipment. Additionally, check out Web accessibility in classrooms, school computer labs and media centers. If the Web is a tool you may use and ask students to access, how available is it? Additionally, take an inventory of your school or district software, find out what's available and if the purchase permits installation on computers you will be using.

Effectively working with and managing technology can be a challenging process, so it is important as well to inventory the available technology support. This may come in the form of a technology specialist (computer teacher, computer resource specialist, technology integration teacher) or one's own technology training. Find out what policies your school or district may have regarding the tools you may adopt for use in your planning and teaching. Installation of software and hardware on computers may be time consuming, plan for issues of timing in your implementation. When you are ready to teach a lesson using some technologies new to you or your students, consider notifying your technology support person, to be at hand to help problem solve any unforeseen challenges with implementation.

Curriculum planning and delivery. Another important step in implementation of UDL in instruction is curriculum planning and delivery. To begin, we recommend that teachers have a basic understanding of UDL, and a commitment to make the curriculum and learning accessible for all learners. While keeping in mind the three principles of UDL, based on the three networks recognition, strategic and affective, we have found the following process useful in designing lessons. The process includes four steps, based upon the principles and concepts of UDL, proven professional development strategies, and effective teaching practices; (a) Set Goals, (b) Analyze Status, (c) Apply UDL, and (d) Teach the UDL Lesson.

In the *Set Goals* stage of curriculum planning, we recommend that teachers establish the context for instruction. Context is usually driven or based on state standards, followed by the design of goals for the instructional episode. We recommend that all teachers closely evaluate these to assure alignment and assure that the means for attaining the goals are separated from the goals and standards.

Next, when designing a UDL lesson, teachers should *Analyze the Current Status* of the instructional episode. What are the current methodologies, assessments, and materials used to teach the lesson? Analyze these teaching procedures in relation to potential barriers of learners in the classroom. Do all students have access to the materials? Are students able to express themselves with the current

methods and materials? There are a number of resources and tools available from CAST to analyze lessons in the Planning for All Learners Toolkit located on the TES Web site.

The third recommended step of the planning process is to *Apply UDL to the Lesson/Unit.* This includes the goals, methods, assessments and materials used to implement the lesson. Create the UDL lesson plan, grounded in the learning goals, classroom profile, methods and assessment, and materials and tools. Then, collect and organize materials that support the UDL lesson.

In the final step, *Teach the UDL Lesson/Unit,* minimize barriers and realize the strengths and challenges each student brings to learning, rely on effective teaching practices, and apply challenges appropriate for each learner. In this way, instructors can engage more students and help all students progress. When teaching and evaluating students work, also evaluate and revise the lesson/unit to assure student access and success. You may obtain additional information about designing UDL methods, assessments, and materials, in Teaching Every Student in the Digital Age, Chapter 4.

Secure administrative support. School districts and administrations can be powerful sources of support – financial and otherwise. Administrative commitment to UDL can strengthen a teacher's sense of mission and self-satisfaction and lead to important funding. A case in point is the town of Gloucester, Massachusetts. The principal for the school system is so convinced of the importance of digitized materials that he has set a mandate that teachers use only those textbooks that have a digitized version. Teachers will use a text-to-speech reader to further improve the accessibility of the text. Clearly, this kind of change would have happened much more slowly in the absence of such tremendous administrator-level support.

Administrator support can also help to facilitate funding, which although not a prerequisite for UDL, can create important opportunities. Funding might enable the purchase of equipment, professional development, and the launching of new UDL teaching projects. Districts vary widely concerning the types and level of funding that they offer teachers, but teachers who can convince their administrators of the value of UDL may be able to secure district-level grants, professional development awards, and sabbaticals. For example, in a North Shore Massachusetts school district, the Technology Program Manager and Special Education Director teamed with two teachers using UDL, wrote and were recently awarded a state-level technology grant to implement UDL. This is just one example of how support at the administrative level can facilitate the acquisition of materials that support UDL efforts in the classroom.

Parent education and involvement. Parents are another valuable resource for teachers building a UDL curriculum. There are at least two important ways that parents can be a resource: as advocates and as volunteers.

By educating parents about the UDL activities going on in the classroom, teachers can develop a support system of informed individuals who can assist with and advocate for UDL instruction. Teachers should think about ways to inform parents about classroom

activities. Notes sent home, parent night presentations, and IEP meetings are all excellent opportunities to engage in this kind of communication. Once parents are educated about UDL they may wish to become involved themselves. There are many ways that parents can do this, including volunteering in the classroom and lending support at home. A few possibilities are scanning materials, monitoring kids during UDL lessons, helping with technology, donating equipment, and supporting homework assignments.

Conclusion

Differentiated instruction, although somewhat still developing in educational settings, has received significant recognition. When combined with the practices and principles of UDL, differentiated instruction can provide teachers with both theory and practice to appropriately challenge the broad scope of students in classrooms today. Although educators are continually challenged by the ever-changing classroom profile of students, resources, and reforms, practices continue to evolve and the relevant research base should grow. And along with them grows the promise of differentiated instruction and UDL in educational practices.

