



Direct Instruction + UDL = Access for Diverse Learners:
How to Plan and Implement an Effective
Multisensory Spelling Lesson

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Direct Instruction + UDL = Access for Diverse Learners: How to Plan and Implement an Effective Multisensory Spelling Lesson

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Abstract

This article describes a lesson plan model that applies principles of universal design for learning (UDL) and multisensory learning centers to the framework of a traditional direct instruction spelling lesson for elementary students with learning, social, and attention problems. It reviews essential components of UDL and demonstrates how to incorporate multiple means of representation, engagement, and expression with elements of direct instruction. In a pilot project, a traditional lesson plan for teaching high frequency spelling words is expanded to account for student characteristics, their potential academic barriers to learning, and appropriate UDL supports for each. Three multisensory centers used during independent practice to activate auditory, tactile, kinesthetic, and visual senses and provide multiple opportunities for student access and participation are described. Step-by-step procedures for making and using whisper phones, sand trays, and magnet letter centers are presented. Also included are directions for students, a teacher checklist, and a video clip demonstration of each center.

Keywords

Universal Design for Learning (UDL), multisensory centers, lesson plans, direct instruction

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“High Frequency Spelling Words” – All elementary teachers know the weekly drill to teach these pesky little terms: Say ten words, use each in a sentence, look up the definitions, write each word ten times... and hope your students can remember how to spell them for the test on Friday. Next week you’ll do it all over again with another list of words.

But is there a better way? We decided to try one. We created a lesson plan model for teaching high frequency spelling words to a special education resource class of diverse elementary students with learning, social, and attention problems. We applied principles of universal design for learning (UDL) and added multisensory learning centers to the framework of a traditional direct instruction

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spelling lesson. We matched UDL components of representation, engagement, and expression with direct instruction elements (introduction, teacher input, guided practice, independent practice, and closure). Then we expanded the lesson plan template to include student characteristics, their potential academic barriers to learning, and appropriate UDL supports for each. The three multisensory spelling centers, whisper phone, sand tray, and magnet letters, used low-tech materials to activate students’ auditory, tactile, kinesthetic, and visual senses and provide multiple opportunities for access and participation. For our classroom, it was a better way!

Overview of Direct Instruction and UDL

The requirement to provide access to the general curriculum for all students (IDEA, 2004; NCLB, 2001) means that teachers must rethink the way they develop lessons so all students have a chance to be successful in school. With the diversity of learners in America expanding and their numbers increasing, diverse classrooms are becoming the norm (Council for Exceptional Children, 2005). Students with disabilities are a large part of this group, which also includes learners who are academically gifted and those who have differences in other areas such as language, culture, race/ethnicity, socioeconomic status, and/or religion (Montgomery, 2001). Because instructional needs of today’s students have shifted, teachers are called upon to retool traditional concepts of learning and teaching in response to the individual differences that diverse learners exhibit. To help meet this challenge, principles of universal design for learning (UDL) are now being infused into direct instruction teaching methods and materials (Mao, 2008; Price & Nelson, 2007; Spooner, Baker, Harris, Ahlgrim-Dezell, & Browder, 2007).

Direct Instruction

For many years, direct instruction methodology has been shown to be effective in helping students who struggle with language processing, vocabulary, and memory (Lewis & Doorlag, 2005). These diverse learners have benefited from explicit instruction in skills, concepts, rules, procedures, and strategies (Mercer & Mercer, 2005; Rosenberg, O’Shea, & O’Shea, 2006). The process of direct instruction provides intensive, systematic teacher input (e.g., modeling, examples, non-examples), and offers many oppor-

tunities for students to practice specific targeted skills (Gagnon & Maccini, 2005). Students work in groups to receive new content and then participate in supported practice sessions. The pace of the lesson is fast with a high degree of student engagement and response. Teacher prompts and cues are given and then faded as students are guided to mastery. Throughout the process, the teacher catches student errors quickly and gives corrective feedback.

Three Components of UDL

Direct instruction alone, however, may not meet the needs of *all* learners. Applying three components of UDL to a direct instruction lesson plan offers teachers a way to reach more students by using a variety of flexible and accessible materials and methods (Center for Applied Special Technology, 2007; www.cast.org). UDL addresses student diversity in the broadest sense by focusing on initial planning for access, participation, learning, and assessment for all students by providing multiple means of (1) *representation*, (2) *engagement*, and (3) *expression* in classroom instruction (Rose & Meyer, 2002). Next, we describe and give examples of these three components (see Table 1 for more examples).

Multiple means of *representation* refers to providing various ways to help learners acquire information and content knowledge. Students receive, recognize, and interpret this information using their senses and store it in their working memories. In planning for content delivery, teachers consider individual student learning preferences, background knowledge, and experiences. In a typical lesson plan, representation takes place mainly during *teacher input*. When presenting a new skill to diverse learners, the teacher begins by making an advance organizer or

agenda, and then uses it as a visual representation as the lesson progresses. Examples of UDL representation include delivering or enhancing information with pictures, animations, video clips, or audio recordings.

