3

Developing Creative Productivity in Young People through the Pursuit of Ideal Acts of Learning

JOSEPH S. RENZULLI AND CATHARINA F. DE WET

INTRODUCTION

The September 2007 issue of *Smithsonian Magazine* was dedicated to "America's Young Innovators in the Arts and Sciences" – 37 people under the age of 36 who are making names for themselves and are well on their way to eminence in their fields. Most of them can trace their passion and career focus to a few key experiences. Cristián Samper, for example, Acting Secretary of the Smithsonian Institution, says in his editorial introduction,

> My own love of science came from a love of nature. As a Boy Scout, I camped and hiked in Colombian rain forests, returning home eager to organize my collections of plants and animals. . . . At 15, I joined ornithologist Jorge Orejuela on a World Wildlife Fund (WWF) summer expedition to the remote rain forests in the Choco region of Colombia. This was my first experience in hands-on fieldwork, and as I saw scientific data, field observation, conservation biology and environmental policy all coming together, I was hooked (*Smithsonian Magazine*, 2007, p. 3).

The unfortunate truth is that schools are not places where youngsters gain these kinds of experiences, places where creativity thrives, especially in the current educational climate where the emphasis is on increasing the academic achievement of underperforming students (Renzulli, 2005; Robinson, 2001). Academic achievement has become the focus of most of the thought, finances, and energy expended in education, and yet, we have an ambiguous relationship with academic achievement. Academic ability is believed to be essential for individual success and societal advancement, but anything impractical or not worthwhile is easily dismissed as being "academic" (Robinson, 2001).

Formal and Informal Education

Dewey (1916) divided educational activities in society into two distinct arenas: the informal and the formal. While all education is a social renewal process

of "transmission by communication" (p. 11), and all social interactions have some educative effect, informal education occurs when children learn the skills, habits, and customs of their society by participating in activities with their elders. In other words, they learn by experience and by watching and doing. Lisa Sanditz, a landscape painter whose first museum show was presented by the Kemper Museum of Contemporary Art in Kansas City in 2006, was looking at paintings from the time she could walk – her mother and grandmother both were museum docents (Lubow, 2007). Lisa says, "My greatest professional influence is my grandmother's knowledge and insight about contemporary art" (see http://www.smithsonianmag.com/specialsections/innovators/sanditz-lw.html for a quick questionnaire with Ms. Sanditz).

Formal education, by contrast, is purposeful or intentional teaching of the younger members of society by older and more experienced members of that society. Formal education has been dominated since the Enlightenment by the desire for knowledge and the emphasis on intelligence, deductive reason, and "objective" scientific evidence. In the process, the role of creativity in learning and thinking has been reduced, and rationalist tradition has dominated our education system. Dewey states that the need for intentional, formal education increases as society becomes more complex but that the increase of formal education brings with it the danger of an "undesirable split" between the (informal) experience gained in more direct associations and the (formal) education that is acquired in school. "This danger was never greater than at the present time," says Dewey in 1916, "on account of the rapid growth in the last few centuries of knowledge and technical modes of skill" (p. 11).

This "rapid growth of knowledge and technical modes of skill" is nowhere better exemplified than by the actions of Joshua Schachter (Rogers, 2007). All he wanted to do in 1998 was keep track of those sites on the Internet that interested him and that he thought he might want to revisit. He devised a simple way of tagging sites with one key word in his bookmark folder. Today, his Web site is called "del.icio.us," and 2.5 million visitors a day use it to search the Web. He had the knowledge he needed to build a website from studying electrical and computer engineering at Carnegie Mellon University. (Mr. Schachter publishes a blog on http://joshua.schachter.org/.) What was it that set him apart from his classmates (and earned him a reputed $30 million buyout from Yahoo)?

Renzulli has written extensively about two kinds of giftedness or ability (1978a). The first category is referred to as "schoolhouse ability," or test-taking or lesson-learning ability. It is the kind most easily measured by intelligence quotient (IQ) or other cognitive ability tests and, for this reason, it is also the type most often used for selecting students for entrance into special programs. The abilities that people display on IQ and aptitude tests are exactly the kinds of abilities most valued in traditional school learning situations. In other words, the games people play on ability tests are similar in nature to the games

that teachers require in most lesson-learning situations. Research tells us that students who score high on IQ tests are also likely to get high grades in school. Research also has shown that these test-taking and lesson-learning abilities generally remain stable over time. The results of this research should lead us to some very obvious conclusions about schoolhouse giftedness: It exists in varying degrees; it can be identified through standardized assessment techniques; and we should therefore do everything in our power to make appropriate modifications for students who have the ability to cover regular curricular material at advanced rates and levels of understanding (Renzulli, 1978a). Terence Tao is an excellent example of a person with this kind of ability (Mackenzie, 2007). He taught himself arithmetic at age 2 and excelled in mathematics at school. He was the youngest competitor ever (at age 10) in the International Mathematical Olympiad and won its gold medal at 12, outshining high school competitors. Earning his doctorate in mathematics at 20, four years later at 24, Tao became the youngest full professor in University of California Los Angeles history. Today, after a decade of work in mathematics, he has 140 papers to his credit. Dr. Tao has a website at http://www.math.ucla.edu/~tao/.

