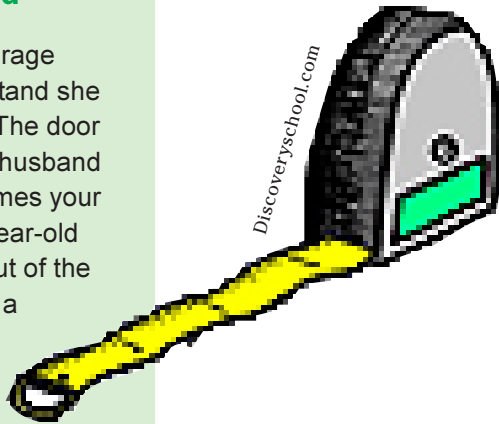


Linda Takes a Measure of the World

Lou is in the garage sanding a TV stand she plans to paint. The door opens and her husband calls, "Here comes your helper!" Four-year-old Linda comes out of the house carrying a tape measure. "Come on over," her mother says.

Linda immediately begins to measure the TV stand, laying the tape measure across the top. Her mother continues sanding. "It's 32 inches," Linda reports. Next she measures up the front of the stand, announcing, "It's 32 pounds."

Finally, Linda scoots behind the stand, places the tape measure across the back, and announces, "It's 20 to 5."



Measure for Measure Celebrating a Young Learner at Work:

Mark W.F. Condon and Jean Anne Clyde

Celebrating what children know

If we stop to think about this brief story (which made us laugh out loud), we can learn a lot about four-year-old Linda. An astute observer of her world, Linda has learned many measurement-related words. She understands that numbers go with these words, and she uses the words and numbers together in an appropriate context. She is comfortable with the language of inches, pounds, and time, even as she is still learning how to use this language.

Linda reveals her incipient understanding of three-dimensional physical space by measuring three sides of the television stand. She also seems to know that each measurement is somehow different. With more experience she might talk about "height," "width," and "depth." For now, she has invented her own way to express this understanding by using a different *unit* of measurement for each.

Another aspect of Linda's learning is her use of the measuring tape and the clear agenda with which she applies this tool to the object of study. Again we have evidence that she is a careful observer. Earlier in the day Linda's mother had used the tape measure to determine where to place the television stand so it would fit in the corner without covering the window. Linda borrows important parts of her mother's "demonstration" (Smith 1978); she extends the tape along various dimensions, using the language of measures and reporting numbers out loud as she's heard others do. Linda's omission of all referents to units of measurement when offering "20 to 5" reveals she has noticed that those knowledgeable about time never say, "It's 20 minutes to 5 o'clock." The units are understood by those fluent in the language of time. For young children there's a lot to learn about measuring one's world!

Confident that her mother will respond in a positive and supportive way, Linda comfortably and candidly shares her current knowledge and its limitations in a happy display of facts and misconceptions. (Her mother reports that Linda has always been an eager helper.) This is important for Linda's cognitive growth; sharing of her findings reveals to others the connections she has made through her observations and her own attempts at measuring. Linda's sharing with her mother also reveals connections or conclusions that are less than accurate—what we like to call *misconnections* (Clyde & Condon 2000). A misconnection signifies a conceptual gap, an incomplete or inaccurate understanding, common in *all* learners' early thinking about new ideas. (We adults make misconnections too!) Some may refer to these as mistakes; however, that term is too negative. Because learning is a process of making connections between new information and existing

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The authors thank their colleague, Charles S. Thompson, a noted mathematics educator, for responding to their suggestions for parents in this article.

understandings, misconnection seems a better fit, as it honors young learners' attempts at making sense of the world.

Power tools for young children

A tool can be defined as anything that extends the power of the learner to think, create, build, or accomplish something. All children love to explore the potentials of what they perceive as powerful tools. And so it is for Linda. Having observed Lou earlier, she senses that the tape measure holds such promise. Whoever holds the tape is transformed by it in important ways:

- The tape allows her to do things she couldn't do without it.
- Other people pay attention to the person with the tape measure; they wait for her to finish her work so they can act upon the important information supplied by the person in command of this tool.

Tape measures have an almost magical quality that can be felt as well as seen. The small box is unexpectedly heavy; it contains a long, semi-rigid metal strip that can be pulled out almost effortlessly. The really cool tape measures lock with the metal strip extended and then retract with the press of a button. The tape has precise lines of demarcation and numbers associated with those lines. For those new to them, tape measures offer many possibilities. We've heard it said that to a child with a hammer, everything looks like a nail. With her tape measure in hand, Linda's world is filled with opportunities to quantify!