Another component of UDL, multiple means of engagement, refers to the way students participate in the learning process. Teachers tap into learners' specific areas of interest, challenge them appropriately, and incorporate methods and materials to motivate them to learn. In a typical lesson plan, engagement is first evidenced in the introduction and includes using a hook to motivate students and stir their curiosity, stating the objective, and activating prior knowledge. Engagement is important throughout the lesson, but perhaps most critical during guided practice, the time when students participate in error-free practice of a new skill. During this phase, they have many chances to interact with information, ask questions, and seek clarification, and they receive valuable teacher feedback to assure new material is understood. Examples of UDL applications of engagement include working with partners or small groups, using electronic whiteboards, choral reading and responses, movement, and manipulatives.

A third component of UDL is multiple means of expression. This refers to the way students respond to or act on information presented using strategies that have been systematically taught and practiced. In a direct instruction lesson plan, multiple means of expression are typically applied during independent practice. Students demonstrate knowledge so growth can be assessed. However, diverse learners cannot always express what they know in traditional paper/pencil formats due to fine motor, language, attention, cognitive, and/or other challenges (Gargiulo & Metcalf, 2010). Teachers support

strategic learning and assess student knowledge by offering a variety of written, oral, or other visual/tactile/kinesthetic products based on criteria determined during the lesson planning process. They also create and use a checklist or rubric that reflects the lesson objective and expectations to measure skill acquisition and proficiency. UDL examples of expression include Podcast and Web Quest creations, dramas, debates, posters, journal entries, model construction, multi-media productions, and photographic essays.

Evidence-Based Teaching Tools for Spelling Acquisition

Researchers (Mao, 2008; Nolet & McLaughlin, 2005) have noted that teachers' purposeful planning plays a critical role in matching learner needs to appropriate supports and that setting goals to align with content and state standards increases student access to the general curriculum. These tasks drive the learning objectives and impact the methods and materials/tools that teachers select to use for instruction. Researchers have also shown that direct instruction has been helpful in acquiring spelling skills (Brady & Moats, 1997; Carreker, 2005; Moats, 1995). Despite the success of this methodology, students who struggle with spelling often have difficulty with phonological processing and may need to say, see, feel, and hear letters and sounds using multisensory strategies in order to master them.

Both high-tech and low-tech teaching tools can be applied to a UDL framework dur-

ing lesson planning and implementation to facilitate the use of multiple means of representation, engagement, and expression (Gargiulo & Metcalf, 2010). UDL researchers advocate using high-technology tools to offer multiple ways to help diverse learners receive, engage in, and express learning (Pisha & Coyne, 2001). Examples of high-tech tools include: digital textbooks that support vocabulary development and comprehension (Dalton & Strangman, 2006; Hitchcock, 2001; Horney & Anderson-Inman, 1999; Rose & Meyer, 2002); audiotape recorders paired with direct instruction methodology (Wirtz, Gardner, Weber, & Bullara, 1996); and battery-operated spell checkers (MacArthur, Graham, Hayes, & DeLaPaz, 1996). Take another look at Table 1 for more examples of high-tech strategies for each of the three components of UDL and see Grey Box 1 for a photo and audio clip of a spell-checker.

Our spelling lesson plan project used low-tech multisensory strategies and tools. Materials commonly found in classrooms can be easily incorporated into lesson plans to increase flexibility and access to learning for all students. These materials help students engage with and express understanding of academic content by using visual, auditory, kinesthetic, and tactile senses to experience and imprint new information. See Grey Box 2 below for a few evidence-based examples of the efficacy of these low-tech methods.

Table 1 UDL Components, Definitions, and Examples

UDL: Multiple Means of...	Definition	Examples
<p>Representation</p> <p><i>Teacher Input</i></p>	<p>Presentation/Content</p> <ul style="list-style-type: none"> • Presents content in different ways • Activates multiple senses to receive, recognize, and store information in student working memories 	<p>Low-Tech Demonstration, advance organizer/agenda, models, poster/markers, books on tape</p> <p>High-Tech Video clips, PowerPoint, Smart-board, overhead presentations</p>
<p>Engagement</p> <p><i>Guided Practice</i></p>	<p>Participation/Process</p> <ul style="list-style-type: none"> • Builds in motivation based on learner interest areas and needs by providing choice of participation medium • Provides prompts and feedback. 	<p>Low -Tech Partner/small group work, choral reading/responding, response cards, graphic organizer, manipulatives, teacher support</p> <p>High-Tech Interactive Websites, portable keyboards/spell checkers, classroom response systems (CPRs), virtual manipulatives, social networking media</p>
<p>Expression</p> <p><i>Independent Practice</i></p> <p><i>Formative Assessment</i></p>	<p>Assessment/Product</p> <ul style="list-style-type: none"> • Shows information using strategies that have been systematically taught and practiced. • Provides choices for response/student output 	<p>Low-Tech Hand written paper, poster, song, drawing, play/drama, debate, journal entry, model construction</p> <p>High-Tech Word processed paper, Podcast, multi-media production, WebQuest creation, photographic essay</p>

Gray Box 1: Student-Endorsed High-Tech Teaching Tool

Tommy, a second grader with written expression deficits, likes to use a battery operated spell checker. He finds it helpful when he tries different ways to spell a word. "If you don't get the right spelling the first time," Tommy advised "...you have to try again and sound it out." Then he exclaimed, "It's really easy!" Researchers (MacArthur et al., 1996) found that students with learning disabilities corrected 37% of their spelling errors in final writing drafts using a spell checker compared to 9% corrected without using one.