This is not the end of the Terence Tao story, though. He is an excellent example of a person who combines academic ability with Renzulli's second kind of ability – creative productivity. Tao is described by colleagues as unusually open-minded and exceedingly tenacious. "The heart of Tao's gift may simply be his ability to let his thinking roam freely toward an unseen horizon" (Mackenzie, 2007, p. 75). He works with pure mathematics, yes, but he also loves practical math. For example, he tried to improve the data acquisition of digital cameras. Present-day cameras acquire a vast amount of data, and then computers use a compression algorithm to reduce the data in a picture to manageable amounts. Tao's question was, Why not design a camera that would acquire only a fraction of the data to begin with? His work created a new field of mathematics called compressive sampling. This is an excellent example of the second kind of ability. Creative productive ability describes those aspects of human activity and involvement in which a premium is placed on the development of original material and products that are purposefully designed to have an impact on one or more target audiences.

IDEAL ACTS OF LEARNING

What sets Terence Tao apart from other mathematicians is his ability to apply his vast knowledge of the principles and methodologies of mathematics to the solution of practical, real problems. What sets Joshua Schachter apart from his classmates is the ability to ask a simple question arising from a personal need (a need many people have, as evidenced by the millions who use his Web tool, including the present authors) and devise a stunningly simple answer. They are innovators – creative producers rather than replicators. We value

creative producers, as opposed to replicators, because they are the persons who go beyond our current levels of knowledge and understanding to bring about new ideas, questions, solutions to problems, and new products and services that did not exist prior to their application of the creative process. It is the creative producers who, in effect, create thousands of jobs for replicators. One creative idea, such as a book, a symphony, a new device, or a software program for a computer, starts the wheels of production turning, thereby creating thousands of jobs in manufacturing and a host of other areas, such as finance, advertising, marketing, packaging, transportation, and sales. Thomas Edison's invention of the storage battery gave rise to an entire industry that still prospers today and that has provided the added benefit of being a vehicle for the many innovative modifications and improvements made on this innovative product over the years.

Both Tao and Schachter are illustrative of important truths with regard to the two kinds of giftedness:

1. Both types are important.
2. There is usually an interaction between the two types.
3. Our education programs should make appropriate provisions for encouraging the development of both types of ability, as well as providing numerous occasions when the two types can interact with each other.

Components of Ideal Acts of Learning

Learning situations that are designed to promote creative productive giftedness emphasize the use and application of information (content) and thinking processes in an integrated, inductive, and real-problem–oriented manner. The role of the student is transformed from that of a learner of prescribed lessons to one in which she or he uses the modus operandi of a firsthand inquirer. This approach is quite different from the development of lesson-learning ability, which tends to emphasize deductive learning, structured training in the development of thinking processes, and the acquisition, storage, and retrieval of information. Creative productivity is simply putting one's abilities to work on problems and areas of study that have personal relevance to the student and that can be escalated to appropriately challenging levels of investigative activity. Within an educational setting, the learner is not, however, solely responsible for this kind of activity. Two other components are critically important – the teacher and the curriculum.

When these three components – the *learner*, the *teacher*, and the *curriculum* – are present in a particular manner, ideal acts of learning occur, often with creative productivity as the result. The relationships between and among these components are represented in Figure 3.1. The diagram emphasizes the dynamic nature of the interactions between the components and is not meant
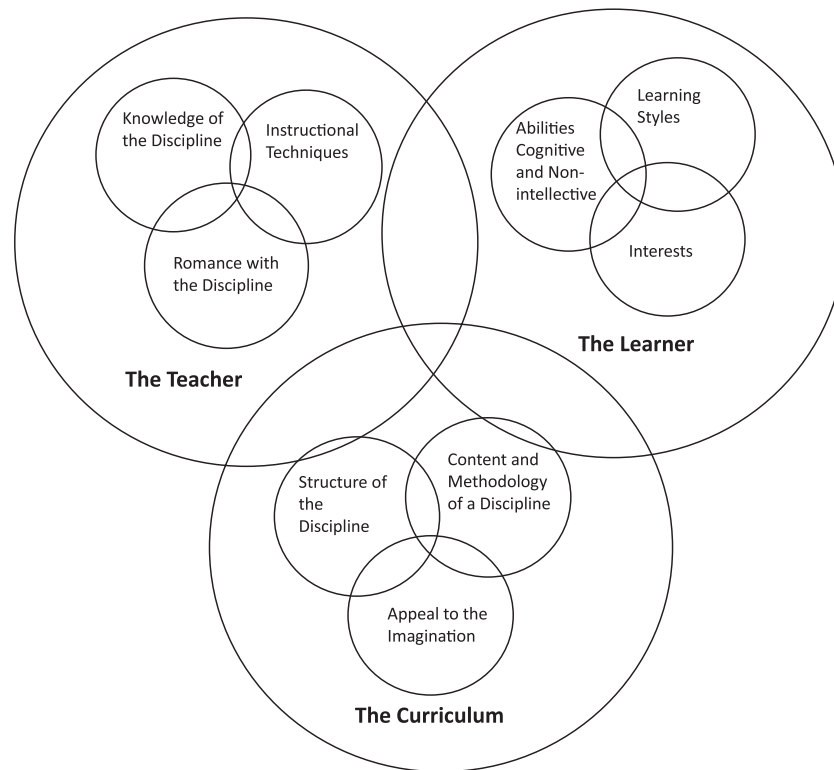
Figure 3.1. An ideal act of learning.

