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Types of Knowledge

Information is not knowledge.

—Albert Einstein

Meet Jen

Jen is a teacher who has been teaching fifth grade for the last five years. She is proficient as a teacher. Her students and their parents have always been pleased with her teaching. Her administrator has also given her consistently high reviews. Jen has attended several workshops on the topic of differentiated instruction and is concerned about meeting the needs of each of the students in her class. Jen is looking forward to starting her sixth year of teaching and has new ideas to implement this year. She and the other fifth-grade teachers have some time for planning before the first day of school.

Examining Knowledge

Jen and her team dive into their new science textbook eagerly. After thumbing through the text and related support materials, she begins her work by looking at the state standards and local standards she is required to address during the semester. During the first part of the year, she is focusing on physical science and must teach her students about states of matter. She reads the standard that says, "Students will identify three states of matter and recognize that changes in state can occur." Jen finds in the textbook where states of matter are addressed. There are two pages of reading and some basic questions at the end of the second page

to focus on the identification of states of matter. The text provides pictures as well. Jen recognizes that the identification of states of matter means that students will simply name and define each state of matter. She also knows that to recognize the fact that changes can occur is fairly simple in nature. She wonders how her students will connect and relate to these standards.

Jen realizes that these standards are mostly a set of facts, and she needs to increase the level of understanding in order to provide a quality learning experience. She knows she must branch out beyond the textbook in order to make the learning meaningful. She asks herself, "Why is it important for students to know this?" and she determines that the real idea here is about states of matter being able to change when conditions change. She asks herself again why that idea is important for her students to learn and how it could apply to their lives. She thinks that she can take an approach or lens for these standards and teach her students the concept that outside factors influence and can create powerful change. She will use matter and states of matter as a way to promote student thinking about change on a broader level. She sees how this idea can connect to events in history, characterization in literature, mathematical functions, team sports in PE, and music history. She is satisfied that now she has something substantial with which to work.

Jen goes back to her standards along with the objectives in the textbook and begins to determine related facts and skills required to understand the standards along with the concepts of influence and change. She comes up with this list:

- There are four states of matter: solid, liquid, gas, and plasma.
- Temperature plays a role in determining states of matter.
- Combining matter can affect the state.
- Data collection is needed to document change.

Now, she can address each of these standards while focusing on the concept that outside factors influence and can create powerful change in multiple areas of life.

Jen shows us that all knowledge is not created equal. It is easy to get caught up in the content of the discipline and forget that there are different levels of knowledge or understanding required from standards. There is a hierarchy of knowledge that must be considered in order to differentiate instruction and prioritize both teaching and learning. There are distinct types of knowledge, and with the different levels or types comes different approaches to instruction.

TABA'S CATEGORIES OF KNOWLEDGE

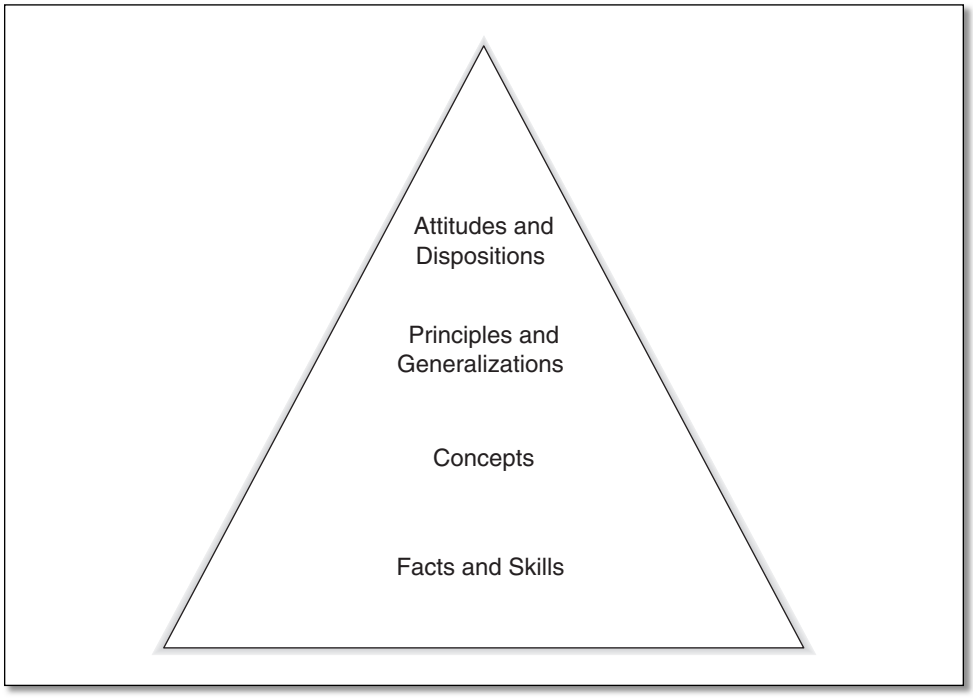
Early on, Hilda Taba (see Tomlinson, 2002) organized types of knowledge into categories. Her research became the basis for much of the more recent

work done in the field of knowledge and learning. She identified five levels of knowledge:

