What Works in Curriculum for the Gifted

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Curriculum for the gifted learner has become the centerpiece of strong programs for these students at all stages of development. As we come to realize the power of interventions in the process of talent development, we have begun to craft the curriculum, instruction, and assessment aspects of our programs with greater care. In this paper, I will review existing research on curriculum for the gifted, present the work that has shaped the Center for Gifted Education at William and Mary for the past 20 years, and reflect on the lessons learned that are relevant to share with others on the processes of curriculum development.

Research on effective interventions with the gifted

There are several sets of studies that are highly relevant to our crafting effective interventions for gifted learners. These studies may be categorized as accelerated learning studies that offer students content acceleration, grade skipping, compacting, or telescoping—all techniques that allow for a better optimal match between learner and curriculum level (Stanley, 1976; Olszewski-Kubilius, 1998; Lynch, 1992; Stanley, 1991; Stocking & Goldstein, 1992; Swiatek, 2002; Lubinski & Benbow, 2006). Additionally we have studies that focus on instructional techniques such as inquiry, problem-based learning, and thinking strategies that enhance learning for this population (Rogers, 2007; Sternberg, 2006; Grigorenko, Jarvin, & Sternberg, 2002; Gallagher, Stepien & Rosenthal. 1992; VanTassel-Baska, Bass, Ries, Poland, & Avery, 1998). There are also a set of curriculum adaptation studies that have used the standards in each subject area as a point of departure and then modified curriculum through various differentiation techniques (Moon & Feldhusen, 1994; Sternberg, 2000; Van Tassel-Baska, Zuo, Avery, & Little, 2002; VanTassel-Baska, Johnson, Hughes, & Boyce, 1996). Finally, we know about effective interventions from the eminence literature—what approaches were used with highly successful individuals to promote talent development such as tutorials, mentorships, and other forms of personalized learning opportunities (Cox, 1926; Simonton, 2000; Bloom, 1985; Gardner, 2004; Ochse, 1990).

Findings from acceleration studies that are most relevant to curriculum are those that have consistently demonstrated the rate of learning of the gifted and the speeded up proficiency that is realizable in all subject domains for 11-14 year olds. Moreover, the long term impact of accelerated study suggests that not only do they attend more prestigious institutions than nonaccelerated peers, they are also more motivated and more likely to continue studies in graduate school. A recent followup study from the SMPY longitudinal data demonstrate that 30 years later these students are also more creative in respect to books and patents attained. They also earn more money, are more likely to be full professors at prestigious institutions, and publish more than their counterparts.

Curriculum studies suggest that gifted learners can enhance their learning of higher order skills in content areas by being exposed to differentiated units of study, designed to elevate the learning level for them. Sternberg et al. have also demonstrated the value of designing curriculum to match a student's preferred cognitive strength, be it analytical, creative, or practical. Some evidence of greater student motivation exists as a result of using aspects of the School-wide enrichment Model of Renzulli.

Instructional studies have suggested that the use of inquiry is the most powerful teaching tool for working with the gifted. Forms of problem finding and problem-solving also heighten the interest of gifted students and their capacity to perform and create products at advanced levels.

Eminence literature has found that gifted learners are idiosyncratic in their approach to learning and often require a more personalized approach by mentors or tutors. Moreover, they benefit from the attention of adults and older children who can instruct and inspire them to develop. Strong coteries are also helpful in developing talent.

What is differentiation for the gifted?

As we come to understand that theory, research, and practice are intertwined and reiterative not linear, we have also come to appreciate the extent to which experimentation with curriculum requires an appreciation for the manipulation of several variables simultaneously. In its simplest form, differentiation is based on how gifted learners differ from the norm in respect to precocity and complexity, the two most powerful and research-based distinctions that we can identify. Thus differentiation in curriculum comes from being responsive to those very characteristics—offering a curriculum that is advanced, emphasizing higher level thinking and problem solving, and exposing students to the world of great ideas, issues and themes. Such integrated differentiation has been the foundation for the Integrated Curriculum Model, used as the basis for all of the William and Mary curriculum.

