What Works

20 Years of Curriculum Development and Research for Advanced Learners

Center for Gifted Education
The College of William & Mary

1988–2008

Purpose

The purpose of this document is to highlight "what works" based on the curriculum development and research work of the Center for Gifted Education during the past 20 years. Areas of study include curriculum development, instruction, assessment, and professional development. Through the use of the Integrated Curriculum Model as a template for design, coupled with curriculum reform emphases in content areas, the Center curriculum has produced positive outcomes in student achievement and teacher use of differentiated strategies.

Credits

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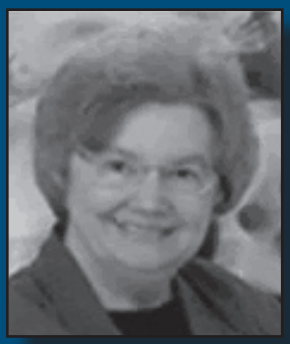

Letter From the Executive Director

It is with great pride that The Center for Gifted Education produces this publication for the world of K–12 practitioners. *What Works* is our effort to share research-based findings from more than a decade's worth of research on effective curriculum, instruction, assessment, and professional development with teachers. The importance of this work is nested in several assumptions that make it valuable to the broader audience of all school practitioners, not just to the teachers and administrators of gifted programs.

- We assume that all children can learn challenging material and have set about to demonstrate the truth of that assumption by using high-powered curriculum, designed for gifted learners, with all learners in the poorest schools in our nation.
- We assume that higher level thinking can be taught best through the core domains of learning. We have systematically tested this assumption by assessing critical thinking and problem-solving abilities through language arts, science, math, and social studies curriculum.
- We assume that the use of graphic organizers to scaffold instruction facilitates learning, especially for promising learners from low-income backgrounds and other diverse learners. Our research evidence suggests that such scaffolds are clearly contributory to the learning gains of students using our curriculum materials.
- We assume that multiple pathways to learning, as well as multiple approaches to assessment of that learning, enhance the likelihood that students will benefit from planned instruction. Our work has consistently employed multiple models and assessment tools, including performance-based, portfolio, and standardized assessments, to capture the nature and extent of the authentic learning of students.
- We assume that professional development must augment the development and dissemination of curriculum materials in order for learning of students to be optimized. Toward that end, we have offered ongoing professional development opportunities to schools, school districts, states, and university groups that wish to implement our curriculum units of study.

We invite you to use this publication with administrators and board members in your district to help clarify what we know about the effective use of curriculum designed for high-end learning. The compilation of studies that anchor the assertions of effectiveness, the broad-based dissemination and use profile, and the statements of satisfaction from districts that are using the curriculum all attest to its impact on the learning of more than half a million children over the years. Our evidence base provides the field of education with important direction for increasing rigor and challenge in schools. May you all enrich your children and your schools with such high-powered learning tools.

Sincerely,

Joyce VanTassel-Baska
Executive Director, Center for Gifted Education
College of William and Mary

Introduction

The Center for Gifted Education, under the direction of Dr. Joyce VanTassel-Baska, has been in operation at The College of William and Mary School of Education since 1987. The Center has been the recipient of 20 years of continuous funding from federal, state, and foundation grants for curricula development, research, and dissemination. From the Center's inception, one of its major emphases has been the development of exemplary curriculum frameworks and units of study for classroom use with high-ability learners in science, language arts, mathematics, and social studies. Teams of content specialists and educators have collaborated in writing and field-testing units. Many Center materials have been recognized for their quality and enhancement of student achievement by the United States Department of Education and the National Association for Gifted Children. Specifically, 12 of 29 units published by an outside publisher have received exemplary curriculum awards by the National Association for Gifted Children and 7 of the problem-based science units for grades 2–8 were recognized as a promising curriculum by the United States Department of Education. A list of curriculum developed by content area is outlined in Figures 1 and 2.

The Center for Gifted Education also serves as a training site for graduate students pursuing a master's or doctoral degree at The College of William and Mary. Students who work at the Center for Gifted Education represent a variety of fields including curriculum and instruction, gifted education, counseling, psychology, and planning, policy, and leadership. These student professionals are engaged in research, curriculum development, instrument design, assessment projects, and direct teaching or piloting of Center materials through the Summer/Saturday Enrichment program, also coordinated by the Center. This program not only serves students in pre-Kindergarten through grade 10 in the community and abroad, but also provides a learning laboratory for curriculum projects, research, and student teaching.

William and Mary, Center for Gifted Education Published Curriculum

	TITLES	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	High School
SCIENCE	**Guide to Teaching a Problem-Based Science Curriculum for High-Ability Learners**									
	Where's the Beach?		•	•	•					
	What a Find!		•	•	•					
	Acid, Acid Everywhere				•	•	•			
	Electricity City				•	•	•			
	Animal Populations						•	•	•	
	Nuclear Energy: Friend or Foe?						•	•	•	
	Something Fishy						•	•	•	
	No Quick Fix						•	•	•	
LANGUAGE ARTS	**Guide to Teaching a Language Arts Curriculum for High-Ability Learners**									
	Beyond Words	•	•							
	Journeys and Destinations		•	•						
	Literary Reflections				•	•				
	Patterns of Change				•	•	•			
	Autobiographies					•	•			
	Persuasion					•	•	•		
	Utopia							•	•	Grades 9–10
	1940's: A Decade of Change						•	•	•	Grades 9–10
	Threads of Change in 19th Century American Literature							•	•	Grades 9–11
SOCIAL STUDIES	**Guide to Teaching a Social Studies Curriculum**									
	Ancient Egypt: Gift of the Nile		•	•						
	Ancient China: The Middle Kingdom		•	•						
	Building a New System: Colonial America 1607–1763				•	•				
	The World Turned Upside Down: The American Revolution				•	•				
	A House Divided? The Civil War, Its Causes and Effects					•	•			
	The 1920s in America: A Decade of Tensions						•	•		
	The 1930s in America: Facing Depression						•	•		
	The Road to the White House: Electing the American President						•	•	•	
	Defining Nations									•
	Post-Colonialism in the 20th Century									Grades 9–10
	Primary Sources and Historical Analysis									Grades 9–10
	The Renaissance and Reformation in Europe									Grades 9–10

FIGURE 1. Published curriculum from the Center for Gifted Education.

Curriculum Developed From Recent Projects

TITLES	Grade K	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grades 6–8	High School
SCIENCE								
Water Works	•	•						
Survive and Thrive	•	•						
How the Sun Makes Our Day	•	•						
Budding Botanists		•	•					
Weather Reporter			•					
What's the Matter			•	•				
Invitation to Invent				•				
Dig It				•				
LANGUAGE ARTS								
Jacob's Ladder Reading Comprehension Program				•	•	•		
Navigator Novel Studies	•	•	•	•	•	•	•	•
MATHEMATICS								
Beyond Base Ten				•	•	•	Grade 6	
Spatial Reasoning (two units)			•	•	•		•	

FIGURE 2. Curriculum developed from recent projects.

Curriculum Dissemination

The curriculum from The College of William and Mary, Center for Gifted Education has enjoyed national and international widespread use. It has been distributed to school districts and students in all 50 states, as well as 28 countries, including Puerto Rico and the U.S. Virgin Islands (see Figure 3). Private and public school districts, ranging from Title 1, low-income schools to high-socioeconomic status (SES) schools, have found the Center materials useful in promoting student achievement. Presentations on the curriculum have been conducted at state, national, and international conferences annually, and staff members frequently conduct implementation workshops for educators across the country and abroad. Professional development workshops for teachers provide participants with modeling and practice involving the core strategies of each unit, as well as an introduction to unit-specific resources and activities. Annual conferences at William and Mary also are provided twice per year to address curriculum, instruction, and assessment for gifted learners based on best practices in the field and current Center projects. We estimate that more than 60,000 teachers have received such training and more than 600,000 students have been impacted by the curriculum.

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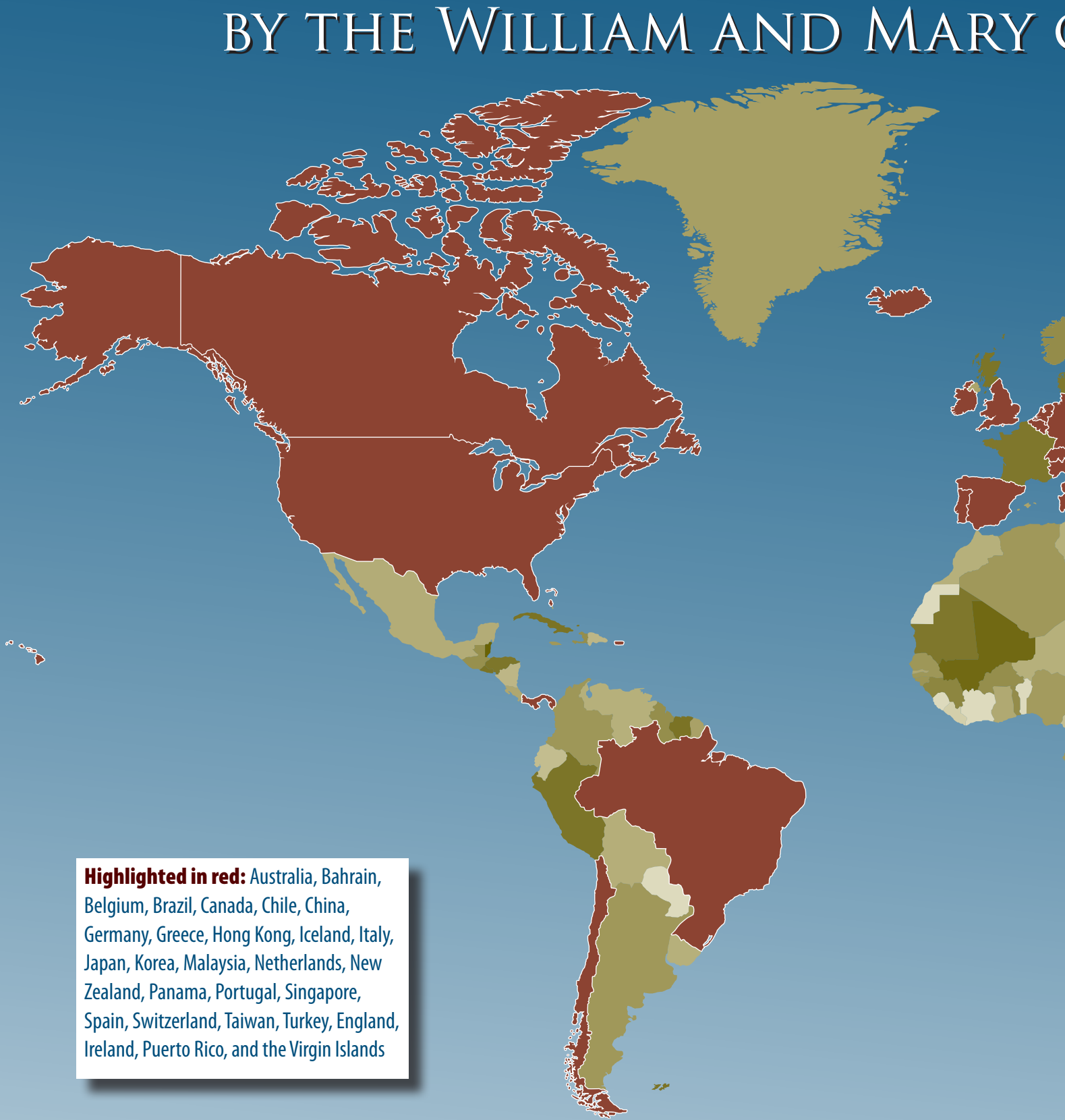
by the William and Mary C



Highlighted in red: Australia, Bahrain, Belgium, Brazil, Canada, Chile, China, Germany, Greece, Hong Kong, Iceland, Italy, Japan, Korea, Malaysia, Netherlands, New Zealand, Panama, Portugal, Singapore, Spain, Switzerland, Taiwan, Turkey, England, Ireland, Puerto Rico, and the Virgin Islands

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curriculum units.