Gray Box 2

A research-based multisensory approach developed for spelling by Fernald over fifty years ago continues to be used by teachers to help students who struggle with spelling (Fernald, 1943, 1988; Mercer & Mercer, 2005). In this process, the word is perceived visually, traced with the finger, and pronounced slowly and deliberately. The word is written repeatedly to develop automaticity. As words are memorized correctly, they are placed in a file box and used in writing stories.

A low-tech strategy for spelling called S.O.S. based on the work of Gillingham and Stillman (1960) and later adapted by Cox (1992), also uses multisensory procedures. Initially students are directed to look at the teacher's mouth and teeth and tongue placement as the word is pronounced. Students repeat and segment the sounds using a mirror and visual cues for mouth, teeth, and tongue positioning. They also make a fist and, moving in a left to right direction, extend a finger for each sound they hear as they segment a word. Manipulatives such as counters, blocks, buttons, or pennies can also be used to practice this segmentation. Next, students touch a finger or manipulative as they name each letter in the word. Then they name the letters out loud as they write them or spell them with magnet letters. The teacher may be the scribe as the student dictates the letters if they cannot manipulate a writing tool or magnet letters.

Another low-tech method for spelling acquisition is the cover-copy-compare (CCC) research-based strategy. It was found to be more effective than a copy-only method in teaching spelling to students with learning disabilities (Nies & Belfoire, 2006). The CCC strategy directed the student to look (visual) at the word and point to it on paper while the teacher said it out loud (auditory). The students said the word while pointing to it again. Next, they covered it up by folding half of the paper over it (tactile). Then they wrote it (kinesthetic), uncovered the model word and evaluated their response. Immediate feedback and self-correction were considered key to student success as well as the multisensory steps in the instruction and practice.

Using other low-tech strategies, Howard, DaDeppo, and De La Paz (2008) employed mnemonics to teach spelling sight words to three students with learning disabilities in grades 3 - 5. The approach, called PESTS, included pictorial representations, acrostics, and personalized stories to help students recall spelling words. All 3 students showed improvement in spelling scores after using these

High Frequency Word Lesson Plan

Next, we present a spelling lesson plan that applies UDL methods, materials, and multisensory learning centers to a traditional direct instruction model (see Table 2). In planning this pilot project, we reviewed the CAST Lesson Builder (CAST, 2007), Livingston County School District (2008), and cur-

rent peer-reviewed literature (Price & Nelson, 2007; Mao, 2008; Spooner et al., 2007) for ideas on incorporating UDL in direct instruction lessons [See resources table]. Then we created the spelling lesson plan by matching the UDL components of representation, engagement, and expression with direct instruction elements of introduction, teacher input,

guided practice, and independent practice. We expanded the typical lesson plan template to include: (a) student characteristics, (b) their

potential academic barriers to learning, and (c) appropriate UDL supports for each.

Table 2 Direct Instruction + UDL Multisensory Spelling Center Lesson Plan

Lesson Objective: The learner will spell high frequency words correctly

Lesson Element	Procedure for Teacher	Potential Barriers for Learning: The student has challenges with...	UDL Multiple Means of... Representation Engagement Expression
<p>Introduction Time 5 min</p> <p>Set Up & Opening</p>	<p>Focus & Review T rings the transition bell Class, it's time for spelling.</p> <p>Review last week's words: Let's read and spell them together. You will each lead us with 2 words. [T hands each student 2 spelling cards.]</p> <p>Hook: Student Objective Practice new spelling words by playing with sand, magnets, and phones!</p> <p>Prior Knowledge When do you use writing?</p> <p>At school: stories, journals, PowerPoint presentations ...</p> <p>At home: letters, e-mail, diaries, notes to family members...</p> <p>Advance organizer: 1. Learn 10 new words. 2. Read, spell, use in a sentence. 3. Practice spelling words in 3 centers. 4. Review 10 words.</p>	<p>Staying focused</p> <p>Following directions</p> <p>Participation in a group</p> <p>Motivation</p> <p>Recalling prior knowledge</p> <p>Schedule changes or inconsistencies</p> <p>Organization</p>	<p>Use auditory and visual signals for attention.</p> <p>Review classroom rules and expectations chart.</p> <p>Give each student 2 word cards to lead the class in choral spelling.</p> <p>Give positive feedback and encouraging support.</p> <p>Offer verbal and visual prompts: "Remember when we..." (point to posted writing project).</p> <p>Use an advance organizer poster to provide step-by-step list of tasks for this lesson.</p>

