Explicit Instruction

General Guide with Practice Examples

Explicit instruction often is described as the cornerstone of effective mathematics instruction for students with learning difficulties (Hudson et al., 2006; Jitendra et al., 2018; Witzel et al., 2003). Although many helpful models of explicit instruction exist, the model developed by the National Center on Intensive Intervention (NCII) offers a valuable guide for understanding explicit instruction (www.intensiveintervention.org).

Figure 1 below illustrates the NCII model of explicit instruction.

MODELING	PRACTICE
Step-by-step explanation Planned examples	Guided practice Independent practice
SUPPORTS Ask high-level and low-level questions Eliciting frequent responses Providing affirmative and corrective feedback	

Figure 1. National Center for Intensive Intervention model for explicit instruction.

As shown in *Figure 1*, explicit instruction includes a thoughtful combination of the following:

Modeling	Practice
Supports	

Modeling is facilitated by the teacher, **practice** involves the students and the teacher, and **supports** consist of an ongoing dialogue between the teacher and students. Supports are integral to modeling and practice because supports are employed during modeling *and* during practice. As such, we describe supports within our explanations of modeling and practice. First, we review **modeling.**

Modeling

Modeling prepares students to complete a mathematics skill successfully. Modeling includes two main components: **(1) clear explanations** and **(2) planned examples.**

(1) **Clear explanations** are the first component of modeling. Clear explanations provide a 2-3 sentence statement about the goals and importance of the lesson. After stating the **goals and importance of the lesson**, teachers need to **explicitly model the steps** for solving a mathematical problem. Clear explanations should include important **vocabulary** and **precise mathematics language** (see *Figure 2* for examples). Depending on students' familiarity with the mathematics content, teachers may choose to model one example or model several examples. The amount of modeling varies based on students' needs and exposure to the mathematical content.

(2) **Planned examples** are the second component of modeling. **Before the lesson,** teachers should thoughtfully plan the examples needed to help students understand the mathematical concept. For example, for a division lesson, important questions to ask are: *How am I going to present the division problems? Am I going to use a slash, obelus (i.e., ÷), long division bracket, or all three symbols? How many examples do I need to include?* Examples may be open-ended, worked examples (i.e., previously-solved problems answered correctly or incorrectly), or non-examples (see *Figure 2*).

Modeling	
(1) Clear Explanations	**Examples**
Goals and importance	*"Today we are going to learn about division. Division is important because sometimes you need to share or divide things with your friends, like when you order pizza or want to share candy."* *"Let's continue working on our three-dimensional shapes. Today, we will learn about cones. Cones are important because we see examples of cones everyday: ice cream cones, party hats, and orange cones in our school parking lot."*
Explicitly model steps with precise mathematical language *(Note: **bolded words** represent precise mathematical language)*	*"To solve 21 **plus** 73, I first decide about the **operation**. Do I **add, subtract, multiply** or **divide**?"* *"The **plus sign** tells me to **add**. So, I'll **add** 21 **plus** 73. I'll use the **partial sums strategy**. First, I **add** 20 **plus** 70. What's 20 **plus** 70?"*

	*"20 **plus** 70 is 90. I write 90 right here under the **equal line**. Where do I write the 90?"* *"Then I **add** 1 **plus** 3. What's 1 **plus** 3?"* *"1 **plus** 3 is 4. So, I write 4 here in the ones place."* *"Finally, we **add** the **partial sums**: 90 and 4. 90 **plus** 4 is 94. So, 21 **plus** 73 **equals** 94. What's 21 plus 73?"*		
(**2**) **Planned Examples**	For an addition lesson:		
Examples	5 + 6	9 + 3	8 + 8
Worked examples	5 + 6 = 11	9 + 3 = 11	8 + 8 = 16
Non-examples	5×6	$9 \div 3$	$8 - 8$

Figure 2. Components of modeling.

Although modeling primarily is teacher-directed, students actively participate through **supports**, which we describe in the next few paragraphs.

Supports <u>during</u> Modeling

During modeling, teachers should attend to the following three supports: (**1**) **ask high- and low-level questions**, (**2**) **elicit frequent responses**, and (**3**) **provide immediate affirmative and corrective feedback**, which are outlined in the bottom section of *Figure 1.*

(1) **Ask high- and low-level questions:** While providing clear explanations and presenting planned examples, teachers should ask students a mix of **high- and low-level questions**. Teachers should aim to **ask students a question at least every 30-60 seconds** during modeling.