to represent equity among the components and subcomponents. The circles may vary in size from one learning situation to another, and even within a single learning situation. However, all components have to be present to some degree for ideal acts of learning to occur.

The Learner

Abilities
Learner abilities include both cognitive and noncognitive traits. Moral courage, optimism, vision, charisma, hope, absorption, personal choice, tolerance for ambiguity, risk taking, and perseverance are noncognitive traits that may influence what creative work a person chooses to do and how that person chooses to go about his or her creative activities. In an ideal learning situation, environmental variables, the domains in which youngsters work, and the contexts in which they pursue their work are considered.

Interests
Interests play a crucial role in learning and in high levels of creative productivity. The degree of interest that is present in an act of learning enhances all cognitive

behavior, wherever that cognitive behavior may be on the continuum from basic skill learning to higher levels of creative productivity. Personal interests are often motivators for youngsters to commit to the hard work involved in creative productivity. Piaget (1981), Albert and Runco (1986), and Gruber (1986) all emphasize the importance of personal interest in constructing a person's activities. Renninger and Wozniak (1985) examined children between 2.9 and 4.2 years of age and found that as young as they were, they had strong, stable, and relatively focused individual interests that were powerful determinants of their attention, recognition, and recall. Renninger (1989; 1990) also found that fifth- and sixth-graders were more competent in both reading and mathematical performance when the content involved material with both high levels of knowledge and high levels of value (as measured by interest) compared to similar levels of knowledge with low levels of value. The best indicator of college majors and expressions of career choice on the part of young adults has been intensive involvement in projects (Renzulli, 1977b; Hébert, 1993). Interest is a fundamental part of ideal learning situations.

Learning Styles
An area of major importance in which students differ is their style of learning. Learning styles have been variously defined according to psychological types:

1. Introversion versus extraversion (Myers, 1980)
2. Preference for varying degrees of structure in the learning process (Hunt, 1975)
3. Concrete to abstract and from sequential to random (Kolb, Rubin, & McIntyre, 1971; Gregorc, 1985)
4. Various physical characteristics of the learning environment (e.g., auditory and mobility preferences, comfort requirements, and preferences for individual versus group work) (Dunn, Dunn, & Price, 1975)
5. Sensory modality preference (visual, auditory, tactile, and kinesthetic) (Barbe & Swassing, 1979)

Learning styles have also been typified as preferences for function (Sternberg, 1988): legislative (creation, formulation, and planning); executive (the execution of plans and ideas); and judicial (monitoring, judging, and evaluating). Furthermore, Renzulli and Smith (1978) developed an instrument called *The Learning Styles Inventory,* which assesses styles in correspondence with the following instructional techniques: projects, drill and recitation, peer teaching, discussion, simulation and teaching games, independent study, programmed instruction, and lecture.

Most of the persons who have contributed to the literature on learning styles agree on certain issues. First, there may be "natural" preferences for a particular style that are a function of personality variables; however, styles are also a function of socialization, and therefore several styles can be developed.

Second, there is a complexity of interactions between and among styles, and styles further interact with abilities and interests. Third, certain curricular or environmental situations favor the applicability of some styles over others. Ideally, we should attempt to match students with teachers and learning environments that capitalize on their preferred style, but a more realistic approach to capitalizing on differences in learning style is to begin in the early years of schooling to provide young students with a broad range of experiences that expose them to various styles. We should be exposing students to carefully planned ways of using various instructional styles. The collective experiences in learning styles should provide: (1) exposure to many styles, (2) an understanding of which styles are the most personally applicable to particular subjects, and (3) experience in how to blend styles to maximize both the effectiveness and satisfaction of learning.