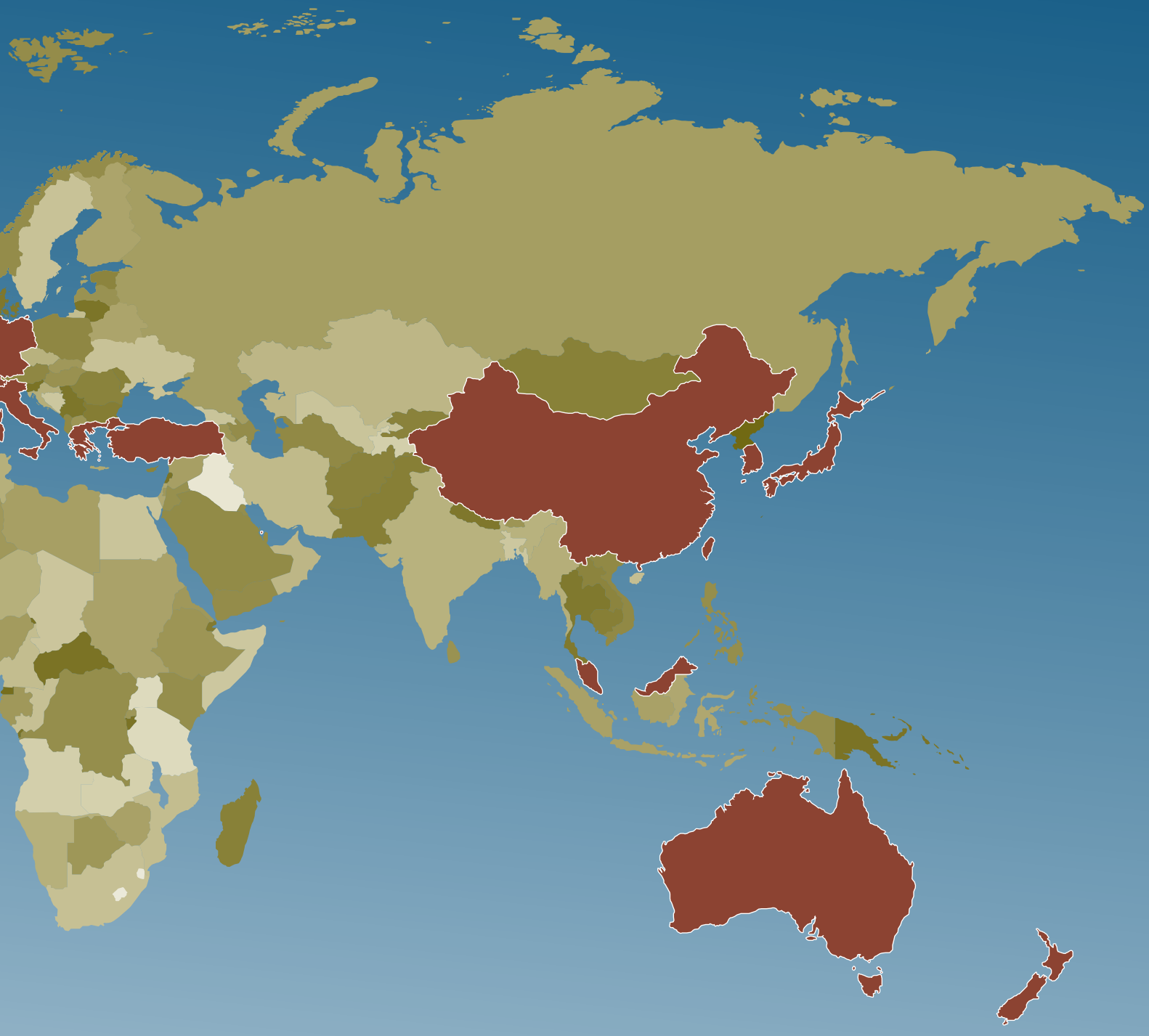
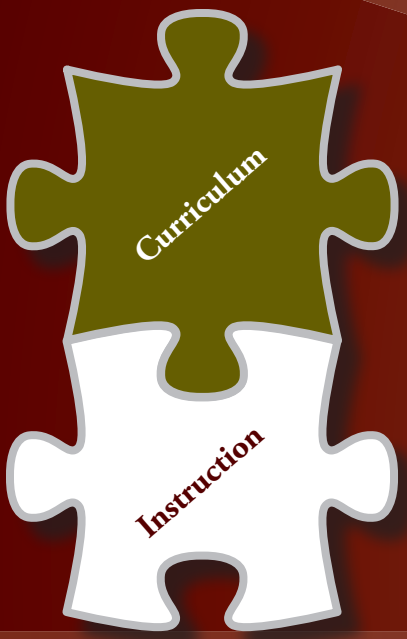


Figure 3. Center of Gifted Education curriculum use by state and country.



Overview of the Integrated Curriculum Model

The Integrated Curriculum Model (ICM), a theoretical model of curriculum design for gifted learners (see Figure 4), emphasizes the integration of advanced content, higher order thinking processes, and connections to overarching themes and issues as the foundation for curriculum development. The greatest student learning occurs when emphasis is given to each of these dimensions within a given curriculum unit (VanTassel-Baska, 1986). The ICM was derived from the key characteristics of gifted students and how curriculum may be designed to best match those characteristics. For example, because gifted students are precocious learners, advanced content within a given subject area provides opportunities for new learning. Because gifted learners have complex thinking capacities, the provision of a curriculum that helps gifted students reason through situations and think critically about subject matter enhances engagement and creative production. Moreover, because many gifted students thrive on making connections, the focus on overarching issues, themes, and concepts elevates their understanding of the real world and how it works. These three components of the ICM (advanced content, processes/products, and overarching issues, themes, and concepts) have comprised the framework for curriculum design and differentiation in all of the William and Mary units of study.

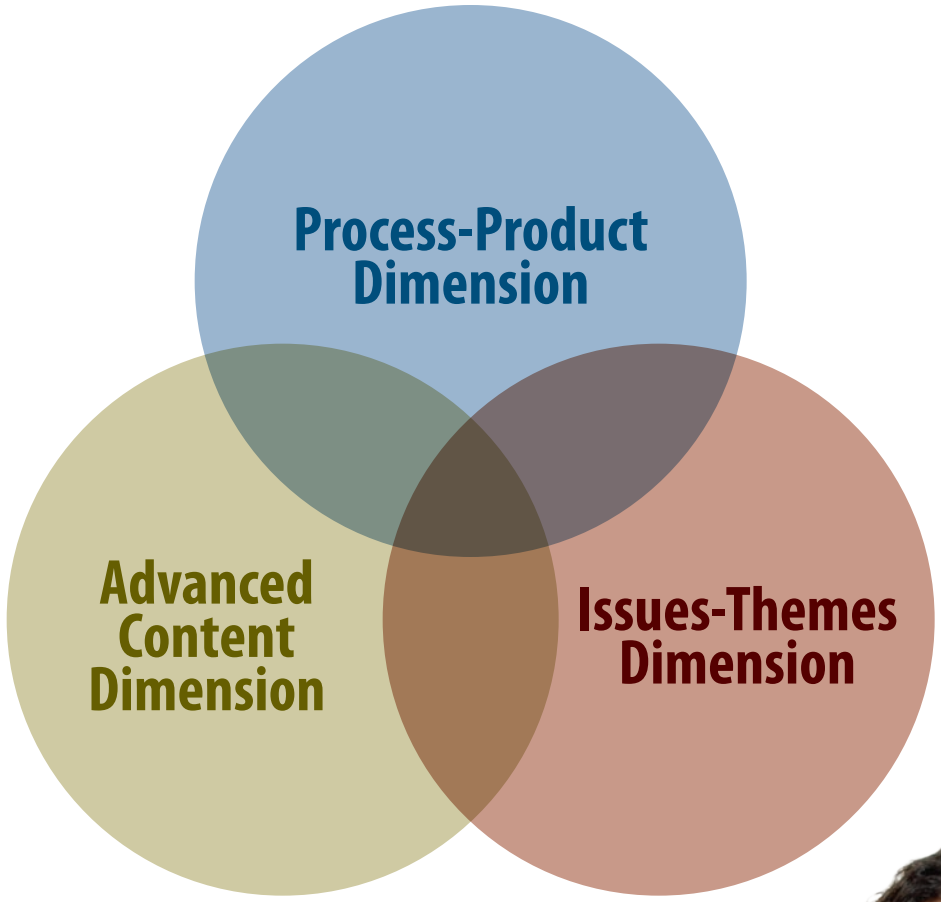


FIGURE 4. Integrated Curriculum Model (ICM).

Note. From "Effective Curriculum and Instructional Models for Talented Students," by J. VanTassel-Baska, 1986, *Gifted Child Quarterly, 30*, pp. 164–169. Copyright © 1986 by J. VanTassel-Baska. Reprinted with permission.

Finally, a model that I can use to guide my curriculum writing! The ICM is a great blend of best practices in gifted education: acceleration, higher level thinking processes, and interdisciplinary connections. I'm excited to apply this model to a unit I will be teaching next year!

—Teacher of Gifted

What Works in Teaching Science Curriculum to Advanced Learners

The William and Mary science curriculum uses problem-based learning as the catalyst to engage learners in scientific inquiry. As active investigators, students take on the role of a scientist to solve real-world problems. The science curriculum follows the ICM model in content, process, and concept dimensions, as seen in Figure 5.

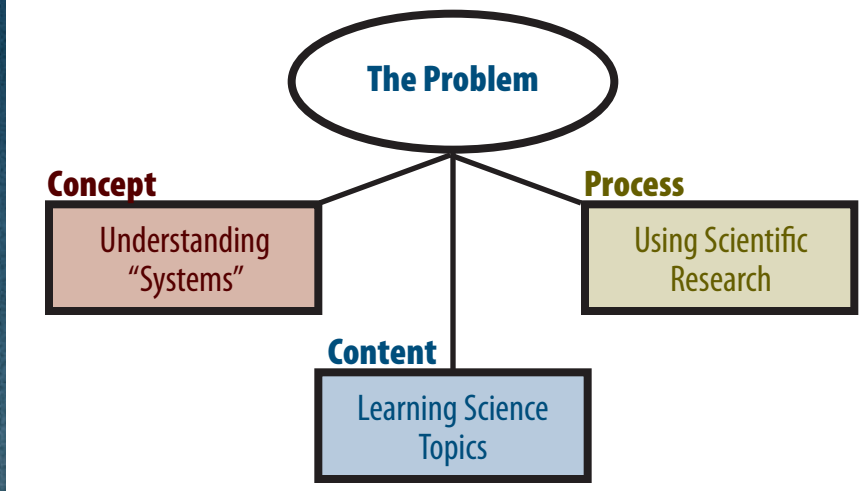


FIGURE 5. Science framework.

The William and Mary science units introduce real-world problems to initiate scientific investigation.

> *You are the supervisor of the day shift of the State Highway Patrol. It is 6 a.m. on a cool autumn morning. You are sleeping when the phone rings. You answer and hear, "Come to the Clear Creek Bridge on Route 15. There has been a major accident and you are needed."*
>
> *Quickly you dress and get on the road to hurry to the site of the emergency. As you approach the bridge you see an overturned truck that has apparently crashed through a metal guardrail. The truck is missing a wheel and is perched on its front axle. You see "CORROSIVE" written on a small sign on the rear of the truck. There is a huge gash is the side of the truck and from the gash a liquid is running down the side of the truck, onto the road, and down the hill into a creek. Steam is rising from the creek. All the traffic has been stopped and everyone has been told to remain in their cars. Many of the motorists trapped in the traffic jam appear angry and frustrated. Police officers, firefighters, and rescue squad workers are at the scene. They are all wearing coveralls and masks. The rescue squad is putting the unconscious driver of the truck onto a stretcher. Everyone seems hurried and anxious (from* Acid, Acid Everywhere, *2007).*

Using this scenario, students actively investigate acids and bases, dilution, and issues related to the effects of an acid spill on environmental and transportation systems by creating their own experiments and using scientific processes to solve this real-world problem. All units incorporate real-world problem-based learning scenarios as the organizer for learning.

The Scientific Research Process

Students in the primary grades, as part of the Project Clarion units, incorporate the Wheel of Scientific Investigation (see Figure 6) to develop scientific habits of mind for independent research investigations. Students learn how to make observations, ask questions about the world around them, read and learn about their new topic, design and conduct experiments, and discuss what their findings mean.

Connecting to Overarching Concepts

All third- through eighth-grade science units incorporate the overarching concept of systems as a way to link unit components together, add depth to the content, and connect students' learning to essential interdisciplinary understandings. Examples of systems applications within the science units include how an acid spill effects the environmental system, how electrical systems impact one another, and how human body systems are interrelated. Students learn how to identify the inputs, outputs, boundaries, and interactions of elements in a system. They also learn how larger systems can encompass smaller ones, how systems are interdependent, and how systems exhibit patterns over time.

FIGURE 6. Wheel of scientific investigation.