High-level questions encourage deeper thinking and reasoning and allow teachers to assess students' conceptual understanding of a mathematics concept. High-level questions often begin with "*Why?*" or "*How*" or "*Explain*" or "*Describe.*"

Low-level questions require simpler answers and are helpful for checking for procedural understanding. Examples of low-level questions may include, "*What is 7 times 9?*" or "*Show me an example of a right angle.*" The inclusion of low-level questions offers an important way to increase students' participation and minimize frustration.

By asking a combination of high- and low-level questions, teachers can evaluate students' understanding and monitor that students are paying attention and on-task. Asking a variety of questions also promotes active engagement in the lesson.

(2) **Elicit frequent responses:** In addition to asking students questions, teachers need to **elicit frequent responses** from students. Eliciting frequent responses proves essential for maintaining students' attention and determining if lesson components require reteaching or additional planned examples.

Teachers should aim to interact with students by eliciting responses at least every 30-60 seconds. Students' responses may include answers to high- or low-level questions; however, not all questions require an oral response. For example, students may respond as a group in a choral or partner response. Students may write or draw an answer on paper, a worksheet, or whiteboard.

In addition, students can gesture with a thumbs up or thumbs down, use manipulatives, check the work of a problem, or update a vocabulary term on a word wall to convey a response. Many response methods exist beyond the few described here.

When teachers model a lesson, students **must participate**. Eliciting frequent responses offers an important way to ensure students participate. **If a teacher models a lesson and talks for 60 seconds without involving the class, students will lose focus and disengage. Ultimately, mathematics learning will decline.** The combination of asking questions and eliciting frequent responses often is misunderstood within modeling. Some teachers believe that modeling only consists of teacher demonstration and teacher talk. This is not the case. **Effective modeling requires an ongoing dialogue between teachers and students.** Although teachers lead (i.e., model), students actively participate.

(3) **Provide immediate affirmative and corrective feedback:** When students respond to questions during modeling, teachers should provide **specific affirmative and corrective feedback.** Feedback creates an opportunity to redirect and bolster confidence, both of which are important for students with learning differences, who frequently exhibit low self-esteem and high anxiety related to mathematics.

Teachers need to provide feedback to students **immediately and as often as possible**. Affirmative feedback proves most effective when students receive **specific** comments about concepts or procedures. For example, *"I noticed you used the counting up strategy to add those two numbers"* or *"I see you are using the geoboard to demonstrate the fraction two-thirds."*

Feedback also needs to be corrective. If students make a mistake or misunderstand a concept or procedure, teachers should immediately communicate how to complete the task correctly. When providing corrective feedback, teachers should encourage students to explain their steps and thinking to ensure teachers understand where and why the students have misconceptions about the task and procedures. As part of this process, teachers should pose questions such as, *"Can you explain the steps you followed for this problem?"* or *"How do you arrive at 4 for the answer?"* Questioning why students make specific errors creates a learning opportunity for other students by providing confirmation about the steps performed correctly and reviewing the steps needed to correct the mistake.

> Teachers sometimes ask a classmate to provide corrective feedback when another student answers a problem incorrectly. When a student's peer offers corrective feedback, the student who made the mistake may feel defeated and frustrated. To promote self-confidence and maximize understanding of learned concepts, **teachers should ask questions** to understand the root of the mistake and **provide modeling** to correct the mistake.

Practice

Modeling and practice are the two main components of explicit instruction. While modeling *prepares* students to complete the mathematics task successfully, practice provides multiple opportunities for students to *practice* the learned concepts. Practice includes: **(1) guided practice** and (**2**) **independent practice.**

(1) **Guided practice:** Guided practice involves the **teacher and students working together** to solve a mathematics problem. The teacher solves the problem while students solve the same problem. Guided practice can take place at a table, with the teacher and students working a problem together, or the teacher can solve the problem on the whiteboard as students complete the problem at their desks.

Guided practice allows students to complete a problem for the first time with supports in place to promote understanding of the lesson concept and to encourage students' success. When the teacher and students **work together**, the teacher asks questions and uses mathematics tools (e.g., manipulatives, hundreds chart, step-by-step checklist) to guide students through the problem.