Research on the Effectiveness of the Integrated Curriculum Model

Research Design and Central Findings from Language Arts Effectiveness Studies

Research has been conducted to support the effectiveness of the use of the model through testing the learning gains accrued to students in curriculum units developed from the model used with gifted populations within a variety of educational settings. The studies on effectiveness have been conducted over a decade and have been carried out in the subject areas of language arts, science and social studies.

The William and Mary language arts curriculum for high ability learners in grades 3 – 8, based on the ICM model, has been rigorously evaluated with demonstrated effectiveness and acceptance by teachers. Over the last ten years, specific units were evaluated by the National Association for Gifted Children curriculum division and described as "exemplary," resulting in a designated award. Not only have the units undergone four major revisions, the next-to-last edition of the units was field-tested across multiple school districts.

The programmatic goals across all units have consistently been to (a) develop student understanding of the concept of change, (b) develop literary analysis and interpretation, persuasive writing skills, and linguistic competency skills, and (c) promote the reasoning process. Specific learning outcomes have been aligned with the intent of the *National Council of Teachers of English* and the *International Reading Association* standards that advocate for substantive content, high-level thinking processes, and mastery of meaningful language arts skills. However, the studies conducted focused explicitly on student application of literary analysis and interpretation, persuasive writing, and linguistic competency (VanTassel-Baska et al., 1996; VanTassel-Baska et al., 2002).

Using a quasi-experimental design, selected school districts nationally have implemented one or more of these units. Comparison data were gathered from students of comparable ability in the same schools. Post-tests were administered after approximately 36 hours of instruction, and between-group analyses were conducted using an ANCOVA to covary pretest differences. Elementary and middle school students from a national network of schools participated in the sample, including volunteer schools from seven states. Implementation involved 2189 students in experimental and control classrooms in nine schools. All participating teachers received implementation training for 2 to 5 days.

Curriculum effectiveness was assessed on two performance-based instruments modeled after existing instrumentation developed by the National Assessment of Educational Progress in Reading (National Assessment Governing Board, 1992). The first assessment was a performance-based test of literary analysis and interpretation. Rubrics and exemplars evolved from pilot testing of literary analysis assessment. The second instrument was a performance-based persuasive writing assessment, the rubric for which was based on a rubric used in earlier studies to assess thinking in persuasive writing. Both assessments were reviewed for content validity by experts in English and gifted education and were given favorable reviews. Interrater reliability estimates for scoring each instruments exceeded .90 for each scorer team (VanTassel-Baska et al., 2002).

Participating districts were recruited from summer and other training institutes from 1996 - 2000. Guidelines for participation included (a) the designation of an on-site coordinator, (b) selection of at least one experimental and one comparison class, (c) a written description of general district demographics and program descriptors (i.e., grade level, grouping arrangement, and duration of intervention), and (d) permission from an authorized district official.

Post-test analyses were conducted using an ANCOVA that covaried pre-test between-group differences. Effect sizes were calculated for all analyses involving comparison groups. The four William and Mary language arts units employed in the study showed significant pre-post student gains and significant differences between the experimental and comparison groups ($p < .001$); effect sizes were very high for persuasive writing at 2.42 and moderately high for literary analysis at .70. Repeated exposure to the units produced significant gains as well ($p < .05$). Low SES students showed high significant gains in both literary analysis and interpretation and persuasive writing ($p < .001$). Gender differences found were smaller and not educationally important.

An analysis of a subsample from one of the school districts that targeted low-socio economic learners for intervention found that gains in persuasive writing were greater than for the rest of the sample, suggesting the high success potential of the curriculum for this population. A further analysis of student responses from the field-test sample was also conducted, showing that more than 50% of the students had room to grow in higher level skill categories such as elaboration and interpretation, suggesting that the curriculum was challenging to high ability learners.