This is the way science should be taught! What a wonderful opportunity for students in these classes.
—Project Clarion Administrator

Research Findings in Brief

- Primary-age students exposed to the William and Mary science units performed better on a standardized achievement test in science (MAT8) than control students (VanTassel-Baska, Bracken, Stambaugh, & Feng, 2007).
- Significant and important treatment effects were found for students' ability to plan an experiment after exposure to the William and Mary units (Feng, VanTassel-Baska, Quek, O'Neil, & Bai, 2005; VanTassel-Baska, Bass, Ries, Poland, & Avery, 1998; VanTassel-Baska, Bracken, et al., 2007).
- Primary-age students who were exposed to the William and Mary units showed significant growth in critical thinking when compared to those students who used the regular science curriculum (VanTassel-Baska, Bracken, et al., 2007).
- Performance-based assessments that emphasized higher order concepts, scientific investigation, and content mastery showed significant growth for Title I students exposed to the science units (VanTassel-Baska, Bracken, et al., 2007).
- Teachers and students both found problem-based science units more engaging than typical science units (Feng et al., 2005; VanTassel-Baska et al., 1998).
- Positive academic achievement effects were significant for all groups of learners, regardless of socioeconomic status, ability level, or ethnicity (Feng et al., 2005; VanTassel-Baska et al., 1998; VanTassel-Baska, Bracken, et al., 2007).
- Continued use of the problem-based learning science curriculum over a 3-year period resulted in continued academic growth for gifted students (Feng et al., 2005).

What Works in Teaching Social Studies Curriculum to Advanced Learners

The William and Mary social studies units use historical periods and events as the catalyst for student learning (see Figure 7). Students actively engage in document analysis, issue-based research on current events, and reasoning through situations to master historical content. Students then connect this new learning to an overarching concept such as systems or cause and effect to gain a deeper understanding of history and its relationship to other areas of study within and beyond social studies.

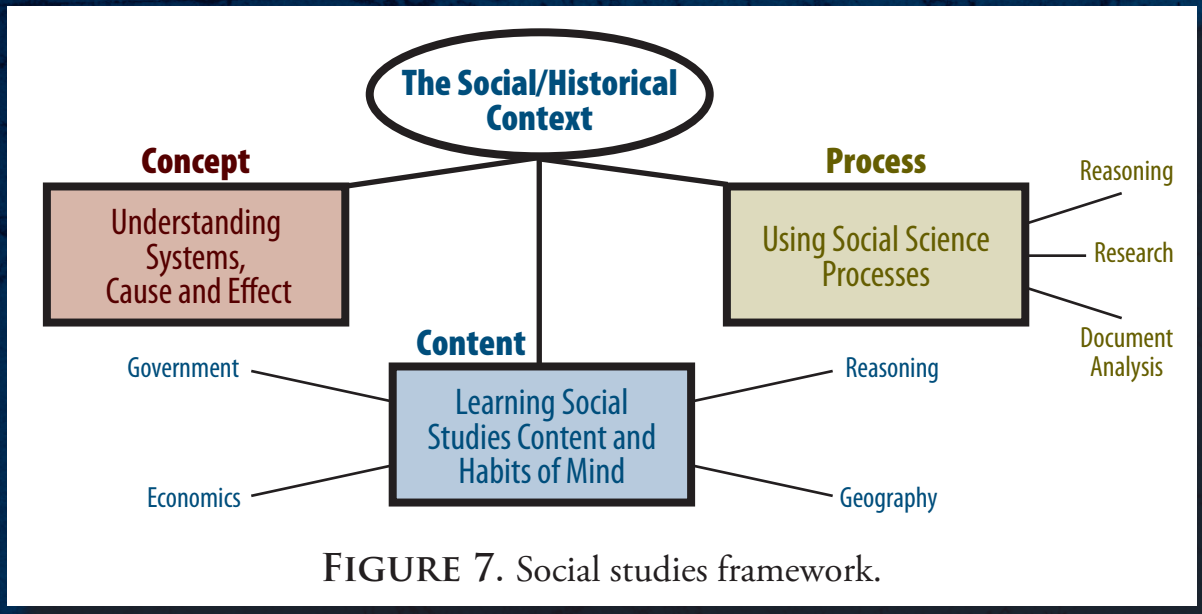


FIGURE 7. Social studies framework.

By allowing students to analyze primary documents such as the Stamp Act, camp diaries from Civil War soldiers, or the 1920s KKK mission statement, for example, they are able to think like a historian and gain a stronger appreciation of past events and their implications on the present and future. When analyzing primary documents, students establish a context and intent for each piece (author, time written, related culture and events, purpose, intended audience), work to understand the source (issues/events and values reflected in the document), and evaluate or interpret the source (reliability, representativeness, potential and actual consequences).

Reasoning Through History

The William and Mary social studies units guide students in analyzing a situation by looking at different points of view. Students may "reason through a situation" using the model shown in Figure 8 to analyze an historical situation or event through multiple stakeholder perspectives. After analyzing a situation, students may be asked to write a persuasive essay from the perspective of one of the stakeholders.

Connecting to Overarching Concepts

The William and Mary social studies units also develop a broad understanding of the concept of *systems* or the concept of *cause and effect*. Students examine relationships to events and eras in history as an essential area of focus. Sample systems discussions include the exploration of the silk trade as an economic system, comparison of European colonist and Native American social systems, and the American political system as a model for other countries. Students also learn about the causes of the American Revolution, the effects of the Declaration of Independence, and the causes and effects of the stock market crash.

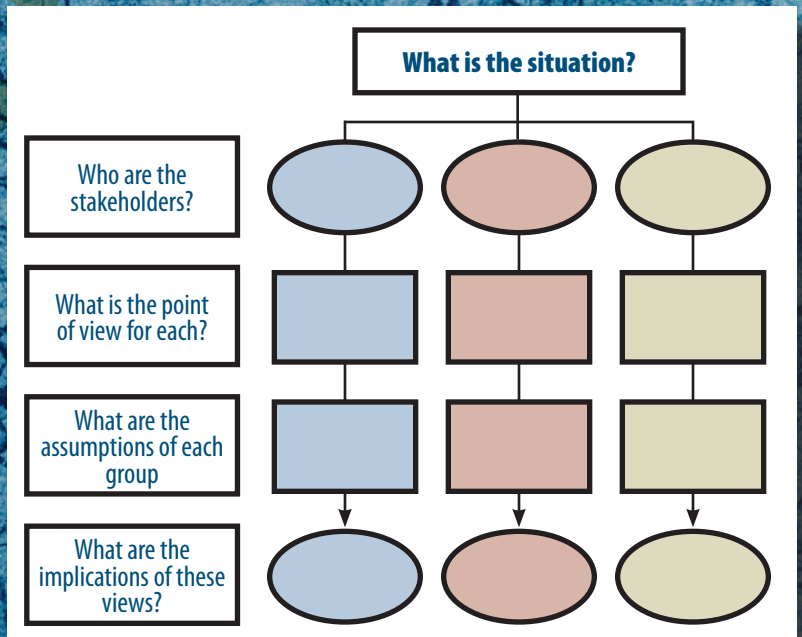


FIGURE 8. Reasoning through a situation.

The social studies units helped me recognize that there are many people in one country that sometimes disagree with each other, and to not always think of people from one country as the same.
—Student

Research Findings in Brief

- Students engaged in the William and Mary social studies units showed significant growth in measures of conceptual thinking, content learning, and critical thinking.
- Treatment effects were evident for the whole sample including nongifted students. Gains were consistent for males and females (Little, Feng, VanTassel-Baska, Rogers, & Avery, 2007).

What Works in Teaching Language Arts Curriculum to Advanced Learners

The William and Mary language arts units employ advanced-reading-level literature as the catalyst for learning. As seen in Figure 9, the Integrated Curriculum Model is operationalized through the teaching of the concept of change, the reasoning process, and advanced content skills in reading, writing, speaking, listening, and grammar.

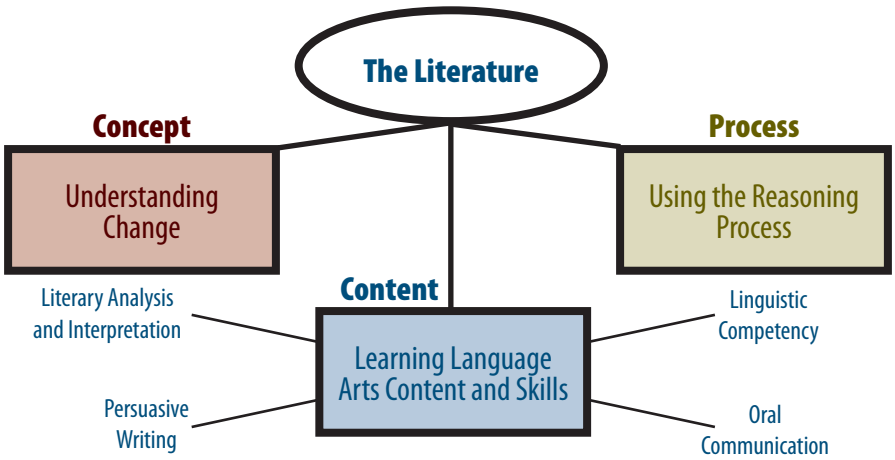


FIGURE 9. Language arts framework.

Thinking Through Reading and Writing

The language arts units incorporate advanced thinking models such as the literature web to help students understand and analyze text. Students are introduced to the literature web early in each unit (see Figure 10). After reading a selected short story or poem, students analyze key words and feelings, describe images and symbols, identify structural elements within the story that contribute to its meaning, and elaborate on main ideas. Students are asked to individually reflect each aspect of the web, share ideas with a partner, and then discuss findings in a small- and whole-group setting with teacher guidance and feedback.

The William and Mary units also employ the teaching of persuasive writing as an essential part of articulating and defending ideas. Students defend a character's actions, discuss the meaning of passage or novel, or analyze an issue and take a stakeholder perspective, given an historical context or problem. The hamburger model of persuasive writing is presented in Figure 11. By using this model, students learn to take a stand, provide evidence for that stand, elaborate their ideas, and summarize.

Connecting to Overarching Concepts

Most of the language arts units focus on the overarching concept of *change*. Progressing through the units, students learn that change is everywhere, changed is linked to time, change may be positive or negative, change may be perceived as orderly or random, and change may happen naturally or may be caused by people. As students read literature, they identify examples of how change affects the story, such as:

- Explain changes over time in the character's outlook, the setting, and the plot.
- How did the character's point of view change over time? Why is that important to the meaning of the story?
- What idea about change is explored in this poem? Justify your answer by using evidence from the text.

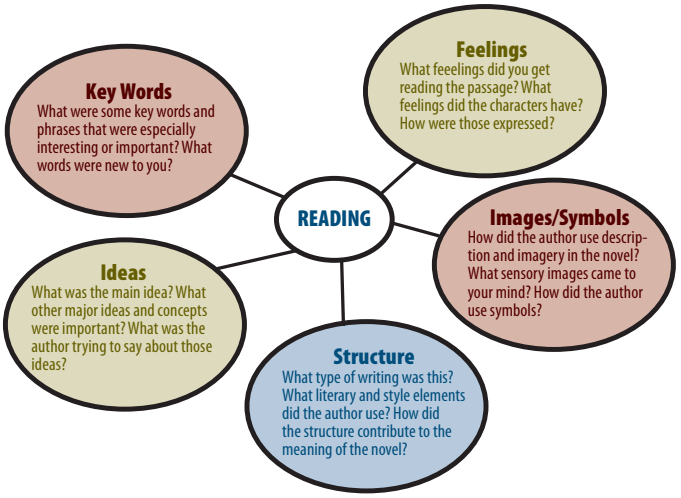


FIGURE 10. Literature web.