Curriculum

Much has been written on what characterizes effective curriculum. A good deal of this material may best be described as ordinary lists of curricular principles or "should lists" that focus on thinking skills, abstract concepts, advanced level content, interdisciplinary studies, thematic approaches, and a blending of content, process, and product. Three major components of curriculum that prepare young people for creative productivity are discussed here: structure of the discipline, content and methodology of the discipline, and appeal to the imagination.

Structure of the Discipline

The predominant value of a discipline lies not so much in its accumulated facts and principles as in its systematic way of thinking about a body of knowledge – its forms and connections, its unsolved problems, its methods of inquiry, its aspirations for improving mankind, and the special way it looks at phenomena. A concern for structure even includes the folklore, humor, personalities, gossip, and insider's knowledge that cause a person to be a member of the discipline rather than merely a student studying about the discipline. Curricular emphasis on the structure or "psychology" of a discipline is recommended because *advanced* involvement in any area of study requires that the interested novitiate learn how to think *in* the discipline. An example will clarify what thinking in a discipline means. Some people can communicate in a non-native language, but they do not know how to think in that language. They communicate by simply translating words they hear or read into their native language, formulating a mental response in their native language, and then translating that response into written or spoken words in the non-native language. Similarly, in mathematics, some people can solve standard problems, even very complex ones, by using replicative thinking – simply "plugging" information into a formula and

performing customary calculations. But without being able to think *mathematically,* it is unlikely that this person will be able to deal with nonstandard problems, let alone make contributions that will lead to the advancement of the discipline.

To promote within-discipline thinking, curricular experiences should be developed in a way that places the learner in the role of a professional or firsthand inquirer in a field rather than as a mere assimilator of information. Within-discipline information is usually based on the following questions:

1. What is the overall purpose or mission of this field of study?
2. What are the major areas of concentration of the field and its subdivisions?
3. What kinds of questions are asked in the subdivisions?
4. What are the major sources of data in each subdivision?
5. How is knowledge organized and classified in this field or subdivision?
6. What are the basic reference books in the field or subdivision?
7. What are the major professional journals?
8. What are the major databases? How can we gain access to them?
9. Is there a history or chronology of events that will lead to a better understanding of the field or subdivision?
10. Are there any major events, persons, places, or beliefs that are predominant concerns of the field or best-case examples of what the field is all about?
11. What are some selected examples of "insiders' knowledge," such as field-specific humor, trivia, abbreviations and acronyms, "meccas," scandals, hidden realities, or unspoken beliefs?

Every experience should be viewed as a *confrontation* with knowledge, and students should be empowered to believe that they have the license to question, criticize, and, most important, add their own interpretations and contributions to existing knowledge. The concept of validation of knowledge and the direct teaching of epistemology (i.e., different ways of knowing, such as authoritarianism, empiricism, revelation, etc.) is another kind of confrontation that teaches students the meta-cognitive procedures for examining critically their own interpretations and creative contributions. A confrontation with knowledge means that everything that is already known, or that we hope students will acquire, is secondary to the development of mind-in-general and within-discipline thinking in particular.

Content and Methodology of a Discipline
Phenix (1964) recommends that a focus on representative concepts and ideas is the best way to capture the essence of a discipline. Representative ideas or concepts consist of themes, patterns, main features, sequences, organizing principles and structures, and the logic that defines a discipline and distinguish it from other disciplines. Representative ideas and concepts can also be used as the bases for interdisciplinary or multidisciplinary studies.

When we select content, the level of advancement or complexity of material must first and foremost take into consideration the age and ability, maturity, previous study, and experiential background of the students. Beyond these considerations, three principles of content selection are recommended. (1) Curricular material should escalate along a hierarchy of the following dimensions of knowledge: facts, conventions, trends and sequences, classifications and categories, criteria, principles and generalizations, and theories and structures.

(2) Movement toward the highest level, theories and structures, should involve continuous recycling to lower levels so that facts, trends and sequences, and so on can be understood in relation to a more integrated whole rather than isolated bits of irrelevant information.

(3) The cluster of diverse procedures that surround the acquisition of knowledge – that dimension of learning commonly referred to as "process" or thinking skills – should themselves be viewed as a form of content. It is these more enduring skills that form the cognitive structures and problem-solving strategies that have the greatest transfer value. When we view process *as* content, we avoid the artificial dichotomy and the endless arguments about whether content or process should be the primary goal of learning. Combining content and process leads to a goal that is larger than the sum of the respective parts. Simply stated, this goal is the acquisition of a scheme for acquiring, managing, and producing information in an organized and systematic fashion. A focus on methodology is the most direct way to prepare young people for their roles as contributors in future fields of professional involvement.

A focus on methodology means more than just teaching students methods of inquiry as content. Rather, it is designed to promote an understanding of and appreciation for the *application* of methods to the kinds of problems that are the essence of particular fields of knowledge. The goal of a focus on methodology is to cast the young person in the role of a firsthand inquirer rather than a mere learner-of-lessons, even if this role is carried out at a more junior level than the adult professional. This role encourages young learners to engage in the kinds of thinking, feeling, and doing that characterize the work of the practicing professional because it automatically creates the kind of confrontations with knowledge described earlier. It is this kind of work that mimics that of a practicing professional that is encouraged in creative productivity.