Although enhanced student learning is the primary indicator of curriculum effectiveness, teachers' favorable experiences with materials and related instructional strategies are also important. Such experiences support teacher acceptance of the materials and contribute to sustained use over time. Teacher acceptance was evaluated and found to be high in respect to curriculum elements employed, challenge, and reuse (VanTassel-Baska et al., 1996; Feng, VanTassel-Baska, Quek, O'Neil, & Bai, 2005). Moreover, a study of using selected school districts demonstrated that the curriculum also impacted positive school change (VanTassel-Baska et al., 2000).

Project Athena Findings

Based on the growing research evidence on the use of The College of William & Mary's language arts units with gifted learners, the team at William and Mary began a three-year longitudinal study of using the curriculum in Title 1 schools and inclusive classrooms with all learners (VanTassel-Baska & Bracken, in press)

Using an experimental design, 28 experimental classrooms implemented a William and Mary unit in grades 3, 4, or 5. More vigorous instruction was included in this study: an investigator-developed Test of Critical Thinking (TCT) and the use of reading comprehension section of the Iowa Test of Basic Skills (ITBS) in addition to the performance-based measures.

The sample for this three year study was 2771 students, with 735 in the experimental group and 611 in the control. Formal training for teachers in the implementing the units was conducted for four days across each year. Data analysis featured the use of MANOVA to assess pre-post results for between-group differences. Effect sizes were calculated for all groups. Results suggested that students in experimental classes showed significant and important educational gains in critical thinking with effect size at the moderate level across three years ($p < .05$). While control students also showed significant gains in critical thinking, significant differences favored the experimental group with small effect sizes of $\acute{\eta}^2 = .037$. All groups within the experiment showed gains including gifted, high readers/promising learners, and typical learners. On the ITBS, reading comprehension subtest, both the experimental and control students showed significant growth. Performance based measures also yielded significant and educationally important results for the experimental students in all ability groups, suggesting that the curriculum is effective with a broad range of learners.

Data were also collected on teacher change as a result of both training and use of a differentiated curriculum. Pre-post data using a classroom observation instrument (the COS-R) suggest that experimental teachers showed significant growth patters in the use of key elements of differentiation (i.e. critical thinking, creative thinking, accommodation to individual differences) across two years of implementation of the William and Mary units of study in comparison to control teachers.

Research Design and Central Findings from Science Curriculum Effectiveness Studies

This study tested the effectiveness of a problem-based learning curriculum with gifted learners on designing original scientific experiments. It was hypothesized that gifted learners using a problem-based science curriculum designed for higher level concept development and thinking would outperform equally able learners not using the intervention in the dimension of scientific research skills. The sample consisted of 62 classrooms in grades 2-7 in total sample in 7 states. Instrumentation was a pres-post performance-based assessment of integrated science process skills developed by Fowler (1990). Procedures for the study involved the training of teachers on the intervention for 5 days and the pre-post administration of the Fowler test in treatment and comparison classes. Analysis of covariance and paired-samples t-tests were employed to test differences between experimental and control students; effect sizes were also calculated. Significant and important treatment effects for integrated scientific process skills as seen in a student generated experimental design were found for experimental groups over controls. No significant gender effects were found. Students improved significantly after unit instruction regardless of the grouping model employed. All students exposed to the units (average and gifted) enhanced their learning at significant levels (VanTassel-Baska et al., 1998).

Additional findings come from the six-year longitudinal study which examined the effects over time of using the William and Mary science units (Feng, VanTassel-Baska, Quek, O'Neil, & Bai, 2005). The results of the study were seen as important in mentioning a second study of the use of the problem-based learning units across cohort groups in the same school district to assess whether growth gains continued to accrue across the implementation of multiple units over time (ie. Three years of schooling). This study examined students at grades 3, 4, and 5 who had been exposed to three problem-based learning units. Using similar analyses to those conducted in the earlier study, findings suggest that gifted students in a pullout program grow significantly each time they were taught a problem-based unit and showed steady gains from pre to post each year (Feng et al., 2005).