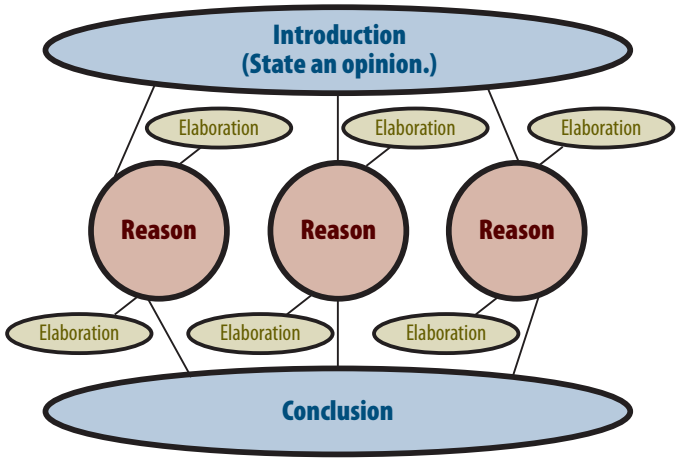
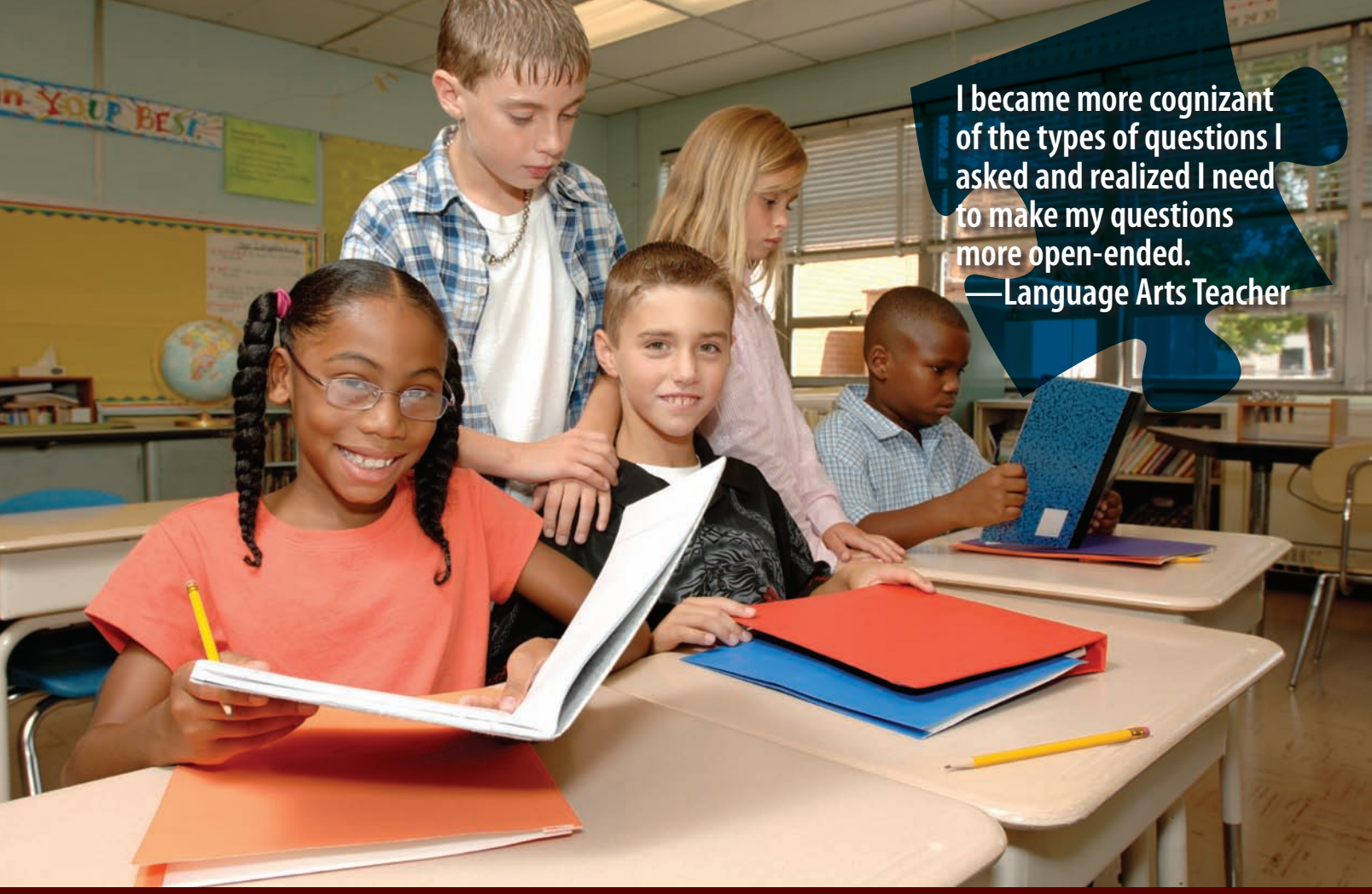


FIGURE 11. Persuasive writing model.

Research Findings in Brief

- Students in Title I schools exposed to the language arts units showed significant learning gains annually in reading comprehension when compared to students who used a basal reader or teacher-created materials (Bracken, VanTassel-Baska, Brown, & Feng, 2007; VanTassel-Baska, Bracken, Feng, & Brown, 2008).
- Students exposed to the language arts units showed significant learning gains annually in critical thinking when compared to students who used a basal reader or teacher-created materials (Bracken et al., 2007; VanTassel-Baska et al., 2008).
- Gifted, learning-disabled, and typical learners all showed significant learning gains in critical thinking through persuasive writing (Hughes, 2000).
- Subanalyses suggest that student growth in critical thinking may be bounded by the characteristics of the learner, teacher skills in soliciting critical thinking behaviors, and fidelity of curriculum implementation (Bracken et al., 2007; Hughes, 2000; VanTassel-Baska et al., 2008).
- Students who were exposed to the language arts curriculum showed significant and educationally important gains in literary analysis (VanTassel-Baska, Zuo, Avery, & Little, 2002; VanTassel-Baska, Johnson, Hughes, & Boyce, 1996).
- Students who were exposed to the language arts curriculum showed significant and educationally important gains in persuasive writing (Bracken et al., 2007; Hughes, 2000; VanTassel-Baska et al., 2008; VanTassel-Baska et al., 1996; VanTassel-Baska et al., 2002).
- Teacher acceptance of curriculum materials impacts the extent to which curriculum elements are employed, how students are challenged, and continued curriculum use (VanTassel-Baska et al., 1996).
- Continued use of the language arts curriculum over a 3-year period significantly enhanced students' literary analysis skills and persuasive writing competency (Feng et al., 2005).
- Academic achievement effects were significant for all groups of learners regardless of socioeconomic status, ability level, or ethnicity (Bracken et al., 2007; VanTassel-Baska et al., 2008; VanTassel-Baska et al., 1996; VanTassel-Baska et al., 2002).



> I became more cognizant of the types of questions I asked and realized I need to make my questions more open-ended.
> —Language Arts Teacher

What Works in the *Jacob's Ladder Reading Comprehension Program*

The *Jacob's Ladder Reading Comprehension Program* was created based on student needs and teacher requests for additional scaffolding within the language arts curriculum, particularly for lower income students in heterogeneous classrooms.

Jacob's Ladder focuses on student-targeted readings of short stories, poetry, and nonfiction sources. Suggested for students in the third through fifth grade to enhance reading comprehension and critical thinking, *Jacob's Ladder* tasks are organized into four skill ladders: A–D (see Figure 12). Each ladder focuses on a different set of skills, from lower order to higher order. Students "climb" each ladder by answering lower level questions and then move to higher level questions or rungs at the top of each ladder.

Research Findings in Brief

- When compared to students in Title I schools who used the basal readers only, those who were exposed to the *Jacob's Ladder* curriculum showed significant and educationally important gains in reading comprehension (Stambaugh, 2007, 2008).
- When compared to students in Title I schools who used the basal readers only, those who were exposed to the *Jacob's Ladder* curriculum showed significant and educationally important gains in critical thinking (Stambaugh, 2007, 2008).
- Students reported greater interest in reading after curriculum exposure to *Jacob's Ladder* (French, 2006; Stambaugh, 2007, 2008).
- Teachers reported more in-depth student discussion after teaching the *Jacob's Ladder* curriculum (French, 2006; Stambaugh, 2007, 2008).

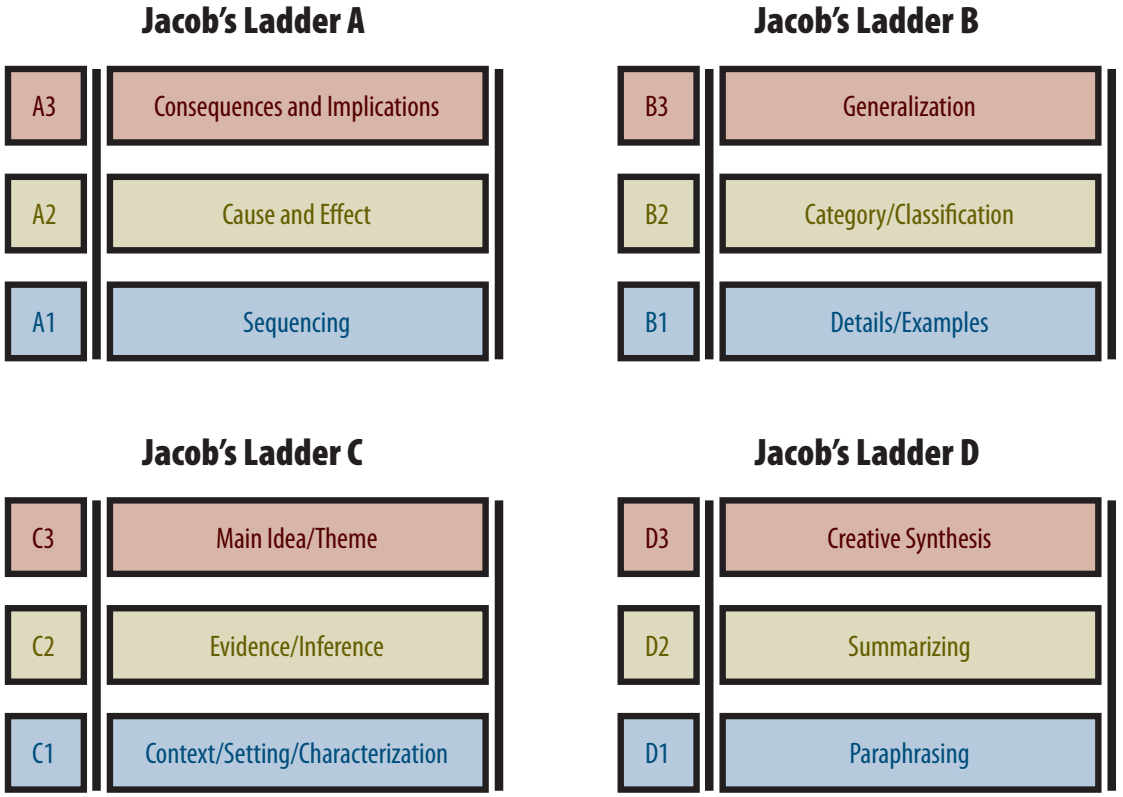
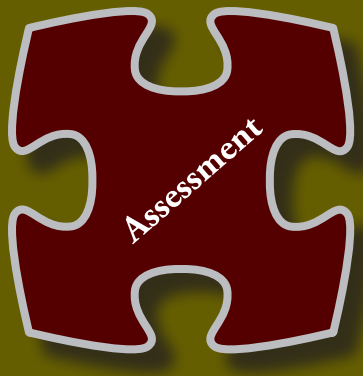


FIGURE 12. *Jacob's Ladder* examples.

Other Promising Center Curriculum

The *Navigator Novel Study Guides* are collections of task demands intended to support group or independent study of classic novels. The *Navigators* encourage advanced readers to develop their skills in analyzing and interpreting literature through structured questions and activities that highlight themes and concepts, literary elements, and real-world connections contained within the books. In addition, novel studies are opportunities for students to develop their own vocabulary and writing skills by exploring and emulating the language and style of authors. Interdisciplinary research opportunities and differentiated activities also are included and feature the models used in the William and Mary language arts curriculum. The Center has published more than 30 *Navigators*, covering literature appropriate for primary to high school students.

Mathematics units also have recently been developed by the Center for Gifted Education. *Beyond Base Ten*, intended for students in grades 3–6, focuses on the representation of numbers by using place value and non-place-value systems. Bases other than base 10 are featured through the context of early civilization number systems and then compared to current number systems. *Spatial Reasoning*, one unit focused on students in grades 2–4 and one focused on students in grades 6–8, approaches spatial reasoning through one-, two-, and three-dimensional tasks and include transitions and representations from three- to two-dimensional objects.



What Works in Assessment

In addition to the well-established curriculum developed by the Center since its inception, considerable efforts have been made to increase the availability of school-based assessments of important instructional behaviors and psycho-educational constructs. Several instruments have been developed by Center staff, students, and faculty during the past decade, with the intent of increasing the number and psychometric quality of instruments for use with diverse populations of students and educators. All of the instruments developed within the Center have been tested and employed within schools and with diverse populations of teachers and students. Each instrument posits strong technical adequacy (see Table 1). Importantly, all instruments developed and published by the Center are public domain; that is, they are available for use by anyone at no cost.