Appeal to the Imagination

In selecting curricular materials, a component often disregarded completely is how the material to be learned can be structured in a way that will appeal to the imagination of the learner (Phenix, 1964). Phenix argues very persuasively for the selection of curricular material that will lift students to new planes of experience and meaning. Material drawn from the extraordinary should

allow students to "see more deeply, feel more intensely, and comprehend more fully" (p. 346). He sets forth three conditions that should guide our thinking with regard to this concept and the role that teachers play in the pursuit of imaginative teaching. First, the means for stimulating the imagination differ according to the individual, his or her level of maturity, and the cultural context in which the individual is located. Second, the teacher must exemplify the imaginative qualities of the mind we are trying to develop in students and be able to enter sympathetically into the lives of students. Finally, imaginative teaching requires faith in the possibility of awakening imagination in any and every student, regardless of the kinds of constraints that may be placed on the learning process. This kind of content represents powerful and controversial manifestations of basic ideas and concepts. Thus, for example, the concepts of loyalty versus betrayal might be examined and compared in political, literary, military, or family perspectives but always in ways that bring intensity, debate, and personal involvement to the concepts. An adversarial approach to ideas and concepts (i.e., loyalty *versus* betrayal) also guarantees that the essential element of confrontations with knowledge will be present in selected curricular topics. In a certain sense, the history of creative productivity can be written as a chronicle of men and women who confronted existing ideas and concepts in an adversarial fashion, and who used existing information only as counterpoints to what eventually became their own, unique contributions to the growth of knowledge.

The Teacher

In any formal learning situation, the role of the teacher is well recognized and is probably the most important ingredient in any model of learning. Teachers make curricular and instructional decisions that directly affect the learner and his or her environment. When Walberg, Rasher, and Parkerson (1980) examined the biographical antecedents of persons of accomplishment, they found that almost two-thirds of their subjects were exposed to creatively productive persons at a very early age. Bloom (1985) reported that demanding teachers and mentors played an important role in the development of high achieving youth, and Goertzel, Goertzel, and Goertzel (1978) concluded in their biographical study of eminent persons that mentors were especially important in evoking motivation. When we view teachers in an expanded role as mentors and models, a compendious biographical and autobiographical literature also points to the significant roles that dedicated teachers-as-mentors have played in the development of persons who have made important contributions to their respective areas of study.

The kinds of teachers who promote high levels of creative productivity in their students have certain characteristics in common. They tend to allow students greater choice in the selection of topics, welcome unorthodox views,

reward divergent thinking, express enthusiasm for teaching, interact with their students outside of class, and generally conduct classes in an informal manner (Chambers, 1973). They establish positive relationships with their students by always working in close proximity with them; they engage in frequent verbal interaction of high-quality with their students, including verbal motivation, higher-level questioning skills, and a reciprocal sense of humor; are flexible about their use of time and scheduling, spending more time with students as it becomes necessary; and recognize that their students' creative productivity is an ultimate goal. These teachers provide human and physical resources to help students realize this goal (Story, 1985). In a study by Torrance (1981) that examined follow-up data of adolescent and adult creative behavior, 220 subjects provided anecdotal reflections about "teachers that made a difference." The findings support Chambers' conclusions and point out teacher attitudes and techniques that helped young learners "fall in love" with a topic or subject to such an extent that it became the center of their future career image.

Three major components constitute the ideal teacher for the development of creative productivity: knowledge of the discipline, instructional technique, and a teacher's romance with the discipline.

Knowledge of the Discipline

Arguments go back and forth about the degree to which teachers should be masters of the content area(s) in which they teach. The position we take here is that advanced competency in at least one discipline is important because it is through such content mastery and personal involvement that teachers, even if they are dealing with topics outside of their major area, develop the kinds of appreciations for within-discipline thinking that improves the guidance of learning in other areas. This is one area where we are in agreement with No Child Left Behind legislation, in the requirement for highly qualified teachers. Equally important for teachers of high potential young children is an understanding of general research methodologies[1] and a repertoire of managerial skills that allow them to guide students through investigative activities (Renzulli & Reis, 1988). But advanced competency, in and of itself, is no guarantee that high-quality teaching will take place. Knowledge of the discipline means far more than merely knowing the facts, principles, and theories that define an area of knowledge. It also means knowing and understanding the role of methodology and being able to guide students through the application of methodology in real problem situations. It is this level of involvement – the

---

[1] At the University of Connecticut and the University of Alabama, all persons enrolled in our programs for teachers of the gifted are required to take at least one course in research methods. Additionally, persons enrolled in a course dealing with curriculum development for the gifted are required to gain at least introductory college-level familiarity with an academic area in which they are planning to prepare curricular materials.

application of authentic investigative methods to self-selected and personally meaningful problems that we believe represents true differentiation in learning and is the goal of creative productivity.