1. Facts—a specific detail, which can be verified;
2. Skills—abilities, techniques, strategies, methods, or tools to utilize knowledge;
3. Concepts—a general idea or understanding, often a category or classification with common elements;
4. Principles—fundamental truths, laws, doctrines, or rules that explain the relationship between two or more concepts across topics or disciplines; and
5. Attitudes/dispositions—an intrapersonal reaction to new understandings involving a belief, appreciation, or value. (Tomlinson, 2002, p. 92)

Each of these types of knowledge has a role in learning and understanding. If we take these types of knowledge and put them into an inverted triangle, we can get a picture depicting levels of knowledge in an ordered way. (See Figure 1.1.)

Figure 1.1



At the base of the triangle, facts and skills are placed together, although facts truly work as a foundation for skills in most cases. These are combined because they are, essentially, the foundation for understanding and application. In many instances, the facts and skills are the standards of a curriculum. They are the things we want students to know and do as a result of their learning. The teaching of the facts and skills is a very different process than teaching for conceptual understandings or other knowledge levels higher on the triangle.

Facts and Skills as a Foundation

When a baby is very young, it learns what a cup is. The baby learns the fact that a cup is the object that provides a drink. The baby learns the word *cup.* The baby then learns how to use the cup. The baby learns that by bringing it to its mouth and tipping it, the baby gets what it wants. These two learning events often happen in conjunction with each other. Knowing a fact does little good if there is no knowledge of a skill to go with it. Ben Franklin stated that knowing some fact or how to do something was not as important as knowing how to make human kind better by utilizing that knowledge or skill. Facts and skills are interdependent.

In many cases, these are the types of knowledge with which educators begin instructional planning and complete the teaching process. The facts and skills are addressed, the students are assessed, and then the next fact or skill is addressed. The standards, in many cases, reinforce this process by emphasizing what students need to know and do. Teach, check for mastery, and move on. It is common to begin and end the learning process all within this foundational level.

Conceptual Level of Knowledge

The next level of knowledge is the conceptual level. At this level, facts and skills are assimilated to create a concept. In some cases, standards are written at this level. In that case, the facts and skills are taught through direct instructional approaches, and then these facts and skills are brought together to create a concept. This is often a common sequence of the teaching process. Teaching for conceptual understandings requires different elements of consideration than the teaching of facts and skills.

After a baby knows what a cup is and can use a cup to drink, the baby begins to create a conceptual understanding. The baby learns that cups are different shapes, colors, and sizes. The baby may learn that different cups hold different liquids. As the baby develops a conceptual understanding, the baby recognizes that there are many cups that can provide what he or she wants to drink.

In the classroom, Jen may teach the fact that there are four common states of matter. Students will complete activities that transform liquids

into different states of matter and label each state of matter attained. By learning the states of matter and completing activities transforming matter, the standards are accomplished. However, at the conceptual level, Jen's students will learn *why* changes in the states of matter occur. They will come to an understanding of what actually happens when heat is applied and why it causes a change in the state of matter. This is a conceptual understanding.

Principles and Generalizations

After learning the concepts of temperature and its potential cause-effect relationship to states of matter, Jen's students will process the relationship between the matter and temperature at a new level. Students will take what they know about both states of matter and about temperature to create new understandings about change itself. Students will identify other cause-effect relationships to compare and contrast to the one involving the physics of temperature and states of matter. This is the creation of a principle that explains the relationship between concepts.

Only after a conceptual understanding is reached is knowledge at the principle level possible. This is the level in which learning becomes personalized. A learner creates his or her own principles based on conceptual understandings. Often, there is a blending of the creation of principles and generalizations. Once an understanding of the relationships between concepts has been achieved, it is human nature to seek other realms in which the knowledge will apply. Jen's students will explore how changes in matter may be like changes in weather conditions or even more far-reaching aspects, such as changes in politics or their own lives. Learning and teaching processes at this level and the next level are distinctly different than at other knowledge levels.

In the case of the baby with the cup, the baby will begin to realize that there are other containers besides cups that can provide a drink. The baby will experiment with multiple objects that hold liquids. The baby sees that bowls, watering cans, and buckets all hold water and can provide a drink. This learning goes beyond convergent thinking as the learner creates new truths through hypothesizing and making connections.