Research Design and Central Findings for Social Studies Curriculum Effectiveness Studies

A quasi-experimental study was designed to assess the efficiency of the William and Mary social studies curriculum with gifted learners and typical learners in heterogeneous settings in six schools in a suburban Virginia enterprise zone school district. It was hypothesized that students exposed to a specific curriculum intervention in social studies would outperform similar students not using the intervention on measures of concept and content learning and critical thinking. It was also hypothesized that teachers trained in the project pedagogy would show change over time in observed and self-reported behaviors supporting high-end learning. The sample consisted of 1200 students in grades 2, 4, and 7 in six schools. Instrumentation included the following tools:

- A conceptual thinking assessment, three multi-part questions, with forms for primary, intermediate, and middle school; evaluator-developed and tested in early stages of the project
- A critical thinking assessment, three multi-part questions, with forms for primary, intermediate, and middle school; evaluator-developed and tested in early stages of the project
- Unit-specific content tests incorporated into the intervention at each level that was investigator-developed
- *The Classroom Observation Scale (COS)*, used to observe fidelity of training and implementation

Procedures for the study involved training for teachers on the intervention, ranging from one to four days for t-each teacher (with some teachers having participated in two previous years of piloting), and a pre and post test administration in treatment and comparison classes. Analyses included an analysis of covariance and paired samples t-tests. A descriptive analysis of teacher behaviors was derived. The treatment group showed significant gains in conceptual reasoning, critical thinking, and content learning (Little, Rogers, VanTassel-Baska & Avery, 2007). Gains were significant in comparison to the control group on the content assessment and on specific items on the other two assessments. Gifted students showed greater gains than did their non-gifted classmates. No significant gender differences appeared on any of the measures (Little et al., 2007). Differences in depth of implementation across schools and teachers corresponded to differences in performance among students. Teachers rated themselves significantly higher on all categories of performance than did external observers. Observation results from external observers showed significant gains for teachers in the category of critical thinking strategies.

Implementation Considerations

Models as Scaffolds for the ICM

The ICM has consistently employed selected teaching and learning models as a way to reinforce desired dimensions of learning. These models are the core emphasis with in the training program on using the William and Mary curriculum and become critical in effective implementation. Three such models are described to illustrate how they exemplify each of the three dimensions of the model.

Advanced Content: Preassessment and accelerated learning

The Center for Gifted Education utilizes curriculum compacting in a series of steps as a scaffold for, and integral part of, the ICM. The purpose of compacting is to truncate known aspects of the curriculum into shorter time periods and to eliminate “coverage” of known material for replacement of more rigorous options. As the first step to compacting, the ICM employs the Diagnostic-Prescriptive approach. In this step, students’ needs are established and documented by asking “What do students need to know and show for the particular unit, skill or concept?” Next, students’ goals and objectives are established. Then appropriate pre-assessments, based on the goals and objectives, are administered. The second step is constituted by the reorganization of curriculum by organizing unnecessary skill review and known concepts. A baseline score of 85% is used to determine mastery, while gaps are remediated based on the pre-assessment (15%). In the third step, students are grouped together based on the preassessment via cluster grouping, ability grouping, cross-grade level grouping or flexible grouping within a grade level.

The substitution of more appropriate curriculum options for individual students is based on the preassessment. Acceleration options in the William and Mary units include the use of higher, advanced grade level standards, advanced graphic organizers, products and task demands. The last step in effectively emphasizing advanced content work is the maintenance of records including parent conferences, documentation of student growth and student readiness and ability, and other record keeping for planning and further assessment beyond the current grade level.

In order to satisfy the need for advanced content, the language arts curriculum (Center for Gifted Education, 1999), developed for grades K-12, uses advanced literature selections that are two years beyond grade reading level. The writing emphasis was on persuasive essays that develop argument, which is a more advanced form of writing than is typically taught at elementary levels. Use of advanced vocabulary and the mastery of English syntax at the elementary level was also stressed. Science units developed from the ICM stress student-determined mastery of science content through the problem-based approach as well as formative and summative assessment of science content learning. Social studies units offer advanced in-depth studies of key periods in U.S. and world history that were influential, with an emphasis on the use of primary sources.