Those of us who have had years of experience with tape measures know that their power is context-specific; that is, they are useful in some situations but not in others. However, new users, such as Linda, find numerous ways to explore the tool's potential. And when a tool is seen as functional, it takes on a certain glamour and mystique: It has the power to extend the user's potential so that she can do things she had never thought of before. For more about the power of tools in the hands of children, see the story of young Marcus (Clyde & Condon 2003), who devises a unique application of tools in an effort to see air!

Direct experience and conversation

L.S. Vygotsky's (1978) concept of the *zone of proximal development* (ZPD) is particularly helpful when we consider how to support Linda (Wells 1999; NCREL 2003). It helps us appreciate how important we are to one another's learning. Not only do we learn from other people but they learn from us as well!

The ZPD concept is simple yet powerful. The zone of proximal development is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky 1978, 86).

In this case there are things that Linda knows and can do on her own without assistance from others. That knowing represents her actual development. But at some point she reaches the limits of her own understanding. The skills, strategies, and ideas that lie just beyond what she can accomplish independently *can* be learned—with the help of a more experienced learner, someone with expertise relevant to the challenge at hand. There are also many things that are not currently within her grasp, regardless of how much support she is offered. For instance, given what she knows, it would be unreasonable to expect Linda to immediately learn how to tell time, accurately measure large distances with numbers she does not yet comprehend, or weigh things to the nearest ounce. She simply does not have sufficient prior knowledge to make those connections at this time.

To offer the greatest help to learners, we have to consider what will make sense to them, what is within their mental reach. What Linda needs next is information that helps her make meaningful connections between the day's experience with the tape measure and what she knows (or is beginning to know) about these important concepts. What's exciting is Vygotsky's observation that what a learner can do today with help, she can soon begin to do independently!

Linda has been swept into the daily swirl of productive life and is learning alongside her mother. In conceptually challenging areas such as measurement, discussion is central to understanding how learning occurs in the ZPD. Linda's conversations with her mother today will shape her internal mental conversations in the future.

Although Lou is not a teacher, there are dozens of ways she can help Linda add to her understanding about measurement and the act of measuring. Linda hasn't asked for help, so Lou will do what most parents do. She will use appropriate language to clarify the concepts in this unique situation. These everyday conversations are crucial to children's development of concepts and ideas. Lou could start by sharing a simple but honest observation.

"Linda, you sure know a lot of *measuring* words!" Next she might invite Linda to "show me how you used your measuring tape." Or "Tell me about pounds." Or "Show me the 32 inches. How did you know it was

If you are interested

... in ways to help young children understand mathematical concepts by discovering principles on their own

We highly recommend *Mathematics Their Way* (20th anniversary ed.), by M. Baratta-Lorton (Boston: Addison-Wesley, 1996).

... in a text filled with stories of real kids, their classroom, and strategies for helping them see mathematics in everyday life

We recommend a book that features Tim O'Keefe, an extraordinary primary teacher: *Mathematics in the Making. Authoring Ideas in Primary Classrooms*, by H. Mills, T. O'Keefe, & D. Whitin (Portsmouth, NH: Heinemann, 1996).

... in the National Council of Teachers of Mathematics standards related to measurement

Visit <http://standards.nctm.org/document/chapter3/meas.htm> and the NCTM-recommended lessons to support the learning of measurement at <http://illuminations.nctm.org/lessonplans/prek-2/games-p2/index.html>.

... in mathematics-focused books for children

The National Council of Teachers of Mathematics suggests stories like *Three Billy Goats Gruff* and *The Three Bears* that focus on measurement of relative sizes. We also find the following helpful: *Exactly the Opposite*, by T. Hoban (New York: Greenwillow, 1990), on the library shelf at 428.1 H861e; *Inch by Inch*, by L. Lionni (New York: Mulberry, Harper Collins Children's Books, 1961); *How Big Is a Foot?* by R. Myller & S. McCrath (New York: Bantam Doubleday Dell, 1990); and *Block City*, by R.L. Stevenson (London: Wolf Anderson, 1988).

... in a sophisticated consideration of Vygotsky's zone of proximal development and particularly of conversation as a key factor in developing cognition

We recommend Wells's chapter 10 in *Dialogic Inquiry: Towards a Sociocultural Practice and Theory of Education* (see references).

inches?" Linda's responses would give more evidence of what she knows. Lou can use this information to decide what to do next to extend Linda's understanding that mathematics is an important tool for organizing and quantifying her world. Lou can include the vocabulary of measuring within this conversation.

