

COMPONENT 1A: DEMONSTRATING KNOWLEDGE OF CONTENT AND PEDAGOGY

Rationale and Explanation

“A person cannot teach what he or she does not know.” This statement captures the essence of why content knowledge is important in teaching. Regardless of teachers’ instructional techniques, they must have sufficient command of a subject to guide student learning. This requirement is independent of teachers’ approaches to teaching; regardless of whether teachers have structured their lessons as a presentation or as guided by student inquiry, they must understand the content to be learned, the structure of the discipline of which that content is a part, and the methods of inquiry specific to that discipline. Teachers must be aware of the connections among different divisions of the discipline (for example, between scientific concepts and inquiry) and among the different disciplines themselves (for example, between the history and the literature of a particular period).

The term *content* includes, of course, far more than factual information. It encompasses all aspects of a subject: concepts, principles, relationships, methods of inquiry, and outstanding issues. Teachers who understand their subjects know which questions sit on the fringes of what is known and which are likely to interest students, yield greater understanding, or represent conceptual dead ends. Furthermore, the *content* of a discipline includes, in addition to its facts and concepts, skills in analyzing the facts and concepts, comparing them to one another, or identifying connections with other aspects of the discipline or with other disciplines.

Students look to teachers as their source of information about a subject. Although teachers may sometimes withhold information to encourage student inquiry, what they do convey should be accurate. For example, teachers of world languages should be able to speak those languages with an appropriate accent. Teachers of physical education should be able to demonstrate or explain the skills they are teaching. Content must also be presented so that it respects the nuances of a discipline. When engaging students in a discussion, teachers should demonstrate that they understand the complexities and patterns of the content to be learned and must be able to challenge students to recognize the relationships between what they know and important questions yet to be explored.

Knowledgeable teachers know which concepts are central to a discipline and which are peripheral. For example, the concepts of pattern are crucial to understanding mathematics; those of revolution and counterrevolution are central to understanding history. Furthermore, frequently it is not sufficient to understand the central concepts in a discipline; one must also understand how those concepts interact with one another. For example, in mathematics, how are area and perimeter related to one another? Can several shapes have the same perimeter but different areas? How many such shapes are there? And which shape yields the greatest area? How do you know? Or, in science, how are buoyancy and floating related to each other? Can a buoyant object sink? Can you demonstrate that?

In addition, some disciplines—mathematics, for example—contain important prerequisite relationships. For example, students must understand place value before they can understand addition and subtraction with regrouping. Other disciplines have similar internal constraints; students need to learn some

concepts or skills before they can tackle others. Knowledgeable teachers know where these important relationships are in the subjects they teach.

Although necessary for good teaching, subject knowledge is not enough. Many adults can recall the teacher who was an expert in chemistry but could not share that knowledge or engage students in the subject. Teachers use pedagogical techniques particular to the different disciplines to help convey information and teach skills. General pedagogical skill is insufficient to ensure student learning; every discipline has its own approaches to instruction. Techniques used in writing, for example, are different from those used in science.

A teacher's knowledge of content and pedagogy is also reflected in an awareness of common student misconceptions or likely sources of error—and how these should be handled. Elementary students, for example, sometimes have difficulty with regrouping, partly because of a weak understanding of the underlying concept of place value. A knowledgeable teacher recognizes that many students make mistakes in regrouping, and the teacher knows how to anticipate or correct the situation. Or students may hold a naive and incorrect understanding of a concept in science, such as how light is transmitted. Teachers who are knowledgeable about subject-based pedagogy anticipate such misconceptions and work to dispel them.

Knowledge of content and pedagogy is not stagnant but evolves over time. Even when teachers specialize at the university level in the disciplines they later teach, their knowledge, unless renewed, can become dated and stale. Teachers must keep apprised of developments in the field and in the accepted best methods of engaging students with it. And if teachers'

responsibilities for instruction change, they have an even greater need to become thoroughly acquainted with their new field or subfield. For example, a teacher who has been teaching high school chemistry for many years may switch to biology. That change will require content and pedagogical preparation in addition to that required if the teacher continued to teach only chemistry.

Knowledge of content and pedagogy are appropriately different for teachers at different levels of schooling. Content specialists who teach only one subject (typically at the secondary level) may be held to a higher standard than generalists (mostly at the elementary level) who teach many. Moreover, the balance between content and pedagogical knowledge varies from one discipline to another. In some disciplines, such as reading, the content does not change, but the pedagogy is critical. In others, such as science, both the content and the pedagogy change over time. That is, in reading, the instructional goal is for students to be able to derive meaning from written text. Although this goal has remained stable over many years, the approaches used (such as phonics and whole language) have been the subject of much controversy. Alternatively, science teachers must alter not only their instructional strategies over time but also the topics taught as new knowledge evolves.