Process and Products: Thinking Skills

Engaging gifted learners in higher order process skills is an important element in the ICM and in implementing effective curricula for gifted and high-ability learners. Gifted students need to become proficient in thinking and problem-solving strategies that examine concepts central to specific disciplines, but that are also common to different fields of study. Incorporating a specific model such as Paul's Elements of Reasoning (Paul & Elder, 2001) into a framework for teaching heightens the potential for student learning well beyond current levels (Struck, 2003).

Paul's Elements of Reasoning. Comprised of key aspects of thought which are the building blocks of productive thinking, Paul's (1992) Elements of Reasoning provide a general logic to reasoning which are implicit in gathering, conceptualizing, applying, synthesizing, and evaluating information (Struck, 2003). These elements are described in more detail below:

1. *Purpose, goal or end in view:* Because people generally reason in order to achieve an objective, satisfy a desire or fulfill some need, students require a clear purpose in writing or speech in order to focus the intended message in a coherent direction. If the outcome or result is unrealistic, confusing or conflicting with the student's belief system in some way, then the reasoning used to achieve that result or outcome will be difficult and problematic.
2. *Question at Issue (or Problem to be Solved):* If reasoning is required, then there must be a question, problem, or issue to be solved. If a student is confused as to what the problem at hand is, it is doubtful they will find a clear or reasonable answer. Students need to be able to formulate the question to be addressed.
3. *Points of View or Frame of Reference:* All students come with a unique perspective or "take" on an issue which can influence the way they reason. If the student's point of view is too narrow, imprecise, or biased problems in reasoning will be encountered. Learners need to be able to consider multiple points of view, sharpen or broaden their thinking in order to provide strong arguments for or against other perspectives. A careful exploration and acknowledgement of his or her individual point of view will enable the student to hone the required reasoning process.
4. *Experience, Data, Evidence:* All learners should be able to support their perspective with reasons or evidence. Evidence is the difference between giving opinions and stating facts in order to create a thoughtful judgment. By examining the supporting data or evidence, students can evaluate the strength of an argument.

5. *Concepts or Ideas:* Students learning to reason should understand the use of concepts and ideas in such a way that they can identify key ideas and organize thoughts around them.
6. *Assumptions:* Learners need to be aware of assumptions or suppositions they may take for granted when reasoning which can lead to difficulties in reasoning. It is important for learners to clarify perspectives, presuppositions, beliefs and assumptions made by different stakeholders affected by an issue.
7. *Inferences:* A student's ability to draw conclusions based on data depends on the skill he or she has in making sense of individual situations and the reliability of available data. As students reason they should be aware of distinctions between experiences and interpretations, conclusions or inferences based on those experiences.
8. *Implications and Conclusions:* The ability to understand and articulate implications and consequences of an issue or perspective is crucial to a student's reasoning. Students should be able to listen or read an argument and vocalize the implications of following the specific path outlined by the issue.

The Elements of Reasoning are used as a framework for developing lessons in various subject areas based to enhance critical thinking as a part of the ICM model.

Concept Dimension

Curriculum developers have long acknowledged the importance of concepts as central to the conceptualization and content of units of instruction in the education of gifted learners. Concept learning is crucial in a gifted learner's acquisition of big ideas and instrumental in facilitating their reasoning processes including deductive and inductive thinking. Inferring from the specific to the general or deducing from the general to the specific involves understanding the nature of generalities, and generalities are conceptual understanding (Avery & Little, 2003).

Concepts provide "important pathways between the disciplines so that separate aspects of knowledge are understood as being integrated" (VanTassel-Baska, 1998, p. 347) and have the power to deeply engage teachers and students with the material, provoking curiosity and inquiry (Schack, 1994). Thus, concepts which are relevant to real life not only link disciplines together, they also dynamically link the learner to the content (Avery & Little, 2003).