Attitudes and Dispositions

Finally, the most personal level of learning is the level of attitudes and dispositions. At this level, the learning is internalized, processed, organized in a schema, and then evaluated. The learner makes decisions based on the knowledge. The learner determines his or her own level of interest or passion and level of motivation in further pursuing new questions. This level of knowledge is often overlooked or is not considered a category of knowledge. In Jen's classroom, she helps students internalize

their knowledge by asking them to consider an influence that has changed a condition in their own lives and evaluate the significance of the influence at the time and compare it to the significance after the change occurred. Jen also has them complete an analogy to reflect the process of a change in matter in science class to this life event.

Levels of Knowledge Is Not a Recipe

It is important to note here that although these levels are distinct knowledge levels, and are achieved through a specific developmental process, they do not need to be addressed in the classroom in the particular order in which they were presented here. Although facts and skills are a foundation to conceptual understandings, concepts can be approached first with facts and skills to follow. This approach creates a sense of exploration and prompts students to ask questions. In the case of Jen, she may have students first explore changes in matter on their own by providing them with materials to create changes. Students may discover, without knowing why, that heat can change matter. Later, she may explicitly teach the facts about the states of matter and the related facts, but she does not have to start instruction with the facts.

Each of these levels may not be addressed for every learner on every topic. There are several variables to consider, including interest and motivation on the part of the student as well as importance of the content. Generally, the first levels—facts and skills, along with concepts—are knowledge levels that all learners need, which is why they become the standard for all students. Many times, the levels of knowledge beyond concepts are not addressed.

In another example, I recently had a sprinkler system installed in my yard. After it was installed, the installer showed me where the sprinkler heads were in the lawn and flowerbeds. He showed me the timer and where the power source was. He gave me the basic facts. Then he showed me how to adjust the settings on the system and how to reset it if I needed to do so. I was able to perform the basic skills needed to operate the sprinkler system. I had the facts and skills needed to own the system.

Our conversation continued as he began to explain how the system should be monitored in the flowerbeds. He also showed me where water may be more likely to pool. At this point, he was combining facts and skills about irrigation, landscaping, and flora to create new concepts for me. This pushed my levels of both interest and ability. I was able to gain a conceptual understanding of the system's workings.

However, the conversation continued when the installer began sharing about the relationship of my sprinkler system to water-conservation efforts. He told me how my system was similar to and different from the local water treatment plant in its workings. He was now at the knowledge level involving principles. This was information that I did not need to

know or have much desire to know. However, this installer was a specialist in irrigation. He had a reason and desire to reach this level of knowledge. Finally, he made a comment about how he was experimenting with his own personal irrigation system in order to create a better system. He was attempting to invent a new idea in the field of irrigation. Here, he displayed the highest level of knowledge, in which there is a contribution to a field of study. He was certainly at the highest level of knowledge, attitudes, and dispositions.

This example is important as it points out where the standards fall. It also illustrates that all learners do not have to reach all levels of knowledge for all content areas. It shows us that there is a level of proficiency that is considered a baseline. These are the standards of what all learners should know and do. Many times, these are within the knowledge levels of facts and skills, and concepts. This story also shows us that there are times when a learner wants or needs to go beyond the concepts to higher levels of knowledge. This recognition leads to the need for differentiated instruction.