Table 1
Instruments and Technical Adequacy

ASSESSMENT INSTRUMENTS	TECHNICAL ADEQUACY DATA
Test of Critical Thinking (TCT)*	Internal Consistency = .89 Concurrent Validity With Verbal Correlates: ITBS Reading: r = .61; ITBS Language: r = .55, CogAT Verbal: r = .59 Concurrent Validity With Nonverbal Correlates: UNIT Abbreviated Scale: r = .29; CogAT Nonverbal: r = .45
Classroom Observation Scale–Revised (COS-R)*	Overall reliability is > .90 for the entire scale and between .65–.86 by subscale. Content Validity = .98.
ASPIRE	Internal Consistency = .95 Internal Consistency of Subscales = .67–.88
Professional Development Questionnaire (PDQ)*	Ideal Scale Internal Consistency Reliability Coefficient: .97 Present/Past Scale Reliability Coefficient: .96
Science Observation Scale	Internal consistency reliability by subscale ranged from .77–1.0.
Performance-Based Assessments	**Project Clarion Science Units** Internal Consistency Concept: .68; Content: .69; Process: .75 Interrater Scoring Reliability Concept: .85; Content: .89; Process: .88 **Language Arts Units** Persuasive Writing Content Validity: .77 – claim; .56 – data; .66 – warrant Interrater reliability: >.90 Literary Analysis Interrater reliability: .81 **Jacob's Ladder Reading Comprehension Program** Literary Analysis Internal Consistency: .76 Interrater reliability: .81

*A technical manual has been developed and is available for educators wishing to study the development and technical data on this instrument for possible use in future research.

I like the inclusion of the performance-based assessments in each unit. I am always amazed to see how much growth my students make. The pre- and post-assessments are wonderful tools to use in my students' portfolios so that I can show students, parents, and administrators how much students learn as a result of the William and Mary units.
—Classroom Teacher

Classroom Observation Scale–Revised. The Classroom Observation Scale (COS) was developed to assess the instructional behaviors of teachers implementing Center curriculum. As a measure of implementation fidelity, the COS focuses on specific behaviors known to be conducive to effective teaching. The COS was revised in 2004 (COS–R; VanTassel-Baska, Avery, Struck, Feng, Bracken, Drummond, & Stambaugh, 2005); the revision rendered a briefer instrument with improved psychometric characteristics. The COS–R has a total of 25 items within the following categories: Curriculum Planning and Delivery, Accommodations for Individual Differences, Problem Solving, Critical Thinking Strategies, Creative Thinking Strategies, and Research Strategies.

Student Observation Scale. In addition to teacher behaviors assessed on the COS–R, this instrument was extended to assess students' learning behaviors. The Student Observation Scale (SOS; VanTassel-Baska, Bracken, & Drummond, 2004) was developed to assess the extent to which students demonstrate classroom behaviors consistent with the corresponding instructional behaviors addressed by the COS–R.

Science Observation Scale. The Science Observation Scale (Hastings-Gregory, Robbins, VanTassel-Baska, & Bracken, 2006), similar to the COS–R, was developed to assess instructional behaviors of teachers who teach science. The Science Observation Scale includes 13 items across the following categories: Overarching Concepts, Science Content, Scientific Investigation, Habits of Mind, and Environment for Inquiry.

Professional Development Questionnaire. Because the Center has professional development as one of its primary foci, Center students, staff, and faculty developed an instrument to assess the extent to which professional development participants believe they have benefited from prior and current professional development experiences. The Professional Development Questionnaire (PDQ; Bracken, Little, McGowan, Tyler, Baker, Chandler, Quek, & Ginsburgh, 2004) is a comprehensive evaluation of broadly defined professional development experiences (i.e., workshops, ongoing experiences, coaching, self-study). The PDQ assesses

participants' beliefs about *ideal* professional development experiences and *current* PD experiences.

Test of Critical Thinking. Critical thinking is an important aspect of education. Curricular efforts of the Center have included emphases on enhancing students' questioning, searching for evidence, considering multiple options, and general thinking at a deeper, more critical level. Superficial learning and acceptance of rote facts leads to an unquestioning attitude, an attitude that is not beneficial for the learner or society. The Test of Critical Thinking (TCT; Bracken, Bai, Fithian, Lamprecht, Little, & Quek, 2004) provides an assessment of students' ability to critically read text and answer questions accurately based on available facts. Developed on Paul's (1992) model of critical thinking, the TCT is theoretically based and found to be practically useful for students in grades 3–5, but likely will be useful for students in middle and high school as well.

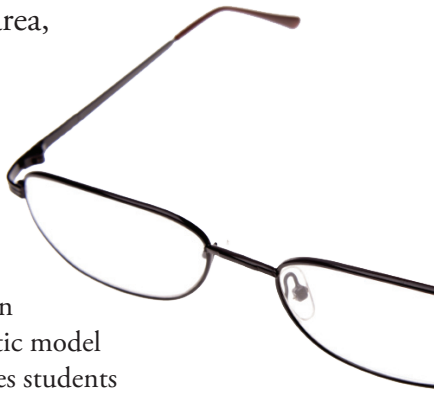
Performance-Based Assessment. In addition to the traditional objective measures developed within the Center, considerable experimentation and application has been made of performance-based assessment (PBA) measures of achievement. PBA is especially useful when researchers are interested in a direct one-to-one assessment of knowledge and skills included within a specific curriculum. PBA has proven especially valuable in the documentation of gains acquired by students who have been exposed to various Center curricula.

ASPIRE. The ASPIRE (Tieso, 2006) was developed to measure teacher attitudes toward reform, change, and innovation. There are seven subscales, each of which focuses on a separate strand of research that promotes change: evidence-based practices that enhance reform, factors that sustain reform, support mechanisms, strong leadership, effective site-based leaders, collaboration, and professional development.

Recognizing the value of equity, fairness, and objectivity in gifted identification and ability assessment, all of the Center's curricular efficacy studies have researched and employed instruments known to have the highest technical qualities and shown to be fair for diverse populations of students. Investigative studies have considered the differential identification rates and behavioral profiles of students from differing socioeconomic, race/ethnicity, geographic, and gender groups. Fairness and equity in assessment is a hallmark consideration of the Center's assessment and evaluation efforts.

What Works in Professional Development

An acknowledged important adjunct to demonstrating curriculum efficacy with students is the corresponding capacity of teachers to deliver the curriculum in an effective and faithful manner. Thus our research agenda has focused on this area of study, as well. As part of any ongoing curriculum innovation research project, teachers typically have received 2–4 days of training in a curriculum unit of study before implementation with targeted students. The professional development agenda with teachers has focused strongly on the faithful implementation of a unit of study in a given subject area, coupled with instruction and application in the use of central teaching and learning models central to curriculum delivery. Across all units of study, the professional development sessions with teachers have stressed the use of the following interdisciplinary models.



- **Problem-based learning.** The focus for professional development is on helping teachers facilitate student work through an unstructured problem in small groups of four or five students by completing a "Need to Know" board, asking probing questions, preparing resources needed, monitoring the preparation of problem logs, and assisting in problem resolution papers and presentations to real audiences.
- **Concept development.** Professional development sessions model teacher use of inquiry as a tool for students' constructing their own understanding of a meta-concept like *change* or *systems* through guided work. Teachers provide 25 examples of a concept such as change, categorize the examples, cite nonexamples, and draw generalizations about the concept. A debriefing session allows teachers to reflect on using the approach with students.
- **Research study.** The emphasis in professional development is on providing teachers with a heuristic model of the research process that moves students from defining a problem, posing research questions, and collecting data from multiple sources, to analyzing and synthesizing findings and drawing implications for use in both written and oral venues. Teachers then work through the model in teams, discussing various applications for use in their classrooms.
- **Analyzing and interpreting text.** Preparing teachers to use the literature web involves their exploration of a poem by using the elements of the web to focus on choice of words, reader response, main ideas, imagery and symbolism, and the structure of the writing. The facilitator of the session then models the follow-up discussion to be conducted with students as

meaning is built, and the web is used as a tool to elevate thinking about the reading selection.

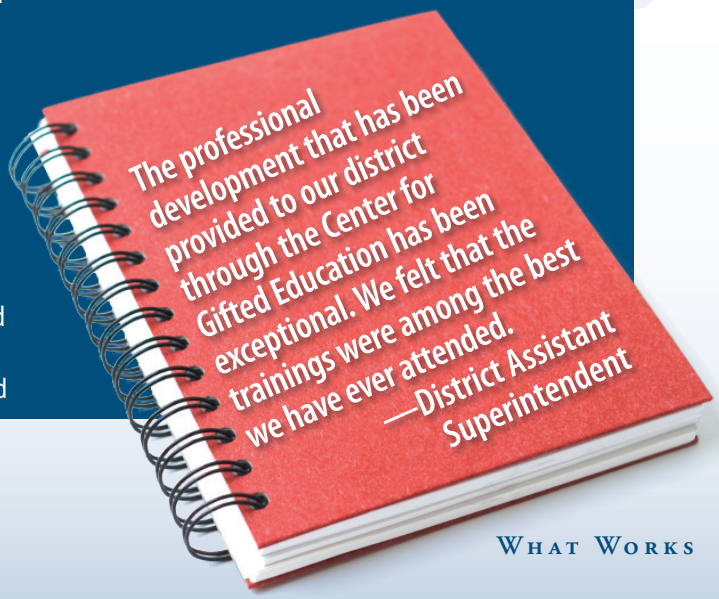
- **Developing persuasive writing skills.** The professional development session helps teachers focus student writing on a model that emphasizes the structure of claim, data, and warrant in the construction of logical argument, using the analogy of building a sandwich. The use of the model in classrooms is further explained and stresses power writing, instruction in the assessment rubric, and peer review.
- **Teaching critical thinking.** The focus of professional development work is on teachers using the eight elements of reasoning (Paul, 1992) to facilitate student growth in thinking ability by employing the elements in different combinations in activities, questions, and project work. Facilitators model the various contexts in which the model may be applied.

The professional development sessions also have emphasized the importance of using performance-based assessment, built into the units of study, as a way to know that students have progressed in their learning.

The Center for Gifted Education faculty and staff have conducted several studies on professional development during the past 20 years. These studies have focused on questions of teacher efficacy, perceptions about critical thinking, differentiation strategy use, and treatment fidelity to newly designed curriculum. Central findings from these studies are found below.

Research Findings in Brief

- Teachers can significantly improve their skills in the differentiation strategies of problem solving, critical thinking, curriculum delivery, and metacognition, given ongoing professional development in such strategies embedded in a social studies curriculum (Avery, 1999).
- Untrained teachers of the gifted in Title I schools can significantly improve their skills in the differentiation strategies of critical thinking, creative thinking, and accommodation to individual differences across 2 years, given training and implementation support in a structured language arts program (VanTassel-Baska et al., 2008).
- Two years of professional development are necessary to enhance the use of differentiation strategies, even with a curriculum base provided (VanTassel-Baska et al., 2008).
- The employment of professional development practices focused on curriculum implementation contributes to positive teacher change (Brown, 2007).
- Teachers score at differential levels in critical thinking and creative thinking, rendering it problematic for them to teach these skills to students if they are low in the capacity to use the skills themselves (McGowan, 2007).
- Exemplary secondary teachers of the gifted in specialized schools in Singapore and the United States score high in the use of differentiated strategies and have incorporated these practices effectively into their daily repertoire (VanTassel-Baska, Feng, & MacFarlane, 2007).
- Teacher self-assessments of differentiation use suggest that they are using differentiation strategies more frequently and more effectively than external trained assessors would rate them (Avery, 1999; Tyler, 2006).
- When teachers employ differentiation strategies, there is corresponding active engagement of students with the learning process (VanTassel-Baska et al., 2008).
- Although all of these studies employed quasi-experimental designs, larger scale studies on the differential impact of teacher preparation with and without a structured curriculum would prove useful for future work.



What Works: Lessons Learned From 20 Years of Curriculum Development and Research

Specific lessons are identified based on general findings from our research and development projects on the William and Mary curriculum. These lessons may prove useful for mounting new or ongoing efforts in the curriculum development enterprise for high-end learning.

Lesson #1: *Curriculum Design Matters*

All William and Mary curricula feature the Integrated Curriculum Model (ICM) as the guiding theoretical framework for curriculum design. The Center for Gifted Education units have been piloted in schools nationwide and found to improve student achievement, not only in the specific content areas, but also in critical thinking and understanding overarching concepts. Each unit, regardless of the content focus, features the following blueprint specifications:

- a curriculum framework that identifies learning goals and anticipated outcomes;
- authentic assessments for content, concept, and process as a guide for diagnostic and prescriptive instruction, as well as formal assessment;
- emphasis on higher level thinking and reasoning through questioning and activities;
- inquiry-based meaningful, hands-on, and minds-on experiences;
- use of graphic organizers;
- inclusion of accelerated reading and advanced resources;
- use of a broad-based concept (e.g., systems, cause-effect, change) to elevate understanding of the subject under study;
- metacognition and reflection components;
- incorporation of interdisciplinary, real-world research;
- use of teaching models to scaffold instruction and to promote higher level thinking skills;
- strong content emphasis that focuses on discipline-specific skills and concepts; and
- use of technology integration tools.

Lesson # 2: *The Curriculum Development Process Matters*

All of the curriculum developed by The Center for Gifted Education over the past 20 years has followed not only a set of design specifications consistent with curriculum reform, it also has followed a consistent approach to development.