Ehrenberg (1981) described three key characteristics of concepts. First, all concepts are abstract because they "constitute[s] a generalized mental image of the characteristics that make items examples" (p. 37). Although concepts themselves are abstract, the individual characteristics that define an item as belonging to the concept may be concrete, abstract or a combination of both. When concepts are spoken of in the context of curriculum development, generally they are concepts with characteristics that are more abstract in nature, or, the "big ideas" (Avery & Little, 2003). A second, feature of concepts is that they cannot be verified, like facts, as being "right" or "wrong". Their meaning is socially constructed, hence a student's understanding a concept is dynamic. Third, concepts are hierarchical. The thoughtful consideration of conceptual hierarchies ensures that the central concepts selected for study by the curriculum developer are broad and deep enough to facilitate reasoning and critical thinking.

Concepts underscore all human thought and communication, and individuals develop conceptual understandings as a part of the natural learning process (Ehrenberg, 1981). However, students need to be guided through a structured and supportive process of concept development. Teachers can facilitate gifted learners' process of concept development by providing contexts in well organized activities and lessons which and lead step-by-step to deeper understandings (Avery & Little, 2003). The concept development model is based on the work of Taba (1962), a major theorist in the area of curriculum development. The process is a constructivist one that asks students to take what they already know about a concept, organize and reflect upon it, develop generalizations, and then apply those generalizations back to previous knowledge.

Teachers can create different instructional strategies that address these elements and which allow students to construct understanding in a more powerful manner than didactic strategies. Lessons that address concept learning can be stacked throughout a unit of study in order to scaffold the learner trough sequenced steps from awareness via initial exposure to a deeper understanding and application of concepts through repeated reinforcement (Avery & Little, 2003). Assessment strategies tied to concept learning can be structured on a pre- and post-assessment basis and make use of embedded assessment activities as well. The approach taken by William and Mary to concept learning is responsive to all these issues.

Change is used as a central organizer in the Center for Gifted Education's series of language arts units (Center for Gifted Education, 1999). In these units, students progress through the stages of concept development activities and at the conclusion of which, are presented with a list of the following generalizations about the concept. These generalizations, such as "change is everywhere," were developed based on a review of literature in various disciplines about change, with central ideas organized into statements accessible to student understanding. In using the concept development model to organize curricula and instruction, a prepared list of generalizations is useful to ensure that the concept has been addressed comprehensively (Avery & Little, 2003). Students' own generalizations should be aligned with this list and validated through discussion and activities throughout a related unit.

The science curriculum emphasizes the concept of systems as a way to study the domains of biology, chemistry, physics and geology. The concept of systems also was applied to understanding structures in society, such as economic and political systems; other units emphasized connected chains of cause and effects to help students understand multiple causation in history and to recognize that historical events were not inevitable (VanTassel-Baska, 2003). Other social studies curricula focus on additional concepts, such as cause and effect, nationalism, and perspective. Concept papers have been written to demonstrate these connections as a support to the curriculum developers and to teachers wishing to implement the curriculum successfully (e.g. Boyce, 1992; Pence, 1999; Sher, 1991).

Curriculum developers may also want to add essential questions as a further tool for stimulating student thinking about the concept and to focus their thinking on broad aspects of the generalizations (Avery & Little, 2003). These questions can also provide teachers with a basis for further lesson planning and development. As a concluding step to the concept development model, students re-examine their examples with the generalizations in mind, demonstrating how particular examples support the generalizations (Avery & Little, 2003). This versatile model is applicable to almost any concept, although sometimes it requires additional instruction prior to the activity to orient students toward an understanding of the term used as the concept label. The concept development model is somewhat more open-ended in its orientation and encourages diverse contributions from students' own experiences and ways of thinking.

The work at William and Mary and other sites as well continue to suggest the importance of a blueprint for curriculum development. This blueprint must be very clear about the specifications of the curriculum by subject area, developmental level, differentiation features, and exemplary curriculum features that are most relevant. Moreover, the blueprint must provide a standardized format for representing the various aspects of the curriculum so that a teacher can easily discern the design elements and how they cohere. The ICM emphasis in content, high level processes and products, and concepts provides both a model for organizing curriculum but also scaffolds for teaching it.

The implementation of any curricular model is based on several considerations in the school setting as well. Most important among them is the nature of the learner. For talented students, regardless of the richness of the core curriculum base, there will be a need to address certain powerful characteristics through flexible implementation of the ICM model.