Instructional Technique

The essential issue regarding instructional technique, and especially technique that fosters creative productivity, is best phrased as questions. To what extent is effective technique a "natural" characteristic of the individual teacher, and to what extent can it be taught? Both personality and training contribute to the development of teachers who encourage and facilitate creativity. Years of training teachers of the gifted have led us to believe that certain personality characteristics are necessary for highly effective teaching of creative students. These characteristics, which are generally found in confident but nonauthoritative persons, include flexibility, openness to experience and new ideas, a high energy level, optimism, commitment to excellence, and enthusiasm for living. These characteristics are viewed as "starting material," and they are important enough for us to recommend that *teacher selection should be a consideration that precedes teacher training*.

But training in pedagogy also plays an important role, and we have attempted to describe the areas on which teacher training should focus in the four menus subsumed under Instructional Technique in Figure 3.2. These menus are taken from The Multiple Menu Model guide for developing curriculum (Renzulli, Leppien, & Hays, 2000). The Instructional Objectives and Student Activities Menu addresses the following hierarchy of thinking processes: Information Pick-up (assimilation and retention), Information Analysis (higher order processing), Information Output (synthesis and application), and Evaluation (review and critique). The Instructional Strategies Menu identifies fourteen teaching strategies that range along a continuum from structured to unstructured patterns for organizing learning. The Instructional Sequence Menu deals mainly with organizational and management techniques, and the Artistic Modification Menu focuses on techniques that personalize the teaching process and encourage teachers to put themselves *into* the material rather than merely teaching about it. Although teachers undoubtedly have "natural" preferences for specific techniques within the several categories that constitute each instructional menu, the broad range of student differences that will be encountered when focusing on nurturing creativity in students requires that a repertoire of techniques be developed. Ideal acts of learning will obviously be enhanced if there is a perfect match between teacher and learner styles. Perfect matches, however, are the exception rather than the rule; therefore, teacher training should be geared toward developing a range of teaching styles and encouraging a flexible use of styles to accommodate individual abilities, interests, and learning styles.
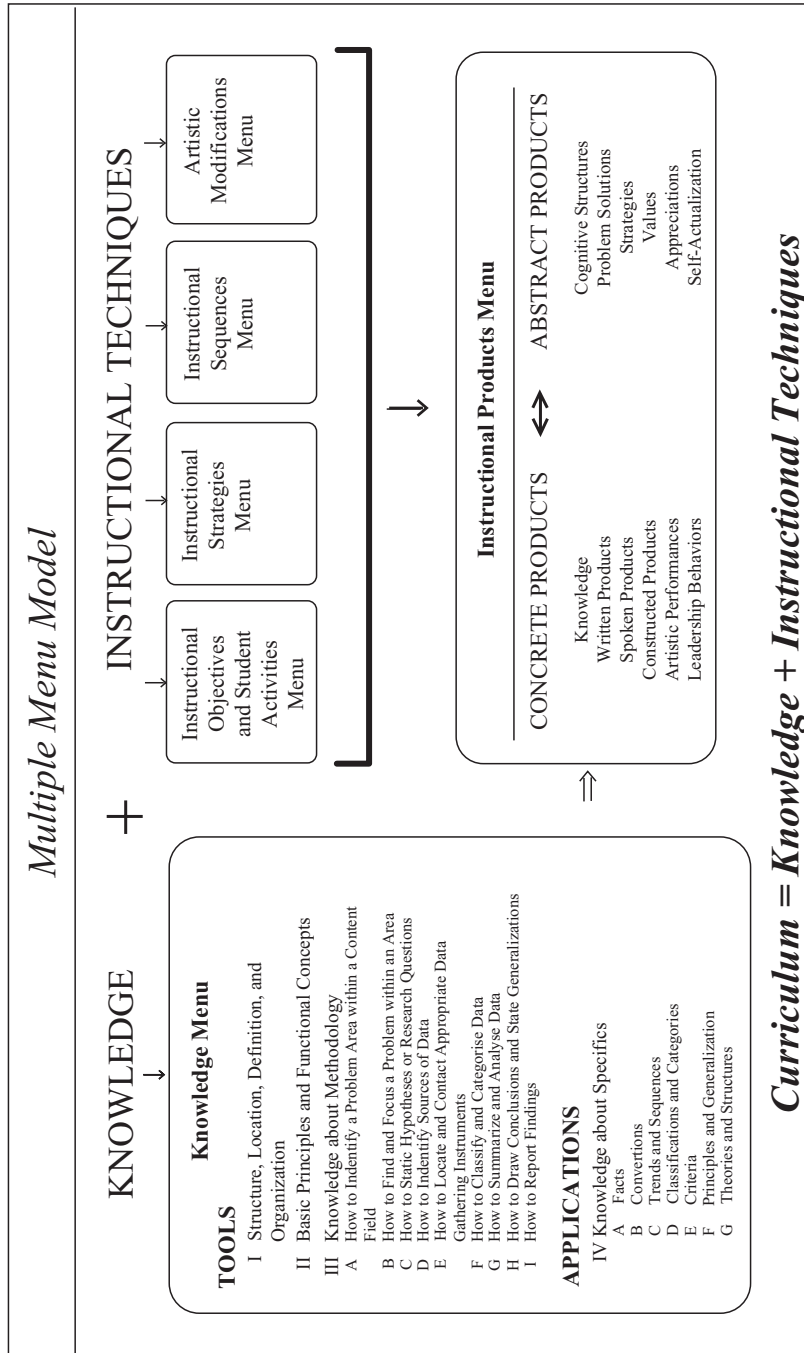
Multiple Menu Model