Guided practice may involve collaboration among the teacher and students or among groups or pairs of students; however, guided practice is most effective when the teacher works with students to complete a few problems. This scaffolded support helps students with learning difficulties and provides a gradual release of responsibility from modeling to independent practice.

> Many teachers include minimal guided practice opportunities or forget to include guided practice in their lessons altogether. Teachers may model the lesson, then skip directly to independent practice. **Guided practice is essential for supporting students with learning difficulties** and should be integral to every mathematics lesson.

(2) **Independent practice:** During independent practice, **students work independently** as the teacher continues to provide feedback and answer questions during completion of the task at hand. Independent practice allows the teacher to determine if students understand the concepts and procedures taught during the lesson.

Independent practice should be implemented **under the guidance and supervision of the teacher.** Importantly, assigning independent practice as homework does not ensure that students are receiving the level of support necessary to understand or solve problems.

Supports <u>during</u> Practice

When students are engaged in guided and independent practice, teachers should continue to attend to the three supports: **(1) ask high- and low-level questions**, **(2) elicit frequent responses**, and **(3) provide immediate affirmative and corrective feedback**, which are outlined in *Figure 1*. Effective practice **continues the ongoing dialogue between the teacher and students**. Ineffective practice encourages students to work independently without teacher support.

As described, explicit instruction involves modeling and practice, with supports embedded into every lesson. During introductory lessons, teachers may model several problems and provide a few practice opportunities while asking the right questions, eliciting responses, and providing feedback. After teachers have introduced the material, they may choose to model one example and offer several practice opportunities for students while attending to the four supports. **Explicit instruction is flexible and should vary from day to day and lesson to lesson.**

Below is an example of **modeling** from the beginning of a teacher's lesson on using a mnemonic strategy (UPS Check) to set up a word problem.

Teacher:	*Yesterday, we solved word problems. We'll continue our work with word problems today. Word problems are important because you solve word problems in everyday life. Let me show you an example.*
Teacher:	*Look at this word problem.* (Writes the following on the whiteboard with 2 students' names from the class: *Jesus bought 6 lollipops at the store. Jayden brought 4 lollipops and 3 candy bars to school. How many lollipops do the boys have?*)
Teacher:	*Jesus and Jayden, would you like to read this problem together?*
Jesus and Jayden:	*Jesus bought 6 lollipops at the store. Jayden brought 4 lollipops and 3 candy bars to school. How many lollipops do the boys have?*

Teacher:	*Yesterday, we learned an attack strategy to follow any time we see a word problem. Does anyone remember what attack strategy we learned?*
Student:	*UPS Check!*
Teacher:	*Yes. Anytime we see a word problem, we follow the UPS Check steps. Remind me, what steps do we follow?*
Students:	*We follow the UPS Check steps.*
Teacher:	*Exactly! Let's write UPS Check in the corner of our paper. What does U stand for?*
Student:	*Understanding by reading and underline the label.*
Teacher:	*Let's read the problem again together.* (Teacher and students read problem.)
Teacher:	*What do we do next? What do we need to do after we read the problem?*
Student:	*Underline the label.*
Teacher:	*U does stand for understand by reading and underline the label. That's good thinking. There's another part of U though. We do need to underline the label. We also need to cross out irrelevant information.*
Teacher:	*Can anyone remind me what irrelevant information is?*
Student:	*Information we don't need.*
Teacher:	*Exactly! Irrelevant information describes numbers that are not about our word-problem label. Irrelevant information is information we don't need to solve the problem.*
Teacher:	*Who wants to come to the whiteboard and underline our label and check for irrelevant information?*
Student:	(Underlines lollipops in the question sentence and crosses out 3 candy bars. See *Figure 3*.)

U ✓ **P** **S** ✓	*Jesus bought 6 lollipops at the store. Jayden brought 4 lollipops and ~~3 candy bars~~ to school. How many lollipops do the boys have?*

Figure 3. Representation of U in UPS Check.