The Learner

There are many characteristics of gifted learners on which one might focus for a discussion of creating an optimal match between learner and curriculum. Several lists have been discussed as a basis for curricular work (e.g. Maker, 1982; VanTassel-Baska, 1994). However, in studies of curricula, it has become apparent that three such characteristics remain pivotal for purposes of curricular planning and development: precocity, intensity and complexity. These three aspects of the gifted learner frame the translations of the ICM into practical differentiated units of study.

While this model has salience for all learners, based on a talent development paradigm, the variable of time becomes crucial in implementation. Not all learners will be ready at the same stage of development in each area for the advanced, intensive and complex study required by the curriculum. Teachers, then, would need to decide whether to substitute more accessible material and still employ the unit with all students or to differentiate instruction in the classroom, using the unit only with a cluster group of high-ability learners. The judicious application of this curricular model for all learners is thus advised.

Context Variables

Contextual variables can impact the successful use of the ICM in school settings. There are at least four such variables that must be considered: flexibility in student placement and progress, grouping, teacher training, and establishing a school climate of excellence.

Flexibility in Student Placement and Progress. Even an enriched and accelerated curriculum developed for high-ability learners that addresses all of the educational reform principles cannot be used without careful consideration of entry skills, rate of learning, and special interests and needs. Thus, ungraded multiage contexts in which high-ability learners access appropriate work groups and curricular stations represent an ideal component of the implementation context. Pretesting of students on relevant skills is a central part of the ICM-based curriculum, and diagnosing unusual readiness or developmental spurts that may occur in a curricular sequence is also important. Schools may notice and use such data as a basis for more in-depth work in an area of a particular teaching unit. For most gifted programs, the ICM-based curriculum is ideally suited to student identified intellectual and academic areas. For each of the content areas, students who possess advanced abilities in only one area of learning may benefit from the curriculum designed in that area.

Most of the curriculum work developed from the model has taken six years from initial design to final dissemination. Part of that time span has always been devoted to piloting the curriculum in multiple teachers' classrooms and using the resulting data to revise units of study. Tryouts allow developers to see how individual lessons work with gifted learners as well as to allow for appropriate revisions at a beginning stage of the process. Rarely does curriculum work the first time through. Refinement is a critical part of ensuring the optimal match between learner and the curricular challenge.

Grouping. As a curriculum for high-ability learners is implemented, attention must be paid to the beneficial impact of grouping for instruction. As Kulik's (1993) reanalysis of the grouping data demonstrated, when curricula are modified for gifted students, the positive effects of grouping become more prominent. Moreover, classroom-based studies have verified that little differentiation is occurring in heterogeneous classrooms for gifted students (Archambault et.al, 1993; Westburg & Martin, 2003) and the majority of teachers in our schools are not trained to teach gifted learners (Westberg, Archambault, Dobnys & Salvin, 1993). Thus, forming instructional groups of gifted students for implementation of the ICM curriculum is clearly the most effective and efficient way to deliver it. Whether such grouping occurs in separately designated classes or in regular classrooms is a local consideration rather than dictated by the model. The effectiveness of the curriculum in various grouping patterns has already been established through controlled studies (VanTassel-Baska, et al., 2000; VanTassel-Baska & Bracken, in press).

Teacher Training

Based on data confirming the significant role of teacher training in providing differentiated instruction for the gifted (Hansen & Feldhusen, 1994; Tomlinson, et. al., 1994) and the availability of coursework in the education of the gifted (Parker & Karnes, 1991) there is good reason to place gifted students with teachers who have received at least 12 university hours of professional training. The benefits to gifted learners become greater when a differentiated curriculum is handled by those sensitive to the nature and needs of such students. Training in the direct implementation of curricular materials to be used is also necessary to prepare teachers effectively for implementation of curriculum based on the ICM. Depending on the experience of the teachers involved, about two to four days of training in the various approaches employed in the curricular materials have generally supported initial implementation.