Many other responses could support Linda as well. "Let's have a look at that tape measure and see if it tells what the numbers mean, what they're called . . . Oh look—it says 'inches'! Let's see how big an inch is." Then she might say, "Let's see if we can find something on *you* that's the same size as an inch." Or "Here, let me show you how to tell how many inches *tall* this stand is." Or "We can use *inches* to measure lots of things—even you! Let's see how *tall* you are—how many *inches* you are." Or "What else should we *measure*?"

Lou could also investigate anything Linda said that Lou didn't quite understand. "Show me the '20 to 5' part. How did you know that?"

Lou might offer Linda clear demonstrations of how to use the tape measure appropriately; for instance, she could show her how to hook the end of it over a corner to make it flush to the surface being measured. She could also demonstrate what happens to the accuracy of the measurement if its user *isn't* careful. "Oops! We didn't make this piece of wrapping paper long enough. We'll have to measure again!"

In order to respond to the needs of young children, we recommend that parents try to meet children where they are and follow their interests. It's important to observe their responses. For instance, watching Linda will signal if she finds the conversation engaging or if she has lost interest in it and is ready to move on to something else.

Linda's experience reminds us a story told by noted kindergarten teacher Vivian Paley (1981). She was planning a performance of Jack and the Beanstalk with five-year-olds when two of the boys disagreed about which of two rugs—one for Jack, the other for the giant's castle—was larger. The children had many ideas about how to determine this, from counting the "walks" (steps) around the rug, to looking at it, to using "the long kind [of ruler] that gets curled up in a box." They finally opted to count the number of "people's bodies . . . lying down in a row" required to cover each rug.

But the next day when they remeasured, the count was different. After lots of rearranging of kindergarten bodies and a good deal of debate, the children concluded that they couldn't measure accurately that day because Warren was absent. After still more suggested solutions, which included using "big people," three-year-olds, short people, dolls, and rulers, Ms. Paley intervened. She provided rulers and demonstrated how

they could be laid end-to-end to measure the rugs. The kids politely participated in this exercise; but the next day when Warren returned, Wally announced, "Here's Warren. Now we can really measure the rug."

Like that of Paley's kindergartners, Linda's understanding of the conventions of measurement will develop over time and through lots of experiences that are relevant to her life (Mills, O'Keefe, & Whitin 1996). She will construct her own knowledge, piecing together small parts of this puzzle as she works to make sense of what measuring is *for* and how it works. Her steps along the way will engage her in mathematical thinking and help her discover that "mathematics is an active and ongoing way of perceiving and interacting with the world" (O'Hanian 1995).

Stories of real children and the surprising things they say and do are often entertaining. But to help families recognize these ordinary events as learning opportunities, we teachers can share stories from our classrooms through newsletters, at family nights, or on the class or center's Web site. We can also invite families to share stories of their kids' learning at home. Such conversations will go a long way toward helping us all validate and respond to the power of young children as thinkers and learners.

With all eyes open and information shared between home and school, parents and teachers alike will be

better poised to celebrate small steps as significant, successive approximations toward the goal of proficiency. Together we'll have a better idea of what to do in the future when Linda makes new observations about measurement . . . or volume or duration or trajectory or . . .

References

- Clyde, J.A., & M.W.F. Condon. 2003. Celebrating a young learner at work: Marcus the scientist. Online: www.naeyc.org/resources/journal/2003/09/CelebratingAYoungLearner.pdf.
- Clyde, J.A., & M.W.F. Condon. 2000. *Get real: Bringing kids' learning lives into your classroom*. York, ME: Stenhouse.
- Mills, H., T. O'Keefe, & D. Whitin. 1996. *Mathematics in the making. Authoring ideas in primary classrooms*. Portsmouth, NH: Heinemann.
- NCREL (North Central Regional Educational Laboratory). 2003. Zone of proximal development (ZPD). Online: www.ncrel.org/sdrs/areas/issues/students/learning/lr1zpd.htm.
- O'Hanian, S. 1995. *Math as a way of knowing*. York, ME: Stenhouse.
- Paley, V. 1981. *Wally's stories*. Cambridge, MA: Harvard University Press.
- Vygotsky, L.S. 1978. *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Wells, G. 1999. *Dialogic inquiry: Towards a sociocultural practice and theory of Education*, chapter 10. New York: Cambridge University Press. Online: www.oise.utoronto.ca/~gwells/resources/ZPD.html.

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