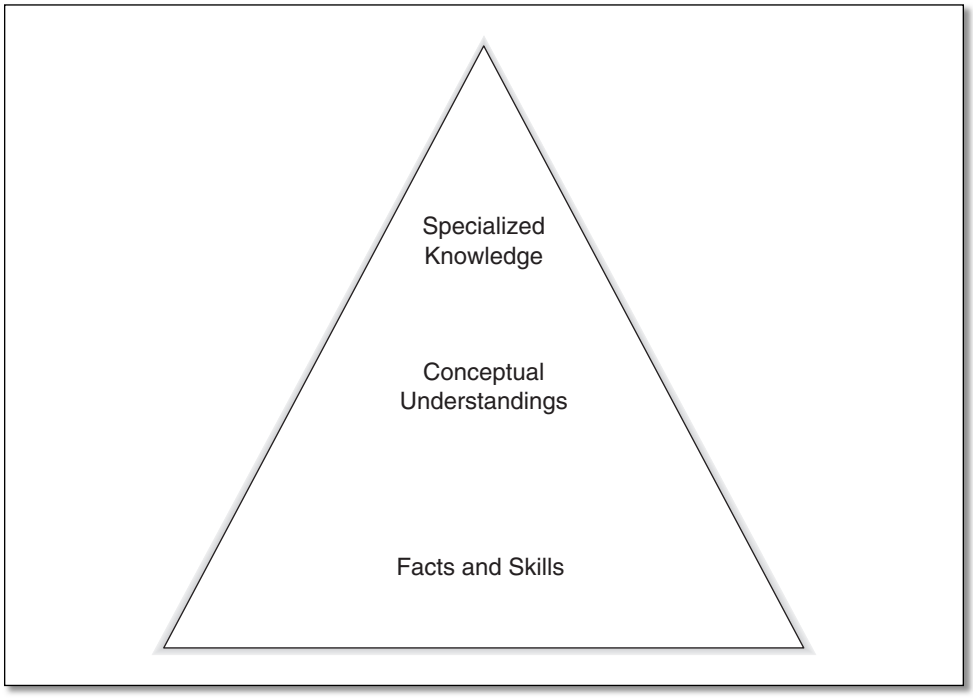
TYPES OF KNOWLEDGE AND DIFFERENTIATED INSTRUCTION

This triangle of knowledge is critical to understanding and is the basis for differentiated instruction. There is foundational knowledge, there are conceptual understandings, and there is specialized knowledge. There is a need to look at differentiation through at least three lenses. We need to consider meeting the needs of all learners with the understanding that all students need to master certain facts and skills. Therefore, the instruction and learning involved with facts and skills is a distinct process from the other levels. We need to also consider differentiation as we bring learners to the level of conceptual understandings so that the knowledge can be useful and transference can take place. This too becomes a distinct process of teaching and learning, different from facts and skills. Finally, we need to differentiate for learners who have the motivation and interest to go beyond the transfer process and enter deeper exploration. This third type of knowledge becomes the final distinct process and often involves very individualized instruction. (See Figure 1.2.)

It is equally important to note the language used here. Each of these three broadened levels of knowledge require different instructional approaches. *It is these distinct types of learning that should drive the instructional decisions and processes* (rather than the instructional processes driving the type of learning). This is the essence of differentiated instruction.

The differentiated practices educators implement is the instructional response to the levels of learning. The student's need for learning the facts and skills, concepts, and specialized knowledge determines the instructional

Figure 1.2



response. The decisions for instruction are made based on the student and the level of learning to be achieved. This is a significant shift in thinking. *We cannot start the teaching process with instructional practices. If we are going to implement differentiated instruction, we must start by identifying the knowledge levels and their relationship to the learners.* This is a very different approach than starting with the curriculum standards and simply addressing those in isolation. It is also different than the practice of implementing a research-based teaching strategy with no consideration being given to the content and how the student interacts with that content. This shift in thinking aligns to more recent practices of using Webb's hierarchy of depths of knowledge levels as opposed to older taxonomies (see Sullivan & Glanz, 2009).

This concept is of critical importance in thinking because this is the key to understanding how to differentiate instruction rather than what differentiated instruction is. Without clarity and consideration for this concept, there may be frustration in the implementation of differentiated instruction despite our having studied differentiated instruction or having learned teaching strategies such as tiered instruction or scaffolding. Differentiated instruction is often presented as being the practice of adjusting the content,

the process, or the product. While that can be true, there needs to be consideration made for the level of knowledge being addressed. At the fact-and-skill level, there is little that can be done to adjust the content or the product, and yet there are unlimited numbers of ways to adjust the process. At the conceptual level, the process or product can more easily be differentiated while the content itself generally remains constant. It is at the top of the triangle, where principles and attitudes are situated, where all three elements, content, process, and product will be differentiated for learners. Without consideration for the type of knowledge as a desired learning outcome, standards may be compromised, instruction and assessment fall out of alignment, or differentiation becomes an unnatural fit with instruction and learning.

SELF-APPLICATION

Professional development in the field of education has spent a great deal of effort on the foundational knowledge of differentiated instruction. Often, teachers are able to reflect mastery of the facts and skills related to differentiated instruction. These teachers, who receive professional development on the topic, in so many cases, understand the concept. But as educational professionals, teachers are thirsty to move toward the principles and disposition levels of their own knowledge. This is where authentic professional practice takes place. The support has been lacking at these levels because there has been a disconnect between instruction within professional development and these levels of learning. While there is a great deal of instruction occurring for teachers at the fact-and-skill level, there is little at the specialization level, which is the level at which many professionals in the field are seeking support.

SUMMARY

There are different types of knowledge that require different approaches to teaching. Foundational knowledge is rooted in facts and skills. The conceptual level of understanding is based on the facts and skills but takes learning to a higher level. In designing instruction, this is the optimal place to initiate curriculum design. At the top tier of the levels of knowledge, there is a level that includes principles, generalizations, and attitudes and dispositions. This level of knowledge is specialized and specific to the learner and the content. It is addressed by need or desire rather than as part of a standard curriculum. Each of these three main levels of knowledge is approached differently in the differentiation of instruction.