We have begun to develop each unit with a review of relevant research on the topic, age level of the student, and the best practices for teaching in the discipline under study. This research phase also takes into account alignment with state standards and curriculum reform research in each subject matter. These findings then are used as the basis for creating a draft set of lessons. These lessons are tried out in relevant classrooms and revised, based on student receptivity and teacher feedback. Next, an entire unit of study is prepared for piloting in one teacher's classroom. Multiple data sources are used to judge the effectiveness of the unit after implementation, including teacher log notes, student learning results, and outside expert review. Revisions then are made to each unit, based on triangulation of the feedback. The units are field-tested at multiple sites with different teachers and data collected on treatment fidelity, student growth, and teacher perceptions of effectiveness. Based on these data, the units are revised a second time before they are disseminated nationally. This multiple stage process allows us to refine the product, based on sources of evidence, to enhance its use as an agent of positive learning.

Lesson #3: *Curriculum Development Work for High-End Learning Requires Collaboration With Content Experts and Teachers*

Discipline-specific expertise is needed to design, develop, and refine curricula to be used with our best learners. Essential content understandings need be developed and articulated that are core to understanding the discipline. Content experts must be an integral part of unit design and review at the beginning stages of development, as well as critiques of later drafts of work.

Similarly, a curriculum that will significantly enhance student achievement must be created with strong teacher involvement. Collaboration among grade-level teachers, content specialists, and educators of the gifted at all phases of curriculum development produces a higher quality product. Collaboration time should be apportioned to the critical tasks of curriculum development and piloting, discussing student assessments, grouping mechanisms, and alignment to relevant standards.

Lesson #4: *Student Exposure to Repeated Models Over Time Enhances Student Achievement and Learning Transfer*

Curriculum delivery requires the use of carefully selected teaching and learning models over time. Research-based, packaged curriculum that has been extensively piloted is more likely to be sustained over time and leads to statistically and educationally important gains in student achievement when compared to idiosyncratic teacher-created materials (VanTassel-Baska, 2003) or strategies devoid of content emphases (Westberg & Daoust, 2003). When students consistently are introduced to the same models (e.g., Paul's Reasoning Model, the Persuasive Writing Model, problem-based learning) over time, learning is enhanced continually (Feng et al., 2005). Moreover, students are more likely to internalize the processes inherent to each model so that their thinking becomes more automatic and thus transfers to new learning situations with ease.

Lesson #5: *High-Level Curriculum May Be Used Successfully With All Learners*

Recent Center studies of science and language arts curriculum effectiveness in heterogeneous Title I classrooms have shown that a curriculum written for gifted learners also is effective with nongifted learners, given the use of proper differentiation, scaffolding, and flexible grouping techniques (VanTassel-Baska et al., 2008; VanTassel-Baska, Bracken, et al., 2007). Scaffolding may be in the form of a supplemental curriculum or specific differentiated strategies and pacing. In language arts, *Jacob's Ladder* was developed to provide additional scaffolding in reading to expose less-experienced students with models that bridge lower level to higher level thinking. *Navigator* novel studies were written so that students could have more choice in novel selections and differentiated activities at a given reading level. In science, specific models were developed to scaffold student's thinking in planning scientific investigations. Pacing of units also was modified within the regular classroom and instructional grouping encouraged effective discussions.

Lesson #6: *Promising Learners From Low-Income Backgrounds and Students of Color Benefit From High-Powered Curriculum*

The research evidence we have collected over multiple projects, as well as evidence collected by our colleagues (e.g., Swanson, 2006), suggests that the William and Mary units are effective with these special populations of promising learners. In fact, the data suggest that, given enough time, these students perform at comparable levels of more advantaged learners in selected areas like persuasive writing (VanTassel-Baska et al., 2002). In Title I schools, all groups showed significant and important growth in key areas of language arts, social studies, and science learning after using the units, including groups of diverse learners.

The use of such curriculum, however, must be accompanied by faithful use of the teaching-learning models provided that scaffold instruction at higher levels of discourse and thought for less-experienced learners in a subject area.

Lesson #7: *Use of Curriculum-Based Assessment Documents Authentic Learning*

Assessment should be aligned to the curriculum and standards taught within any given discipline. Many standardized assessments, while important, are broad-based and may not be sensitive enough to show specific student learning associated with a curriculum intervention. Therefore, pre- and post-curriculum-based assessments are an essential component for measuring the effectiveness of a curriculum on student achievement. In each William and Mary curriculum unit, the first lesson or set of lessons provides a curriculum-based assessment, matched to content, thinking, and problem-solving processes, and overarching concepts so that teachers may use the assessment as a diagnostic tool for instruction. The last lesson of each unit contains a postassessment to assess gains in student achievement over the course of the unit.

The assessment section of this document provides a list of instruments written specifically for our curriculum projects to measure aspects of content, concept, and process learning in students and aspects of teacher behaviors and attitudes. Not only is it important to match assessment to judging the efficacy of curriculum, but also to study teacher variables of interest.

Lesson #8: *Professional Development on Curriculum Materials Enhances Faithful Implementation*

When teaching gifted students, not only does curriculum matter, but the teacher is key. When students in the top 20th percentile grow in achievement, their success may be attributed to placement with highly effective teachers (Sanders & Rivers, 1996). When advanced students do not make noted gains, it may be caused by a lack of opportunity to proceed at their own pace or to be accelerated in their learning, lack of challenging materials, or the concentration of instruction on average or below-average students (Wright, Sanders, & Horn, 1997, p. 66). Instead, teachers need to use critical thinking and metacognition routinely to enhance student learning (Wenglinsky, 2000).

Likewise, advanced instructional practices are more likely to be sustained when a curriculum, embedded with differentiation strategies, is provided as the basis for professional development (VanTassel-Baska, Tieso, & Stambaugh, 2007). Direct training, as well as ongoing, on-the-job professional development concerning use and implementation of new curricula, greatly increases overall effectiveness because teachers do not have to make inferences about how to use new strategies they have learned.

Lesson #9: *Fidelity of Implementation of Innovative Curriculum Efforts Requires Monitoring*

Our work suggests that in order for curriculum to be implemented well, it must be monitored to ensure that teachers are using strategies both frequently and effectively. Such monitoring is a significant part of a curriculum effectiveness research protocol, but also should be an ongoing part of ensuring that professional development results in improved student learning (Guskey, 2000). Whether such monitoring is done by the principal or his designee, the instructional coach, the leaders of a grade level team, or a mentor is not what matters, as each school has its own system for instructional management. What does matter is that there is documentation for teachers using higher level thinking and problem solving in their classrooms in a way that enhances student engagement and achievement over time.

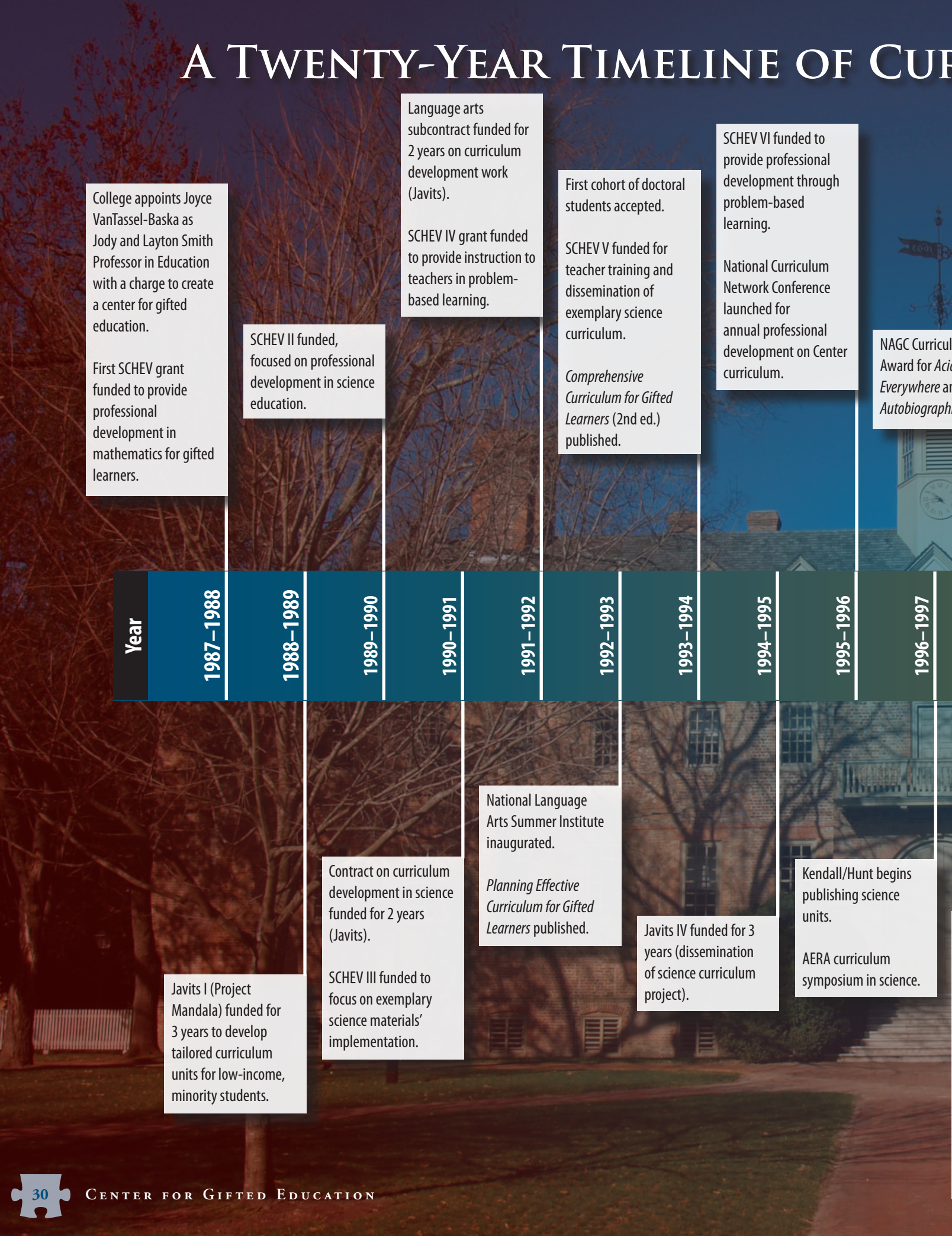
Lesson #10: *Institutionalization of Innovative Curriculum and Instruction Requires Ongoing Attention*

One of the critical issues in conducting curriculum intervention studies is the long-term sustainability of the innovation after the project is completed. There are several factors that are likely to encourage or discourage innovation and change. For example, we have learned that innovation is difficult to maintain after project funding subsides due to competing resources, competing priorities with the overarching school reform agenda, and a lack of monitoring and attention of administrators (Brown, 2007). Schools that have been able to sustain curriculum interventions, particularly for advanced students, have emphasized ongoing assessment and monitoring of high-end student achievement and instituted policies that require the use of research-based curriculum (VanTassel-Baska, Avery, Hughes, & Little, 2000). Schools also have recognized that results in student achievement and changes in teacher behaviors happen over time with guided and intensive professional development and monitoring (Borko, Mayfield, Marion, Flexer, & Cumbo, 1997; VanTassel-Baska et al., in press).