Fidelity of Implementation

One of the biggest challenges facing any curriculum developer is getting teachers to implement a unit of study as it was written so that the innovation can be assessed accurately, and changes made for improvement. A process for assessing the degree of fidelity during implementation must be built into any curriculum project. Usually classroom observation using a structured form is the optimal tool to ensure that this occurs, but follow-up professional development on key aspects of the curriculum is also often required to ensure that teachers transfer completely to their repertoire the salient parts of the new curriculum to be taught.

In the implementation of ICM, it is important not to leave such processes to chance. One that is frequently overlooked in the rush to practice is making the right inferences about the appropriate use of a strategy. If the work with teachers includes a sample lesson plan or unit of study where the strategy is embedded, it is better than only teaching the strategy out of context and expecting the teacher to find the applicability. Guided practice of strategy use in the context of an ICM unit is an ideal way to ensure teacher use. Teachers' growth in the use of differentiation is also a benefit of faithful implementation of ICM as seen in our recent studies (VanTassel-Baska et al., in press).

Climate of Excellence. In order for gifted learners to perform at optimal levels, the educational context must offer challenging opportunities that tap deeply into students' psychological states (Csikszentmihalyi, Rathunde, & Whalen, 1993), provide generative situations (VanTassel-Baska, 1998), and also demand high standards of excellence that correspond to expectations for high-level productivity in any field (Ochse, 1990). More than ever, the climate of a school for excellence matters if curricular standards are to be raised successfully for any student. For gifted students in particular, such a climate must be in place to ensure optimal development, positive attitudes toward learning, and engagement.

Conclusions

Perhaps most cogent among our findings over the past 20 years is the reality that curriculum designed for gifted learners using ICM makes a difference in the nature and extent of learning that these students will amass. It also appears to be a powerful motivator for the less able, especially the scaffolding provided by the instructional models. If we design curriculum for our best learners and use it to stimulate a broader group of learners, then we will have succeeded admirably in our efforts to raise the ceiling for the gifted, but also to provide a new set of standards for others to emulate.

In order to assess the effectiveness of any innovation over time, multiple approaches to analyze the impact must be employed. Our work has examined student growth in higher level processes, teacher growth in the use of differentiated strategies, school-based change in practices, and district level policy changes. For an innovation to be seen as successful, positive results in all of these arenas and levels of the educational enterprise is important. The ICM model has demonstrated, for 20 years, a research-based and practical approach to designing curriculum for high end learning. Through its emphasis on a research-based integrated approach to design, through its coupling with content-based standards as a departure point, and through its extensive research program that documents effectiveness with gifted learners, at risk learners, and typical learners as well as teachers, the model has demonstrated its utility in school-based practice.

Implications

The implications of the work on the ICM clearly point the way to future studies in curriculum for the gifted that examine important questions such as :

- What are effective approaches to teaching other subjects such as the arts, leadership, and even creativity? Do the models translate effectively to these areas?

- At what stages of development have interventions lost their power? Can high-powered curriculum work effectively across the lifespan in reaching the gifted or is there a need for alternative approaches?
- What are the propitious stages of development of talent in different fields ? Should we be teaching languages, math and science early and intensively and waiting to teach more integrative subjects like social studies?
- What are the right interventions for gifted learners at differing stages of development? When should we be asking students to do independent study, service learning, and other interventions that require some maturity and independednt learning habits?

Implications for schools

Clearly, the body of work on interventions for the gifted suggests strongly that well-designed and differentiated curriculum is effective in promoting learning with this population. The direct implications for schools of this work is to use research-based curriculum materials whenever possible to maximize learning for gifted students. If that is not possible, a second best strategy is to apply the research-based teaching and learning models embedded in such curriculum with other curriculum that is required. A second implication rests in the need to see these learners as individuals, not just members of a group and therefore provide assistance with social and emotional development needs and personalized services that reveal themselves to be needed. Finally, schools must seek to find highly qualified teachers who can work successfully with these learners, based on their content knowledge and their pedagogical expertise.

The learning potential of the gifted is too important to leave to chance; we must pursue its development with ardor and diligence.

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