KNOWLEDGE   +   **INSTRUCTIONAL TECHNIQUES**

Knowledge Menu

TOOLS

I   Structure, Location, Definition, and Organization
II   Basic Principles and Functional Concepts
III   Knowledge about Methodology
A   How to Indentify a Problem Area within a Content Field
B   How to Find and Focus a Problem within an Area
C   How to Static Hypotheses or Research Questions
D   How to Indentify Sources of Data
E   How to Locate and Contact Appropriate Data Gathering Instruments
F   How to Classify and Categorise Data
G   How to Summarize and Analyse Data
H   How to Draw Conclusions and State Generalizations
I   How to Report Findings

APPLICATIONS

IV   Knowledge about Specifics
A   Facts
B   Convertions
C   Trends and Sequences
D   Classifications and Categories
E   Criteria
F   Principles and Generalization
G   Theories and Structures

Instructional Objectives and Student Activities Menu

Instructional Strategies Menu

Instructional Sequences Menu

Artistic Modifications Menu

Instructional Products Menu

CONCRETE PRODUCTS   ⟷   ABSTRACT PRODUCTS

Knowledge
Written Products
Spoken Products
Constructed Products
Artistic Performances
Leadership Behaviors

Cognitive Structures
Problem Solutions
Strategies
Values
Appreciations
Self-Actualization

Curriculum = Knowledge + Instructional Techniques

Figure 3.2. The Multiple Menu Model.

36

Romance with the Discipline

One of the characteristics that distinguish truly inspiring teachers is their love for the material they are teaching. Most of what we know about teachers who possess this romance with their discipline comes from biographical and auto-biographical accounts of well-known persons who were inspired and guided by an outstanding teacher. A book edited by John C. Board entitled *A Special Relationship: Our Teachers and How We Learned* (1991) consists of the memoirs of eminent persons from all walks of life who describe the important roles that outstanding teachers played in their early development. In analyzing the common themes that existed between teachers and learners, Board comments:

> These teachers, almost without exception, displayed masterful command of their subject matter. All were caring. All were possessed of an uncanny ability to unleash youthful potential. All were demanding, all relentless in their determination to ignite in every student the will to excel. And all were, to borrow Louis Nizer's words, "alike in their boundless energy" (p. 19).

Board goes on to describe what he calls "an uncommon characteristic that great teachers hold in common," and that characteristic is their own passion for knowledge and learning. They view themselves as a part of the discipline, rather than as a person who merely studies about it or teaches it to others. We believe that it is this romantic relationship with a discipline that causes certain teachers to seek out and nurture students of remarkable potential. In much the same way that the owner of a successful business or *object d'art* wants to ensure that a prized possession is passed on to someone who is a trustworthy recipient, so also is it feasible to postulate that the kinds of ownership and involvement that cause a romantic relationship with a discipline will result in similar concerns about the intellectual heirs of one's beloved field of study. Although the teacher's technique and romance with a discipline may not be as objectively verifiable as the extent of knowledge and methodology that the teacher possesses, the importance of these characteristics in the development of creative productivity in young people should cause us to examine them more carefully.

Ideal acts of learning can be described as action learning (Revans, 1982) – a situation where student, teacher, and curriculum function together in a way that encourages the acquisition of knowledge and skills, the asking of deep questions of interest to the student, the search for solutions and generation of new ideas, and the application of acquired knowledge and skills to the asked questions. Revans suggested that action learning is a reiterative cycle of acting, gathering data, reflecting, designing, and taking new action. Action learning and ideal acts of learning are not linear but require constantly revisiting and redefining the goals and objectives of learning. How can this be practically applied in the classroom?