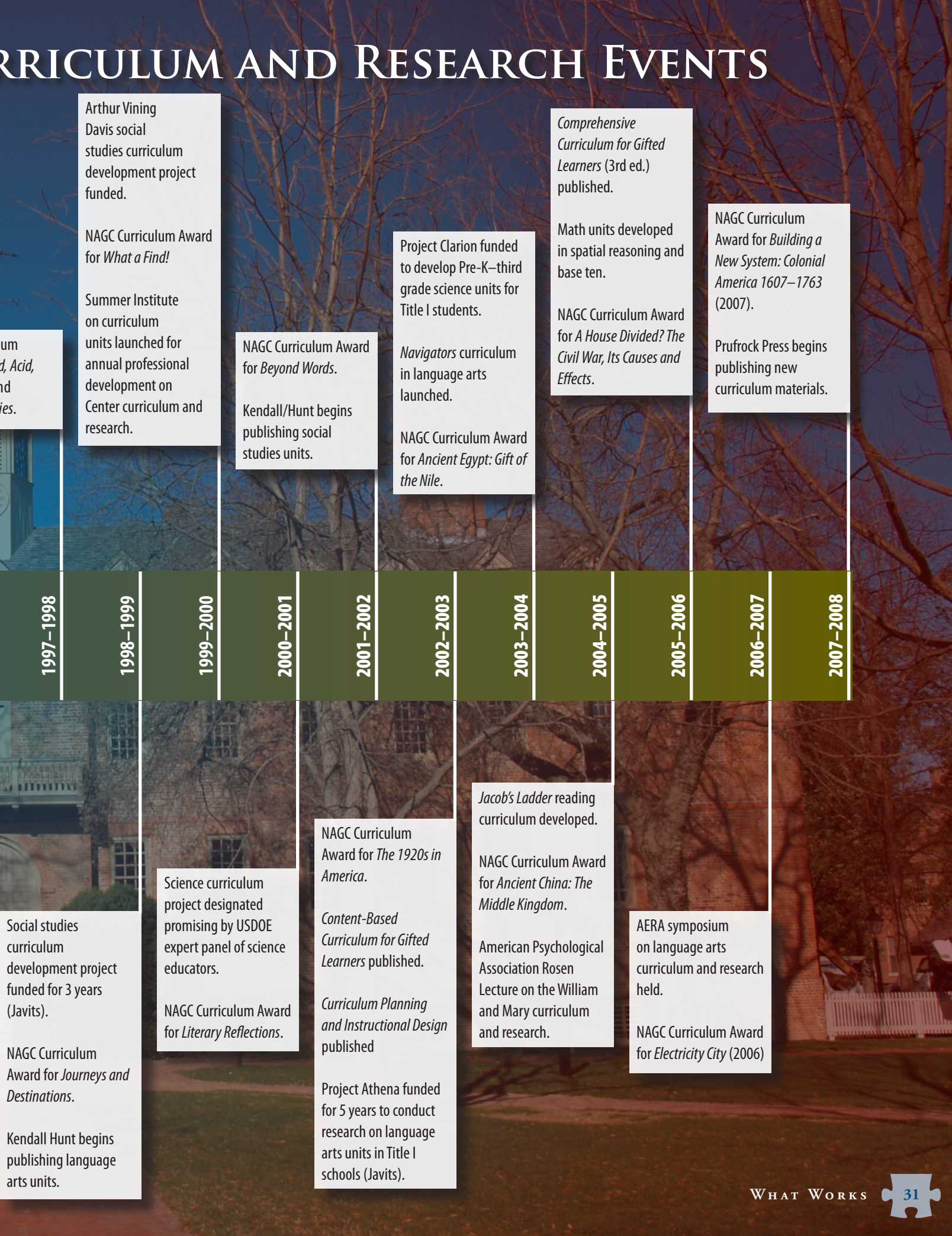
Conclusion

This publication has presented current research findings on what works in curriculum designed for high-end learning and the tools and processes that need to be employed for implementing such curriculum. The puzzle pieces of curriculum instruction, assessment, and professional development can make for a cohesive whole to ensure that schools become the true center of authentic learning for students, teachers, and parents. Optimal learning for all students includes a needed emphasis on our best learners, not just for their individual benefit but for the benefits to the total enterprise of schooling by using high-quality curriculum and instruction materials.

A Twenty-Year Timeline of Cur



rriculum and Research Events



1997–1998

Social studies curriculum development project funded for 3 years (Javits).

NAGC Curriculum Award for *Journeys and Destinations*.

Kendall Hunt begins publishing language arts units.

1998–1999

Science curriculum project designated promising by USDOE expert panel of science educators.

NAGC Curriculum Award for *Literary Reflections*.

1999–2000

NAGC Curriculum Award for *The 1920s in America*.

Content-Based Curriculum for Gifted Learners published.

Curriculum Planning and Instructional Design published

Project Athena funded for 5 years to conduct research on language arts units in Title I schools (Javits).

2000–2001

Jacob's Ladder reading curriculum developed.

NAGC Curriculum Award for *Ancient China: The Middle Kingdom*.

American Psychological Association Rosen Lecture on the William and Mary curriculum and research.

2001–2002

AERA symposium on language arts curriculum and research held.

NAGC Curriculum Award for *Electricity City* (2006)

2002–2003

NAGC Curriculum Award for *Beyond Words*.

Kendall/Hunt begins publishing social studies units.

2003–2004

Project Clarion funded to develop Pre-K–third grade science units for Title I students.

Navigators curriculum in language arts launched.

NAGC Curriculum Award for *Ancient Egypt: Gift of the Nile*.

2004–2005

Comprehensive Curriculum for Gifted Learners (3rd ed.) published.

Math units developed in spatial reasoning and base ten.

NAGC Curriculum Award for *A House Divided? The Civil War, Its Causes and Effects*.

2005–2006

NAGC Curriculum Award for *Building a New System: Colonial America 1607–1763* (2007).

Prufrock Press begins publishing new curriculum materials.

2006–2007

Arthur Vining Davis social studies curriculum development project funded.

NAGC Curriculum Award for *What a Find!*

Summer Institute on curriculum units launched for annual professional development on Center curriculum and research.

2007–2008

Publications on Center Curriculum

Books

VanTassel-Baska, J. (1994). *Comprehensive curriculum for gifted learners* (2nd ed.). Boston: Allyn & Bacon.

VanTassel-Baska, J. (2003). *Curriculum planning and instructional design for gifted learners*. Denver, CO: Love.

VanTassel-Baska, J., & Little, C. A. (Eds.). (2003). *Content-based curriculum for high-ability learners*. Waco, TX: Prufrock Press.

VanTassel-Baska, J., & Stambaugh, T. (2006). *Comprehensive curriculum for gifted learners* (3rd ed.). Needham Heights, MA: Allyn & Bacon.

Research Articles

VanTassel-Baska, J. (1986). Effective curriculum and instructional models for talented students. *Gifted Child Quarterly, 30*, 164–169.

VanTassel-Baska, J. (1994). Development and assessment of integrated curriculum: A worthy challenge. *Quest, 5*(2), 1–6.

VanTassel-Baska, J. (1998). A study of problem-based learning in teaching educational administration courses. In R. Muth & M. Martin (Eds.), *Toward the year 2000: Leadership for quality schools, 1998 NCPEA Yearbook* (pp. 279–288). Denver: University of Colorado.

VanTassel-Baska, J. (2003). *Content-based curriculum for low income and minority gifted learners* (RM3180). Storrs: National Research Center on the Gifted and Talented, University of Connecticut.

VanTassel-Baska, J., & Brown, E. (2004). Research on curriculum models. In F. Karnes & S. Bean (Eds.), *Methods and materials for teaching the gifted* (2nd ed., pp. 75–106). Waco, TX: Prufrock Press.

VanTassel-Baska, J., & Brown, E. (2007). Towards best practice: An analysis of the efficacy of curriculum models in gifted education. *Gifted Child Quarterly, 51,* 342–358.

VanTassel-Baska, J., Quek, C., & Feng, A. (2007). The development and use of a structured teacher observation scale to assess differentiated best practice. *Roeper Review*, *29,* 84–92.

VanTassel-Baska, J., Feng, A., Brown, E., Bracken, B., Stambaugh, T., French, H., et al. (in press). A study of differentiated instructional change over three years. *Gifted Child Quarterly*.

VanTassel-Baska, J., & Wood, S. (in press). The integrated curriculum model. In J. Renzulli (Ed.), *Systems and models in gifted education*. Mansfield Center, CT: Creative Learning Press.

Language Arts and Science

Feng, A., VanTassel-Baska, J., Quek, C., O'Neil, B., & Bai, W. (2005). A longitudinal assessment of gifted students' learning using the integrated curriculum model: Impacts and perceptions of the William and Mary language arts and science curriculum. *Roeper Review, 27,* 78–83.

VanTassel-Baska, J., Avery, L. D., Hughes, C. E., & Little, C. A. (2000). An evaluation of the implementation of curriculum innovation: The impact of William and Mary units on schools. *Journal for the Education of the Gifted, 23,* 244–272.

Language Arts

Bracken, B. A., VanTassel-Baska, J., Brown, E. F., & Feng, A. (2007). Project Athena: A tale of two studies. In J. VanTassel-Baska & T. Stambaugh (Eds.), *Overlooked gems: A national perspective on promising students of poverty* (pp. 63–67). Washington, DC: National Association for Gifted Children.

French, H. (2006). *The use of Jacob's Ladder to enhance critical thinking abilities in gifted and promising learners populations*. Unpublished doctoral dissertation, College of William and Mary, Williamsburg, VA.

Hughes, C. E. (2000). *A comparative study of teaching critical thinking through persuasive writing to average, gifted, and students with learning disabilities*. Unpublished doctoral dissertation, College of William and Mary, Williamsburg, VA.

Little, C. A. (2001). *The effects of instruction on young children's figurative competence: A study of metaphor development*. Unpublished doctoral dissertation, College of William and Mary, Williamsburg, VA.

Stambaugh, T. (2007). *Effects of the Jacob's Ladder Reading Comprehension Program on third, fourth, and fifth grade students' reading comprehension and critical thinking in Title I schools.* Unpublished doctoral dissertation, College of William and Mary, Williamsburg, VA.

Stambaugh, T. (2008). *Effects of the Jacob's Ladder Reading Comprehension Program*. Manuscript submitted for publication.

VanTassel-Baska, J., Bracken, B., Feng, A., & Brown, E. (2008). *A longitudinal study of reading comprehension and reasoning ability of students in elementary Title I schools*. Manuscript submitted for publication.

VanTassel-Baska, J., Johnson, D. T., Hughes, C. E., & Boyce, L. N. (1996). A study of language arts curriculum effectiveness with gifted learners. *Journal for the Education of the Gifted, 19,* 461–480.

VanTassel-Baska, J., Tieso, C., & Stambaugh, T. (2007, November). *Project Athena: Longitudinal effects of a reading intervention curriculum on teachers and students.* Paper presented at the National Association for Gifted Children Annual Conference, Minneapolis, MN.

VanTassel-Baska, J., & Stambaugh, T. (2006). Project Athena: A pathway to advanced literacy development for children of poverty. *Gifted Child Today, 29*(2), 58–65.

VanTassel-Baska, J., Zuo, L., Avery, L., & Little, C. (2002). A curriculum study of gifted-student learning in the language arts. *Gifted Child Quarterly, 46,* 30–43.

Professional Development

Avery, L. D. (1999). *Teacher efficacy and behavior: Their relationship and impact on student learning.* Unpublished doctoral dissertation, College of William and Mary, Williamsburg, VA.

Brown, E. (2007, April). *Case studies of school reform and innovation: Project Athena findings.* Paper presented at the American Education Research Association Conference, Chicago.

McGowan, S. (2007). *An exploratory study of the use of critical and creative thinking in elementary language arts classrooms.* Unpublished doctoral dissertation, College of William and Mary, Williamsburg, VA.

Tyler, K. (2006). *A study of perceived teacher effectiveness.* Unpublished doctoral dissertation, College of William and Mary, Williamsburg, VA.

VanTassel-Baska, J., MacFarlane, B., & Feng, A. (2006). A cross-cultural study of exemplary teaching: What do Singapore and the United States secondary gifted class teachers say? *Gifted and Talented International, 21*(2), 38–47.

Science

Johnson, D., Boyce, L. N., & VanTassel-Baska, J. (1995). Science curriculum review: Evaluating materials for high ability learners. *Gifted Child Quarterly, 39,* 36–43.

VanTassel-Baska, J., Bass, G., Ries, R., Poland, D., & Avery, L. (1998). A national pilot study of science curriculum effectiveness for high ability students. *Gifted Child Quarterly, 42,* 200–211.

VanTassel-Baska, J., Bracken, B. A., Stambaugh, T., & Feng, A. (2007, September). *Findings from Project Clarion.* Presentation to the United States Department of Education Expert Panel, Storrs, CT.

Social Studies

Little, C. A., Feng, A. X., VanTassel-Baska, J., Rogers, K. B., & Avery, L. D. (2007). A study of curriculum effectiveness in social studies. *Gifted Child Quarterly, 51,* 272–284.

Other References Cited in This Document

Borko, H., Mayfield, V., Marion, S. F., Flexer, R. J., & Cumbo, K. (1997). *Teachers developing ideas and practices about mathematics performance assessment: Successes, stumbling blocks, and implications for professional development*. Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).

Guskey, T. R. (2000). *Evaluating professional development.* Thousand Oaks, CA: Corwin Press.

Paul, R. (1992). *What every thinking person needs to know.* Sonoma, CA: Critical Thinking Foundation.

Sanders, W., & Rivers, J. (1996). Cumulative and residual effects of teachers on future student academic achievement (Research Progress Report). Retrieved December 27, 2007, from http://downloads.heartland.org/21803a.pdf

Swanson, J. (2006). Breaking through assumptions about low-income, minority gifted students. *Gifted Child Quarterly, 50,* 11–24.

Wenglinsky, H. (2000). *How teaching matters: Bringing the classroom back into discussions of teacher quality.* Princeton, NJ: The Milken Family Foundation and Educational Testing Service.