Table 2 (Continued)

<p>Teacher Input Time 5 min</p> <p>Presentation of content Examples Demonstration Visual supports</p>	<p>For each of 10 words: 1. Show the card. 2. Say the word. 3. Say and clap each letter. 4. Repeat the word.</p>	<p>Attention</p> <p>Auditory information</p>	<p>Use brisk pacing. Pair auditory with visual learning: Show students the spell word note card and say the word. Write the word on the board and say each letter.</p>
<p>Guided Practice Time 10 min</p> <p>Error-free practice Many opportunities to respond Activity must be:</p> <ul style="list-style-type: none"> ▪ relevant to the objective ▪ observable ▪ measurable <p>Teacher: Close monitoring Prompt Restate questions Reteach to errors Positive & corrective feedback</p>	<p>All students for 10 words: 1. Read the word aloud. 2. Say and clap each letter. 3. Repeat the word.</p> <p>Individual Students: Use each word in a sentence.</p>	<p>Attention</p> <p>Pace of choral response either too fast or too slow</p> <p>Participation in the group</p> <p>Generating original sentences</p>	<p>Use choral response. Clap hands for each letter.</p> <p>Give a hand signal to begin. Set pace with clapping.</p> <p>Offer specific praise for participation. Use a group contingency.</p> <p>Individualize sentences according to student interest. Begin a sentence using chaining.</p>
<p>Independent Practice Multisensory Centers Time Initial lesson-20 min Daily - 10 min</p> <p>Activity must:</p> <ul style="list-style-type: none"> ▪ be directly related to the objective ▪ be observable ▪ be measurable ▪ provide practice to acquire fluency 	<p>See Procedural Checklist for Spelling Centers</p> <p>Centers contain 2 of each:</p> <ul style="list-style-type: none"> ✓ whisper phones ✓ pans with sand ✓ metal cookie trays & magnet letter sets ✓ 10 spelling word cards ✓ Direction cards 	<p>Auditory and visual memory for spelling</p> <p>Focus, attention Following direction</p> <p>Working in pairs</p> <p>Pacing Transitions</p>	<p>Centers offer 3 ways of expressing/producing words using auditory, visual, tactile, and kinesthetic senses.</p> <p>Color-coded direction cards give step-by-step instructions for participation at each center.</p> <p>Assign pairs to model appropriate behavior. Students refer to rules and procedures poster.</p> <p>Students practice continuously until they hear the auditory cue to move to the next center.</p>

Table 2 (Continued)

<p>How to Use Centers Mini-Lesson:</p> <p>Teacher Input 10 min</p>	<p>Teacher states rules and procedures for centers and transitions Reviews center poster Demonstrates use of center and transition bell Assigns: Student pairs, 1st center, rotation order</p>	<p>[See <i>teacher input</i> above.]</p>	<p>Materials: Poster of center rules and transition procedures Spelling word note cards Multisensory Center poster Kitchen timer</p>
<p>Guided Practice 10 min</p>	<p>Students practice each center procedure and transition rotation</p>	<p>[See <i>guided practice</i> above.]</p>	<p>Give positive and corrective feedback.</p>
<p>Daily Independent Practice 10 min</p>	<p>Students rotate – 3 centers 3 min: 2 students at each center with 10 spelling words 20 sec: Transition Teacher monitors, gives positive/corrective feedback, completes checklist</p>	<p>[See <i>independent practice</i> above.]</p>	<p>Students produce letters and words with sound, sand, and magnetic letters. Assess with participation checklist.</p>
<p>Closure Engage all students Review/ summarize Preview next lesson</p>	<p>T rings transition bell and says “Class it’s time to stop centers.” Students to seats for review Next time: Practice in centers</p>	<p>Short term memory Participate in group Attention-seeking Scheduling anxiety</p>	<p>Show cards to prompt Choral/clap review Individuals spell words Point to weekly schedule: Spelling Centers - M, T, H</p>

Direct Instruction Only

The setting for this pilot project was an elementary special education resource classroom for six second-grade students with learning, social, and attention problems. These students received specialized instruction in language arts for 45 minutes every day. Typically, spelling lessons lasted 15 minutes within this block three times a week, Monday, Tuesday, and Thursday. Direct instruction was used to teach a set of 10 high frequency spelling words each week. These words were chosen randomly and they varied in difficulty, from two-letter one syllable words (e.g, by, do) to seven-letter two syllable words (e.g., because). [\[LINK to Appendix A High Frequency Spell Word List\]](#). Dur-

ing the teacher input phase, the teacher showed students a note card of each word, said the word, named every letter, and then repeated the word. During guided practice, students read the word in unison, then clapped their hands together as they called out each letter. Afterwards, they defined the words and created oral sentences with each of them. Independent practice consisted of students spelling the ten words aloud and writing sentences with them. The written spelling test was given every Friday.