Links to Learn More About Differentiated Instruction

Guild, P. B., and Garger, S. (1998). What Is Differentiated Instruction? Marching to Different Drummers, 2nd Ed. (ASCD, p.2)
http://www.ascd.org/pdi/demo/diffinstr/differentiated1.html

Initially published in 1985, *Marching to Different Drummers* was one of the first sources to pull together information on what was a newly-flourishing topic in education. Part I defines style and looks at the history of style research; Part II describes applications of style in seven areas; Part III identifies common questions and discusses implementation and staff development.

The Access Center

http://www.k8accesscenter.org/
This Web site belongs to the Access Center, a national technical assistance center, funded by the U.S. Department of Education's Office of Special Education Programs. The purpose of the K12 Access Center is to make elementary and middle school curricula more accessible to students with disabilities. The Web site hosts chats and discussions and offers publications and presentations on topics related to accessing the general education curriculum, including Universal Design for Learning.

Tomlinson, C. A., (2000). Differentiation of instruction in the elementary grades. ERIC Digest. ERIC_NO: ED443572.
http://ericir.syr.edu/plweb-cgi/obtain.pl

To meet the needs of diverse student populations, many teachers differentiate instruction. This digest describes differentiated instruction, discusses the reasons for differentiated instruction, what makes it successful, and suggests how teachers may begin implementation.

Tomlinson, C. A., (1995). Differentiating instruction for advanced learners in the mixed-ability middle school classroom. ERIC Digest E536.
http://www.ed.gov/databases/ERIC_Digests/ed389141.html

The ability to differentiate instruction for middle school aged learners is a challenge. Responding to the diverse students needs found in inclusive, mixed-ability classrooms is particularly difficult. This digest provides an overview of some key principles for differentiating instruction, with an emphasis on the learning needs of academically advanced students.

Tomlinson, C. A., & Allan, S. D., (2000). Leadership for differentiating schools and classrooms. Association for Supervision and Curriculum Development.
http://www.ascd.org/cms/index.cfm?TheViewID=347 (then use search)

This Web site contains two chapters from Tomlinson's recent publication: *Leadership for differentiating schools and classrooms, Association for Supervision and Curriculum Development.* This book is designed for those in leadership positions to learn about differentiated instruction.

Web Article: Mapping a route toward differentiated instruction.
http://www.ascd.org/pdi/demo/diffinstr/tomlinson2.html

Carol Ann Tomlinson, an Associate Professor of Educational Leadership, Foundations and Policy at the Curry School of Education, University of Virginia, Charlottesville, VA provides an article entitled: Mapping a route toward differentiated instruction. *Educational Leadership, 57*(1).

Willis, S. & Mann, L., (2000). Differentiating instruction: Finding manageable ways to meet individual needs (Excerpt). Curriculum Update.
http://www.ascd.org/cms/index.cfm?TheViewID=347 (then use search)

Based on the concept that "one size does not fit all" the authors describe the teaching philosophy of differentiated instruction. More teachers are determined to reach all learners, to challenge students who may be identified as gifted as well as students who lag behind grade level. This article excerpt describes the essential components of differentiated instruction beginning with three aspects of curriculum: content, process and products.

The Association for Supervision and Curriculum Development (ASCD) Web site
www.ascd.org/pdi/demo/diffinstr/differentiated1.html

A site by ASCD (2000) which discusses differentiated instruction. Page links to other pages with examples from a high school and elementary school, key characteristics of a differentiated classroom, benefits, related readings, discussion, and related links to explore.

Educational Leadership Research Link
http://www.ascd.org/cms/index.cfm?TheViewID=347 (then use search)

This Web site, provided by Educational Leadership, links the reader to a brief summary of an article by Holloway. The author has provided a bulleted summary regarding the principles and theories that drive differentiated instruction.

Holloway, J. H., (2000). Preparing Teachers for Differentiated Instruction.
   Educational Leadership, 58(1).
   http://web.uvic.ca/~jdurkin/edd401/Differentiated.html

   This site is from an education course by Dr. John Durkin. It includes a diagram with suggestions for approaches to differentiated instruction. It also includes a listing of what differentiated instruction is and is not, rules of thumb on how to instruct, and management strategies.

Web Site: for Teachers, Administrators, and Higher Education
   www.teach-nology.com/litined/dif_instruction/

   This Web site is designed for educators and uses technology to inform teachers about current practices, literature, the law in education, as well as professional development. Additionally, links to articles including research on educational practices including links to information on differentiated instruction are included. CAST. *Teaching Every Student.*(n.d). Retrieved September 15, 2003, from
   http://www.cast.org/teachingeverystudent/

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   http://www.cast.org/teachingeverystudent/toolkits/tk_introduction.cfm?tk_id=21

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Rose, D., & Meyer, A., (2000b). Universal Design for Learning: Associate Editor Column. *Journal of Special Education Technology, 15*(1), 67-70.

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Tomlinson, C. A., (2001). *How to differentiate instruction in mixed-ability classrooms.* (2nd Ed.) Alexandria, VA: ASCD.

Tomlinson, C. A., & Allan, S. D., (2000). *Leadership for differentiating schools and classrooms.* Alexandria, VA: ASCD.