Westberg, K. L., & Daoust, M. E. (2003, Fall). The results of the replication of the classroom practices survey replication in two states. *The National Research Center on the Gifted and Talented Newsletter*, 3–8.

Wright, S. P., Sanders, W. L., & Horn, S. P. (1997). Teacher and classroom context effects on student achievement: Implications for teacher evaluation. *Journal of Personnel Evaluation in Education, 11,* 57–67.

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Linda Neal Boyce, whose association with the Center began as a coordinator of the Libraries Link Learning Project, worked as a curriculum reviewer and materials specialist for the science curriculum units and as a consultant for the language arts curriculum units. She is the principal author of *A Guide to Teaching Research Skills and Strategies for Grades 4–12,* disseminated by the Center, and coeditor of *Developing Verbal Talent*. She currently serves as a librarian in Dozier Middle School in Newport News, VA. She has published articles and made presentations to state and national audiences on a wide range of curriculum for the gifted. Ms. Boyce holds an M.L.S. degree from Florida State University. She is the mother of two children.

Elissa F. Brown is the Academically or Intellectually Gifted Consultant with the North Carolina Department of Public Instruction. Formerly she served as the director of the Center for Gifted Education at The College of William and Mary, where she taught graduate courses in gifted education and served as manager for Project Athena. Dr. Brown received her bachelor's degree in education from the University of Georgia and a master's in educational administration from Western Carolina University. She received her Ph.D. in educational planning, policy, and leadership with an emphasis in gifted education from The College of William and Mary. Prior to her work with the Center for Gifted Education, she was director of the Chesapeake Bay Governor's School for Marine and Environmental Science. She also has been a gifted program coordinator, and her teaching experiences include more than 11 years in a multitude of educational settings. Dr. Brown is the current treasurer of the Virginia Association for the Gifted and serves on the State Advisory Committee for the Gifted. She is a contributing author to *Methods and Materials for Teaching the Gifted* (2005). She is the recipient of the National Association of Gifted Children's 2004 Early Leader Award. She has coordinated state and national gifted conferences and presents widely on a variety of topics in gifted education.

Kimberley Chandler is the curriculum director at the Center for Gifted Education at The College of William and Mary. She completed her Ph.D. in educational policy, planning, and leadership, with an emphasis in gifted education administration, at The College of William and Mary; her dissertation study focused on curriculum policies and practices in gifted education in the United States. While a doctoral student, Kimberley earned several awards from the National Association for Gifted Children (NAGC), including the A. Harry Passow Classroom Teacher's Scholarship, the Doctoral Student Award, and the Hollingworth Research Award. Her professional background includes teaching gifted students in a variety of settings, serving as an administrator of a school district gifted program, providing professional development training for teachers and administrators, and leading academic review teams for the Virginia Department of Education. Kimberley also has taught gifted education endorsement courses for The College of William and Mary, the University of Virginia, and CaseNEX, Inc. She has conducted workshops on a variety of topics for parents, teachers, and administrators in numerous states and in several foreign countries.

Annie Xuemei Feng is a cancer research award fellow in evaluation at the National Cancer Institute of the National Institute of Health. Previously she served as the director of research and evaluation at the Center for Gifted Education at The College of William and Mary in Virginia where she coordinated the Center's research and evaluation projects. She has been engaged in several aspects of the Center's research agenda, including writing research and evaluation proposals, conducting statistical and technical adequacy analyses, and mentoring doctoral students on research design and analytical methods. Dr. Feng is a frequent presenter at national and international conferences. She has coedited two books and has published numerous articles and book chapters in recent years. She was the 2003 recipient of Mensa International Award for Excellence in Research. Dr. Feng also is one of the principal investigators of the International Academic Olympiad Studies, a cross-cultural study involving researchers from several countries. Before she came to work at the Center, she served as the assistant/associate director of the Junior Science and Humanities Symposium in the New York metropolitan area.

Valerie Hastings Gregory is the Assistant Director of Staff Development at Chesterfield County Public Schools. Formerly, she was the director of Project Clarion. She has served as a visiting assistant professor of gifted education at The College of William and Mary and has held leadership positions in a variety of other capacities: district gifted program coordinator, elementary assistant principal, and gifted program specialist at the Commonwealth of Virginia Department of Education. Valerie has devoted much of her professional life to shaping professional learning communities in schools and has facilitated professional development in gifted education, assessment, curriculum, instruction, and leadership in more than 43 states and Canada. She received her doctorate in education policy planning and leadership from The College of William and Mary, where she extensively studied conditions for transfer of professional development to classroom practice and curriculum development. While a doctoral student, Valerie received the Outstanding Doctoral Student Award from the National Association for Gifted Children. Valerie is the author of three books, *A Learning Community Guide to Improving Reading Instruction*, *Conditions that Support Transfer for Change*, and *Problem-Based Learning in Social Studies*.

Dana T. Johnson has worked on many projects with the Center for Gifted Education since its beginning in 1988. She was a curriculum reviewer for the Javits science curriculum project and was the project manager of the Javits language arts curriculum project. She has been an instructor in the Saturday and summer enrichment program at the Center. She is an editor of *Developing Verbal Talent* along with Joyce VanTassel-Baska and Linda Neal Boyce. She is the author of "Mathematics Curriculum for Gifted Learners" in the second edition of *Comprehensive Curriculum for Gifted Learners* and "Adapting Mathematics Curriculum for High-Ability Learners" in *Content-Based Curriculum for High-Ability Learners*. Dana is an instructor in the Mathematics Department and the School of Education at the College of William and Mary. Currently she is developing mini-units in mathematics for gifted learners for the Center.

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Janice Robbins earned her Ph.D. in educational research and evaluation from Virginia Tech and her master's in curriculum and instruction from George Mason University. Prior to working at the Center for Gifted Education, Dr. Robbins was Chief of the Curriculum and Instruction for the Department of Defense Education Activity, directing the K–12 curriculum, instruction, and professional development programs for the stateside and overseas DOD schools. She was principal of Longfellow Middle School and Haycock Elementary School in Fairfax County Public Schools. Both of these schools service general education populations, as well as highly gifted students. Dr. Robbins was an Education Policy Fellow, Institute for Educational Leadership, past president of Northern Virginia Council for Gifted Education, vice-president of Phi Delta Kappa Chapter 1144, member of the Virginia Tech Northern Virginia Center Advisory Board, and member of the Virginia Gifted Advisory Committee.

Beverly T. Sher is a visiting professor of biology and health professions at The College of William and Mary. Dr. Sher received her Ph.D. in biology from California Tech. She has training in molecular biology and immunology. Her current interests include immunology, emerging infectious diseases, and gifted education. She has published 11 articles in scientific journals including *Science*, *Nature*, *Cell*, and *The Proceedings of the National Academy of Science* based on her work in molecular biology and immunology. In addition, Dr. Sher has published 19 gifted education pieces including research articles for gifted education journals, book chapters, and problem-based curriculum units for gifted students through her work with the Center for Gifted Education.

Tamra Stambaugh is the director of grants and special projects at The College of William and Mary, Center for Gifted Education. She has a variety of experiences in education, including regular classroom teacher, teacher of gifted, coordinator of gifted services, consultant, and adjunct faculty member. Dr. Stambaugh is the coauthor (with Dr. Joyce VanTassel-Baska) of *Comprehensive Curriculum for Gifted Learners* and *Overlooked Gems: A National Perspective on Low-Income Promising Students*. In addition, she has authored or coauthored journal articles, curriculum units, and book chapters related to differentiation, leadership, curriculum and intervention studies, policy, programming, and evaluation. She is the recipient of the NAGC Doctoral Student Award, The College of William and Mary Center for Gifted Education Doctoral Student Award, and the Margaret, The Lady Thatcher Medallion for scholarship, service, and character.

Carol L. Tieso currently teaches courses in gifted education at The College of William and Mary. Prior to completing her doctorate, Dr. Tieso taught for 16 years in a diverse school district in California and served as the coordinator of the district's gifted programs. She completed her doctoral work at the University of Connecticut and earned her Ph.D. in educational psychology with an emphasis on gifted and talented education in June 2000. While a graduate assistant, she worked as a research associate at the National Research Center on the Gifted and Talented, collecting and analyzing data from a national study of professional development practice in gifted education. Before joining the faculty at The College of William and Mary, she served as program coordinator for Programs in Gifted Education at The University of Alabama. She serves as a consultant to the Center's Project Athena research. Dr. Tieso's current research interests include examining the effects of enhanced differentiated curriculum on students' achievement; and the effects of various grouping practices on students' achievement, self-efficacy, and self-concept.

Joyce VanTassel-Baska is the Jody and Layton Smith Professor of Education and executive director of the Center for Gifted Education at The College of William and Mary in Virginia, where she has developed a graduate program and a research and development center in gifted education. Formerly, she initiated and directed the Center for Talent Development at Northwestern University. She also has served as the state director of gifted programs for Illinois, as a regional director of a gifted service center in the Chicago area, as coordinator of gifted programs for the Toledo, OH, public school system, and as a teacher of gifted high school students in English and Latin. She has worked as a consultant on gifted education in all 50 states and for key national groups, including the U.S. Department of Education, National Association of Secondary School Principals, and American Association of School Administrators. She has consulted internationally in Australia, New Zealand, Hungary, Jordan, Singapore, Korea, England, Germany, The Netherlands, and the United Arab Emirates. She is past-president of The Association for the Gifted of the Council for Exceptional Children, and the Northwestern University Chapter of Phi Delta Kappa. She is currently past-president of the National Association for Gifted Children. During her tenure as NAGC president, she oversaw the adoption of the new NCATE standards for gifted education, and organized and chaired the National Leadership Conference on Promising and Low-Income Learners.

Dr. VanTassel-Baska has published widely, including 22 books and more than 500 refereed journal articles, book chapters, and scholarly reports. Recent coauthored and edited books include: *Alternative Assessments With Gifted and Talented Students* (2008), *Serving Gifted Learners Beyond the Traditional Classroom* (2007), *Comprehensive Curriculum for Gifted*

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Dr. VanTassel-Baska has received numerous awards for her work, including the National Association for Gifted Children's Early Leader Award in 1986, the State Council of Higher Education in Virginia Outstanding Faculty Award in 1993, the Phi Beta Kappa faculty award in 1995, the National Association for Gifted Children Distinguished Scholar Award in 1997, and the President's Award, World Council on Gifted and Talented Education in 2005. She has received awards from five states—Ohio, Virginia, Colorado, South Carolina, and Illinois—for her contribution to the field of gifted education in those states. She was selected as a Fulbright Scholar to New Zealand in 2000 and a visiting scholar to Cambridge University in England in 1993. In 2003, she received the Distinguished Achievement Award from the University of Toledo, her alma mater. Her major research interests are on the talent development process and effective curricular interventions with the gifted. She is currently the co-principal investigator on two federally funded research grants: Project Athena, a language arts scaling-up study, and Project Clarion, a science concept attainment study for grades K–3. She holds B.A., M.A., M.Ed., and Ed.D. degrees from the University of Toledo.

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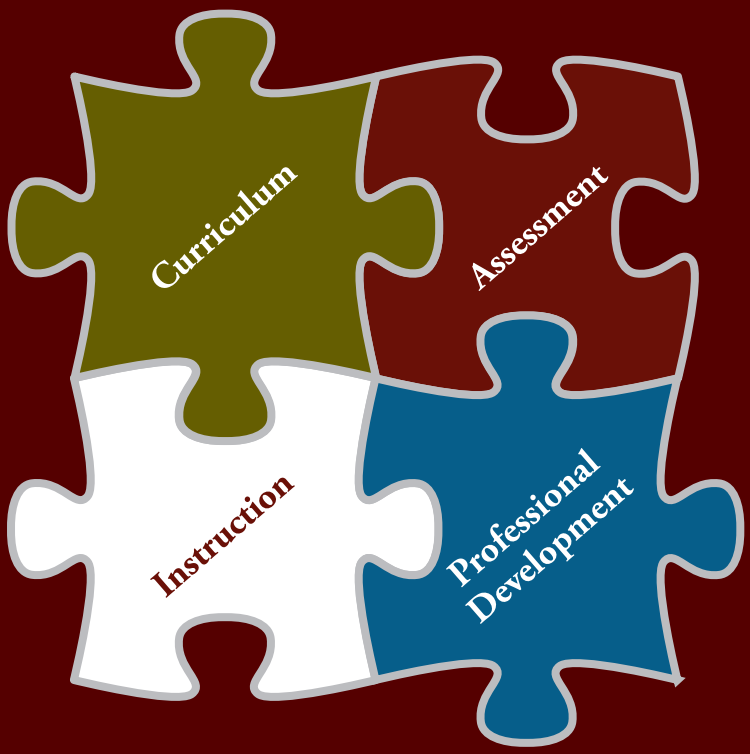

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