During this six-week project, the teacher used the direct instruction procedure only for the first two weeks. Students were given written spelling quizzes for each set of words before the direct instruction lesson be-

gan on Tuesdays and Thursdays, and during the typical Friday spelling test time. The multisensory spelling centers were added during Week 3 and were used for four weeks.

Multisensory Spelling Centers

The teacher planned the centers to meet the academic and social needs of her students. The three low-tech learning stations were based on UDL to activate students' visual, auditory, kinesthetic, and tactile senses and provide them with more opportunities for access and participation. The teacher gathered materials to create whisper phone, sand, and magnet letter centers, and made posters and cards to provide visual supports for the students (see Figures 1 – 4). She also constructed two whisper phones. See the step-by-step directions for making whisper phones in Figure 1 (To learn more about whisper phones go to: <http://www.youtube.com/watch?v=kuCFeZgHzAk>).

The teacher designated the independent practice portion of the lesson as center time. On Monday of Week 3, she introduced the multisensory strategy during the 45 minute language arts class. First, she presented the 10 high frequency words of the week using the typical direct instruction and guided

practice method; then she taught a mini-lesson on how to use each of the three spelling centers. She began by reviewing general behavioral expectations and transition procedures (Figure 2). Then she showed the class the Multisensory Centers diagram (Figure 3) as she described each of the three spelling activities. Next she demonstrated how to use each of them. She read the step-by-step direction card (see Figure 4) for each and modeled self-talk as she practiced with the spelling word note cards. Each center was equipped for two students with two sets of materials, including the same set of 10 high frequency spelling word cards. See the video clip links in Figure 3 to watch a student demonstrating each center.

Every Monday for four weeks, a new set of 10 words was introduced and the teacher reviewed center rules and transition procedures. On Tuesdays and Thursdays, students participated in the three centers the entire 15 minutes allotted to spelling. See Appendix B for the Teacher Procedural Checklist to set up and implement each center ([LINK to Appendix B](#)).

Figure 1. Instructions for Making a Whisper Phone

1. Gather these supplies (found in the plumbing supply section of a hardware store):
 - 1" diameter PVC pipe
 - Two 1" diameter PVC elbows
 - One pair PVC pipe cutters
2. Cut a 3 ½" length of pipe.
3. Slide the elbows onto each end of the pipe.

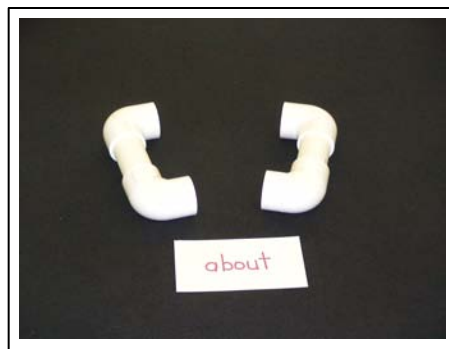


Figure 2. Multisensory Center Rules and Transition Procedures

<u>How to Work in Centers</u>	<u>How to Transition</u>
<ol style="list-style-type: none"> 1. Walk to your first center. 2. Follow the steps on the direction card. 3. Say the words quietly. 4. If you need help, ask your center partner. 5. If you need more help, <ul style="list-style-type: none"> ▪ Raise your hand for teacher. ▪ Go to the next word card while you wait for teacher help. 	<p>When you hear the bell:</p> <ol style="list-style-type: none"> 1. Finish your word activity quickly. 2. For each center: <ul style="list-style-type: none"> ▪ Put the phone on the table. ▪ Wipe away the sand letters. ▪ Move magnets to top of the tray. 3. Stack the word cards in a pile. 4. Walk quietly to the next center. 5. Begin the activity in this center by reading the direction card.

Figure 3. Multisensory Spelling Centers Diagram

(Note: Please click [Whisper](#) or [Magnet](#), or [Sand](#) in “Associated Files” on this article’s site to download video. After downloading, the video will open in a new window.)