When entering the profession, teachers wrestle with “survival” issues and the challenges of daily preparation. Even when teaching in a field in which they are relatively expert, the task of transforming that content into meaningful learning experiences for students is daunting. As teachers become more experienced and enhance their expertise, they become increasingly flexible in how they weave aspects of the content together, and they can make connections with other disciplines.

Demonstration

Teachers provide evidence of their knowledge of content and pedagogy through their performance in the classroom. For example, evidence is found in their clear explanation of concepts, their knowledgeable responses to students' questions, and their skill in engaging students in learning, and by developing instructional plans and participating in professional growth activities.

Teachers can also demonstrate knowledge of the subjects they teach through instructional artifacts, comments on student work, and their classroom interactions with students. Content errors reflect a shaky understanding of the subject, and evasive responses to students may suggest only a thin knowledge of content. Although some responses are deliberately unrevealing, because the teacher wants to engage students in their own investigations, the teacher, in conversation, should be able to demonstrate a solid understanding of the subject. (See Figure 4.1.)

COMPONENT 1B: DEMONSTRATING KNOWLEDGE OF STUDENTS

Rationale and Explanation

Teachers do not teach their subjects in a vacuum; they teach them to students. To maximize learning, teachers must know not only their subject and its accompanying pedagogy, but also their students.

Each age group has certain developmental characteristics—intellectual, social, and emotional. For example, students in the early primary years are consolidating their understanding of the concept of number and the relationships between sounds and

symbols; those in their late-elementary and middle school years are assembling an array of facts and concepts in different disciplines and learning skills related to friendship and peer relationships. The skill of separating and controlling variables in a scientific investigation or the concept of proportional reasoning is not available to most students until they are about 12. Teachers' knowledge of their students should include the students' stage of developmental understanding.

Another aspect of knowing one's students is understanding the general principles underlying learning, particularly those involved in developing conceptual understanding. What students can learn and understand is based on their prior knowledge and experiences; they build their understanding on what they already know. For example, their current understanding of fractions influences what else they can learn and understand about the topic. Their current skill in writing dictates their next steps in developing basic competency. Experienced teachers know that it is not sufficient to *present* information to students; they must *represent* it in such a manner that it relates to students' prior knowledge and engages them in developing their own understanding. The teacher's role in this complex undertaking is to structure the learning environment—the activities and tasks, the materials, and the student groupings—so that it reflects the essential constructivist nature of human learning. A teacher's blind adherence to a grade-level curriculum is unlikely to be effective if students lack the understanding or skill needed to master the content. Furthermore, as students grow older, they become more capable of monitoring and assuming responsibility for their own learning and behavior.

It is important for teachers to realize that some students may hold erroneous beliefs. Recent research has verified the

FIGURE 4.1

DOMAIN I: PLANNING AND PREPARATION Component Ia: Demonstrating Knowledge of Content and Pedagogy Elements: Knowledge of content and the structure of the discipline • Knowledge of prerequisite relationships • Knowledge of content-related pedagogy				
ELEMENT	LEVEL OF PERFORMANCE			
	UNSATISFACTORY	BASIC	PROFICIENT	DISTINGUISHED
Knowledge of content and the structure of the discipline	In planning and practice, teacher makes content errors or does not correct errors made by students.	Teacher is familiar with the important concepts in the discipline but may display lack of awareness of how these concepts relate to one another.	Teacher displays solid knowledge of the important concepts in the discipline and how these relate to one another.	Teacher displays extensive knowledge of the important concepts in the discipline and how these relate both to one another and to other disciplines.
Knowledge of prerequisite relationships	Teacher's plans and practice display little understanding of prerequisite relationships important to student learning of the content.	Teacher's plans and practice indicate some awareness of prerequisite relationships, although such knowledge may be inaccurate or incomplete.	Teacher's plans and practice reflect accurate understanding of prerequisite relationships among topics and concepts.	Teacher's plans and practices reflect understanding of prerequisite relationships among topics and concepts and a link to necessary cognitive structures by students to ensure understanding.
Knowledge of content-related pedagogy	Teacher displays little or no understanding of the range of pedagogical approaches suitable to student learning of the content.	Teacher's plans and practice reflect a limited range of pedagogical approaches or some approaches that are not suitable to the discipline or to the students.	Teacher's plans and practice reflect familiarity with a wide range of effective pedagogical approaches in the discipline.	Teacher's plans and practice reflect familiarity with a wide range of effective pedagogical approaches in the discipline, anticipating student misconceptions.

power and stability of students' misconceptions, particularly in mathematics and science. Teachers' knowledge of students includes knowing what these misunderstandings and misconceptions are; only then can they determine the appropriate

next steps in learning for each student and for groups of students.

Furthermore, many schools include large numbers of students for whom English is not their native language. Awareness