Teacher: *Nice job! I see you underlined lollipops in the question sentence. I also see that you crossed out 3 candy bars. Why do we need to cross out 3 candy bars?*

Student: *Because we only care about numbers that are about our label. Our label is lollipops and 3 is about candy bars. 3 is irrelevant information.*

Teacher: *Nice! We care about the numbers 6 and 4 because they are about our label, lollipops. We need to cross out 3 because 3 is not about our label. 3 is about candy bars. Let's put a checkmark next to the U because we have understood by reading the problem, underlining the label, and crossing out irrelevant information.*

Teacher: *What's our next step? What does the P stand for?*

Student: *Plan.*

Teacher: *Exactly! We can plan by naming the problem type. So far, we have learned about Total problems. Remind me again, what is a Total problem?*

Student: *When parts are put together for a total.*

Teacher: *Nice! Everyone say that with me.*

Students: *When parts are put together for a total.*

Teacher: *Is this a Total problem?*

Students: *Yes.*

Teacher: *How do you know?*

Student: *Because parts are put together for a total.*

Teacher: *Exactly. We are putting parts together for a total. What are our parts?*

Student: *Jesus' lollipops and Jayden's lollipops.*

Teacher: *Exactly. We have Jesus' lollipops and Jayden's lollipops and we are putting them together to find the total number of lollipops. I need a special helper to come up to the whiteboard and show us what we put in the corner to remind us this is a Total problem. Do I have a volunteer?*

Student: (Writes a T with a circle around it next to the problem. See *Figure 4*.)

U ✓ **P** ✓ **S** ✓	*Jesus bought 6 lollipops at the store. Jayden brought 4 lollipops and ~~3 candy bars~~ to school. How many lollipops do the boys have?* (T)

Figure 4. Representation of P in UPS Check.

Teacher: *Great job! I noticed you wrote a T next to the problem with circle around it to remind us this problem is a Total problem. I also see that you put a checkmark next to the P because we planned by naming the problem type. What's our next step?*

Students: *Solve!*

Teacher: *Exactly. Now that we have identified the problem type, we can follow the Total steps to solve it!*

Teacher: *Before we follow our Total steps to solve the problem, let's review the UPS Check steps altogether. What does U stand for?*

Students: *Understand by reading (and underline the label and cross out irrelevant information).*

Teacher: *Excellent! And the P?*

Students: *Plan.*

Teacher: *Fantastic! And the S?*

Students: *Solve.*

Teacher: *Excellent work! And after we solve the problem, what do we need to do?*

Students: *Check our work.*

Notice in this example that the teacher provided a **clear explanation** of the UPS Check attack strategy steps by establishing the goals and importance of the lesson. The **word-problem example was planned** and written on the whiteboard prior to the lesson.

During the modeling, the teacher facilitated the conversation with students, with ongoing questioning and **opportunities for students to respond** orally and to work parts of the problem on the whiteboard. Throughout the lesson, the teacher asked students a combination of **lower- and higher-level questions.** When students answered correctly, the teacher **provided immediate affirmative feedback** with continual praise and validations of the accurate responses. If a student had responded incorrectly, the teacher **offered immediate corrective feedback** by clearly explaining the part of the student's explanation that was missing.

If the dialogue had continued, the teacher would have completed the steps for solving the Total problem (i.e., word-problem schema with parts put together for a total) with students. The teacher also would have modeled a few more additional word problems, potentially including a **worked example** or **non-example**. Then, the teacher would have written a problem on the whiteboard and asked students to write the same problem on their papers. The teacher and students would have simultaneously solved with word problem by following the UPS Check and Total steps.

Guided practice may have included one or a few more additional word problems, depending on students' understanding of the concepts. Finally, the teacher would have encouraged **independent practice** with another few word problems. The problems would have been presented via the whiteboard, and students would have written the problems on their papers, solved each problem following the UPS Check and Total steps, and received **immediate feedback from the teacher**.

Below, in *Figure 5*, is a summary checklist to guide teachers to effectively implement explicit instruction. Ask yourself, *"Does my explicit instruction include these necessary components?"*

- ❑ Model steps using precise language
- ❑ Provide guided practice opportunities
- ❑ Provide independent practice opportunities
- ❑ Use supports during modeling and practice
    - ❑ Ask the right questions
    - ❑ Elicit frequent responses
    - ❑ Provide feedback
    - ❑ Be planned and organized

Figure 5. Summary checklist.