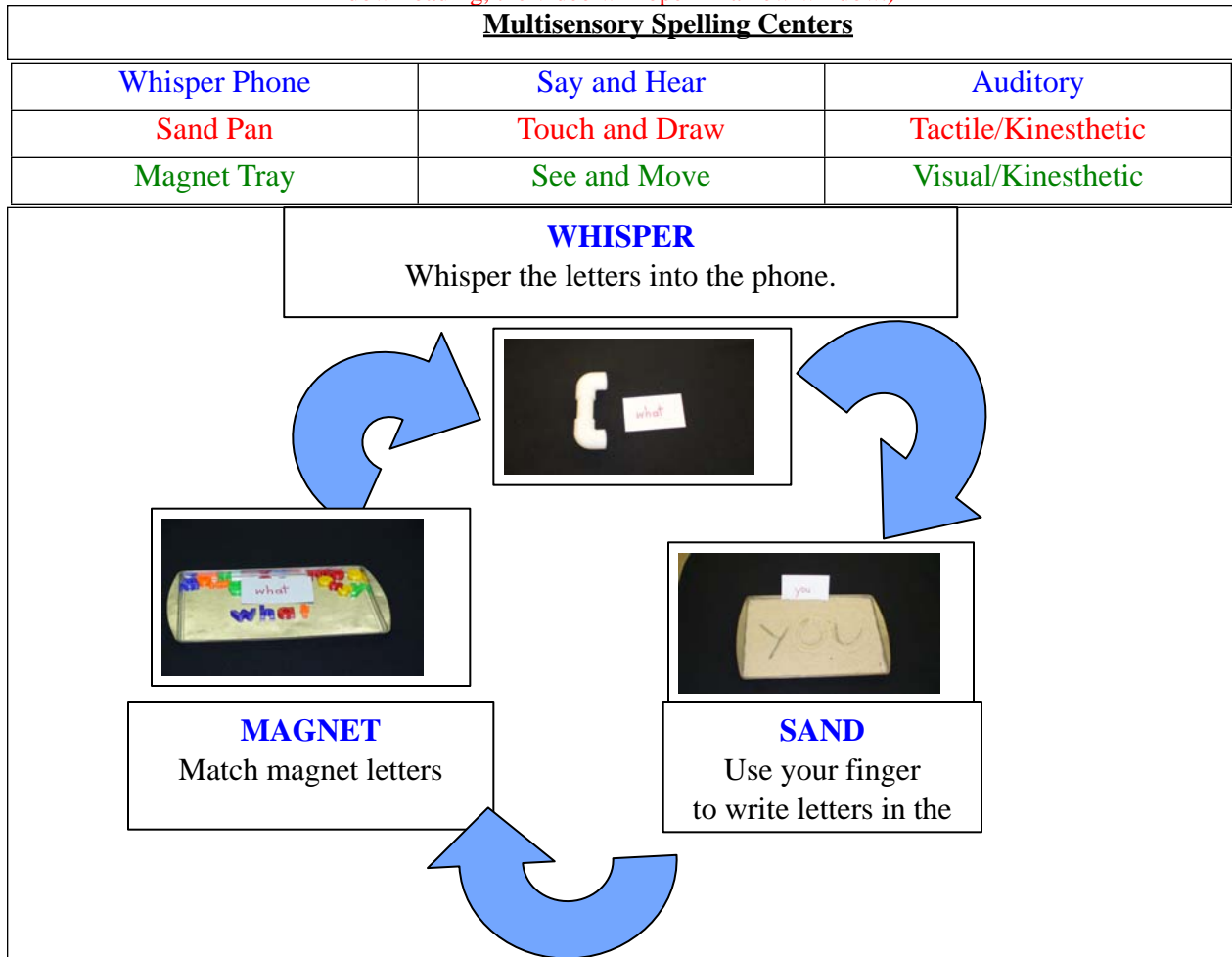



Figure 4. Direction Card for the Whisper Phone Center

How to Use the Whisper Phone

1. Pick up the first word card and read the word quietly.
2. Hold the phone to your ear and whisper the word into the phone.
3. Whisper each letter of the word into the phone.
4. Whisper the word into the phone again.
5. Turn the card face down and pick up the next card.
6. Repeat Steps 1 – 5 with all the cards until you hear the bell ring.



Participation and Results

During center time, the teacher circulated among the class, checking student participation. See Appendix C for an example of a participation checklist to record student engagement in each of the three centers ([LINK to Appendix C](#)).

Also, the teacher tracked spelling acquisition by giving a 10-word quiz three times a week at the beginning of the language arts class. Table 3 includes the daily spelling scores and weekly mean scores for one student throughout the project. As expected, his

Friday score was the highest of three during every week, with the exception of Weeks 3 and 5. Whereas the overall mean of direct instruction only was 55.3, the overall mean of direct instruction + UDL was 90.5. These results show a substantial difference between the two strategies' scores; however, they should be viewed with caution because of the large range of difficulty of spelling words within the pool and the random selection of weekly word sets.

Table 3 DI Only and DI + UDL Spell Scores on 10-Word Quiz

DI Only	Tues	Thurs	Fri	Weekly Mean	Overall Mean
Week 1	40	50	70	50.3	<u>DI Only</u>
Week 2	60	60	70	60.3	55.3
DI + UDL					<u>DI + UDL</u>
Week 3	100	80	100	93.3	90.8
Week 4	80	100	100	93.3	
Week 5	70	90	80	80.0	
Week 6	90	100	100	96.6	

Student Perception

One student, Tommy, was eager to talk about the centers with the first author. (*To listen to his responses to interview questions, please click on “Interview” in Associated Files on this article’s site.*) At first, he couldn’t decide which center he liked best, but it didn’t take long for him to single out the sand center. He said it reminded him of the beach and he was looking forward to practicing writing in the sand this summer. He shared that writing in sand made him think and helped him remember how to spell the words. Tommy preferred the centers to the old method of learning the words. He thought that using the centers was a good way to get ready for the spelling test, and they were fun!

Discussion

In this article, we have presented an overview of UDL and a rationale for combining it with traditional elements of direct instruction. The components of UDL offer teachers a framework to help meet the diverse needs of all students. Strategically planning the placement of varied methods, materials, and technology tools into direct instruction lesson plans ensures students are purposefully working toward the learning objective. Without careful planning, teachers run the risk of providing engaging activities that are incidental to academic goals. In this pilot project, we brainstormed a list of potential barriers to learning and addressed them with multiple means of representation, engagement, and expression. The multisensory centers and visual supports were easy to create and appealing to our students. They enjoyed interacting with the whisper phones, sand, and magnet letters to practice the sometimes boring and difficult task of mastering high frequency spelling words. Students engaged their visual,

auditory, kinesthetic, and tactile senses as they practiced with each word card. Spelling quiz scores improved after students actively participated in the centers, although initial results of this pilot project should be interpreted cautiously. We speculate that practicing with these multisensory tools activated the students’ working memories and helped them store, retrieve, and apply the spelling configurations of each word more effectively than when traditional methods were used.

Limitations and Additional Support

Although we noted that most students were very engaged in the centers, some difficulty occurred for those who struggled with attention and transitions. Despite reminders and redirection, some students were not able to stay on task and follow instruction cards. Also, the short amount of time in a center and the fast paced transition were problematic for students who needed more time to complete each activity. These difficulties can be addressed by including additional supports such as individual contracts, token reinforcers, and peer-buddies. Students who struggle with transitions or who work at a slower pace may need to rotate through centers over three days, staying in one center for the entire 15 minute session each day.

Suggestions for the Future

The initial outcomes of this project using direct instruction + UDL to plan and teach a spelling lesson suggest promising results for the future. It will be important to conduct research studies using this approach with other diverse students. Adding specific conditions for words (e.g., only use three- or four-letter one syllable words) and an error

analysis will be beneficial in determining the relation between scores and the UDL strategy.

Furthermore, generalization of the use of the lesson planning template to a variety of settings and across various academic subjects should be explored. In addition to low-tech learning tools, high-tech materials such as electronic whiteboards, spell checkers, and voice recorders can be included and adjusted to meet the needs of individual students. Lastly, future research may include additional assessment measures that place an emphasis on documenting observable, measurable performance on skill acquisition using multiple valid authentic methods such as using the spelling words in context or in portfolio/ journal entries.

Many teachers already use a variety of techniques and learning tools. Care must be taken to align them with learning objectives and steps within a lesson as effectively as possible. Rather than relying solely on direct instruction or the weekly drill to teach spelling words, applying the UDL components to the direct instruction lesson plans at the start offers teachers a framework for planning that considers the needs of all students in the classroom. This is definitely a better way for our diverse classrooms.

[\(LINK to Appendix D: UDL Resources for Lesson Planning and Materials\)](#)

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APPENDICES

Appendix A. Sample of High Frequency Spelling Words

about	could	had	other	their
after	day	has	our	there
and	did	have	out	these
are	do	little	over	they
because	down	look	said	two
been	for	now	saw	what
but	from	of	see	when
by	get	off	some	which
came	going	on	then	who
come	had	one	that	would

Appendix B. Teacher's Procedural Checklist for Multisensory Spell Centers

		✓Ck		✓Ck		✓Ck
Set Up & Materials	Timer		Center Rules Poster		Transition/Rotation Poster	
Time/ Days 10 min 3 x week	Whisper Words 3 min Mon., Tues., Thurs.		Sand Words 3 min Mon., Tues., Thurs.		Magnet Words 3 min Mon., Tues., Thurs	
	2 Whisper Phones		2 metal pans with sand		2 sets plastic letters 2 metal trays	
	10 spell cards		10 spell cards		10 spell cards	
	Rules /procedural checklist		Rules /procedural checklist		Rules /procedural checklist	
DI Mini-Lesson						
Teacher Checklist	State Center Rules: <ul style="list-style-type: none"> ▪ Move quickly & quietly to your assigned center. ▪ Begin at once. ▪ Say word quietly. ▪ If you need help: Ask your partner. IF he doesn't know, raise your hand for teacher. While you wait, go to the next word.		Assign: Student pairs 1 st center for pairs Rotation order		Model Transition: Ring the timer and students will: Complete the word. Clear the trays. Stack the cards. Walk quietly to next center.	
Teacher models:	Whisper Phone		Sand Pan		Magnet Tray	
	Pick up 1 st card & read the word into the phone.		Pick up 1 st card & read the word aloud. Place card beside the pan.		Pick up 1 st card & read the word aloud. Place card in the tray.	
	Say each letter into the phone.		Say each letter as you write it in the sand.		Spell the word with magnetic letters. Say each letter as you place it below the card to make the word.	
	Repeat the word.		Repeat the word.		Repeat the word.	
	Turn card face down & pick up the next card. Repeat the procedure until the timer rings: 1. Read the word aloud. 2. Say each letter into the phone. 3. Repeat the word.		Turn card face down & pick up the next card. Repeat the procedure until the timer rings: 1. Read the word aloud. 2. Say each letter as you write it in the sand. 3. Repeat the word.		Turn card face down & pick up the next card. Repeat the procedure until the timer rings: 1. Read the word aloud. 2. Say each letter as you spell the word with magnet letters. 3. Repeat the word.	

Appendix C: Assessment instrument - Checklist for Student Participation

Student Participation Checklist: Write student initials in each column. Check specific tasks as your monitor progress. Note problems and supports needed. Offer positive and corrective feedback as you circulate.

Date	Students	1	2	3	4	5	6
Center Rules: <ul style="list-style-type: none"> ▪ Move quickly & quietly to assigned center. ▪ Say words quietly. ▪ If you need help: Ask partner. IF he doesn't know, raise and for teacher. While you wait, go to next word. 							
Transition Bell, then: Complete the word. Clean the center. Stack the cards. Walk quietly to next center.							
Whisper Phone Pick up 1 st card & read word into the phone. Say each letter into the phone. Repeat. Turn card face down & pick up the next card. Repeat until bell rings.							
Sand Pan Pick up 1 st card & read the word aloud. Place card beside the pan. Say each letter as write in the sand. Repeat. Turn card face down & pick up the next card. Repeat until bell rings.							
Magnet Tray Pick up 1 st card & read the word aloud. Place card in the tray. Spell word with magnets. Say each letter as you place it below the card to make the word. Repeat. Turn card face down & pick up the next card. Repeat until bell rings.							

NOTES:

Appendix D. UDL Resources for Lesson Planning and Materials

Source	Description and URL
CAST UDL PAL (Planning for All Learners) Toolkit	This site provides guidelines for planning UDL lessons including UDL goal setter materials, a class profile maker, finding curriculum barriers materials, a UDL lesson planning form and links to resources that provide UDL background knowledge. http://www.cast.org/teachingeverystudent/toolkits/tk_procedures.cfm?tk_id=21
CAST UDL Lesson Builder	This site has examples of model K-5 science UDL lesson plans that are aligned to standards and model principles and practical UDL applications. Lesson plans link to teacher 'think alouds' about UDL connections that can be read and heard. http://lessonbuilder.cast.org/explore.php
UDL Editions by CAST	This collaborative effort between CAST and Google offers digital versions of text for learners ages 10 and up with strategy supports, a glossary, and resources across three levels of learning for English language texts. http://udleditions.cast.org/
Livingston County Schools	This Kentucky school district shares UDL lesson plans (preschool – grade 6), clip art, digital text sources, websites, activities, games and tools. These efforts are made possible through a three-year UDL grant. http://www.livingston.kyschools.us/grant/resources.html
Macomb ISD Universal Design for Learning Initiative	This Michigan UDL initiative includes a UDL lesson planning guide, downloadable planning templates for K-12, and UDL lesson plans (including middle and secondary plans) http://e3t.org/page41/page41.html
T.R.E Center (Technology Resources for Education)	This New York based center specializes in assistive technology and UDL. The website has many UDL resources including free UDL lesson downloads in English and in Spanish for teachers to use as long as they provide feedback. http://www.trecenter.org/udl/lessonplans.htm
Don Johnston, Inc.	This product site has videos of high-tech applications that support UDL principles. Some of the writing/reading products include a children's talking dictionary, word prediction software, portable keyboards, and reading pens. http://www.donjohnston.com/prof_services/training_product.html
The Access Center: Helping Students Access the General Curriculum	This site sponsored by OSEP gives information, strategies, and lesson planning ideas for helping students with disabilities, K-8, access the general curriculum. See sections on direct instruction, graphic organizers, differentiated instruction, and content areas (e.g., language arts, math, science). http://www.k8accesscenter.org/index.php
Special Connections: UDL Teacher Tools for Instructional Planning	This University of Kansas link offers teacher tools for incorporating UDL in instructional planning. It defines the three principles and gives examples and explanations of ways to use them in lesson planning. High-tech and low-tech tools and strategies are presented for representation, engagement, and expression. http://www.specialconnections.ku.edu/cgi-bin/cgiwrap/speconn/main.php?cat=instruction&section=teachertools
The Resource Room: Multisensory Learning	This site gives step-by-step instructions for using multisensory activities in spelling, reading, and math. One section offers multisensory tools for students with giftedness and LD. Also included are teacher perspectives of using multisensory materials, and articles and links to more multisensory resources. http://www.resourceroom.net/index.asp
Curriculum Associates: Differentiated Instruction	This is free multi-media online course on differentiated instruction focuses on helping teachers adjust plans and strategies to meet the needs of all students. The four lessons include audio and video clips, advance organizers, handouts and lesson plans (see <i>resources</i>), authentic examples, and a case study of a North Carolina elementary school. http://www.curriculumassociates.com/professional-development/topics/DiffInstruction/index.htm