NURTURING CREATIVE PRODUCTIVITY THROUGH ENRICHMENT
LEARNING AND TEACHING

Enrichment learning and teaching represent a particular way of applying
the essential components of ideal acts of learning described earlier. Enrich-
ment learning and teaching have also been called high-end learning (Renzulli,
1978b). High-end learning can be defined in terms of the following four prin-
ciples:

1. Each learner is unique, and therefore all learning experiences must be
   examined in ways that take into account the abilities, interests, and learning
   styles of the individual.
2. Learning is more effective when students enjoy what they are doing, and
   therefore learning experiences should be constructed and assessed with as
   much concern for enjoyment as for other goals.
3. Learning is more meaningful and enjoyable when content (knowledge)
   and process (thinking skills and methods of inquiry) are learned within
   the context of a real and present problem, and therefore attention should be
   given to opportunities to personalize student choice in problem selection,
   the relevance of the problem for individuals and for students who share
   common interests in the problem, and strategies for assisting students in
   personalizing problems they might choose to study.
4. Some formal instruction may be used in high-end learning, but a major
   goal of this approach to learning is to enhance knowledge and thinking
   skills acquisition gained through teacher instruction with applications of
   knowledge and skills that result from students' construction of meaning-
   fulness.

The ultimate goal of learning that is guided by these principles is to replace
dependence and passive learning with independence and engaged learning. The
most difficult part of enrichment learning and teaching is getting teachers to
stop teaching and to become facilitators of learning – the proverbial "guide-
on-the-side" rather than the disseminator of information. The teacher's role is
to assist in problem finding and problem focusing and in the procurement of
content and methodological resources and to help students understand how
to use the resources. The only time that direct instruction should take place is
when the instruction is necessary to help produce and improve the product or
service.

For high-end learning or enrichment learning and teaching to be sys-
tematically applied to the learning process in the regular classroom, it must be
organized in a way that makes sense to students and teachers. An organizational
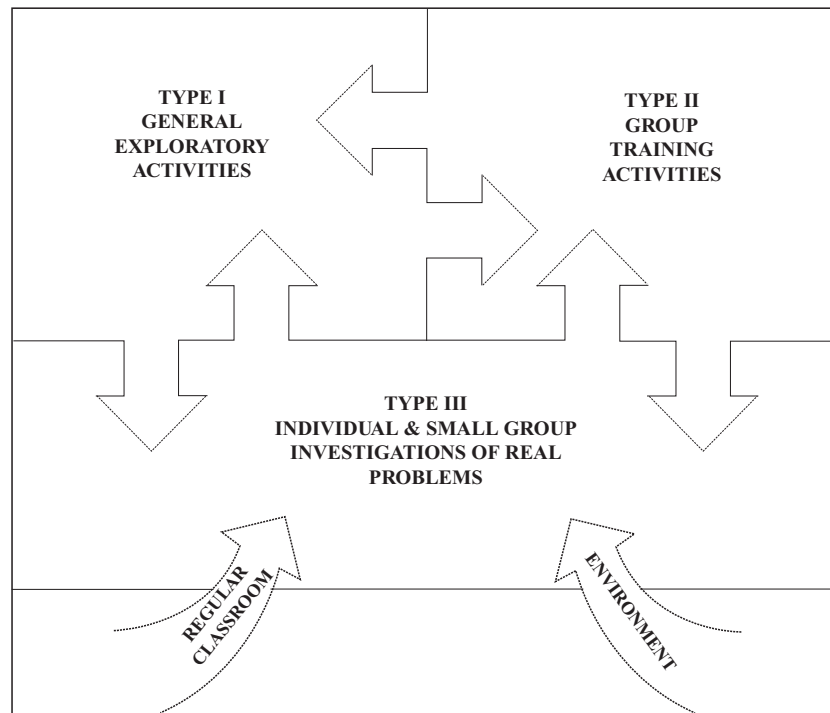pattern called the Enrichment Triad Model (Renzulli, 1987b) is used for this

Figure 3.3. The Enrichment Triad Model.

purpose. The three types of enrichment in the model are depicted in Figure 3.3. Type I enrichment consists of general exploratory experiences that are designed to expose students to topics in areas of study not ordinarily covered in the regular curriculum. Type II enrichment consists of group training in thinking and feeling processes, learning-to-learn skills, research and reference skills, and written, oral, and visual communications skills. Type III enrichment consists of firsthand investigations of real problems. Problem solving in real life almost always results in a product or service that has a functional, artistic, or humanitarian value. The learning that takes place in real problem situations is collateral learning that results from attacking the problem to produce a product or service, what we previously called "action learning." As an example, consider a group of engineering students who want to build a bridge across a stream. They examine the scope of the problem, what they already know, and what they need to know and do to build the bridge. In the process, they may learn about geometry, strength of materials, planning and sequencing, cooperativeness, structural design, spatial relationships, aesthetics, mechanics, and a host of other things necessary to get the job done. This kind of learning

that focuses on the interaction between product and process results in learning experiences that nurture creativity.

Type I Enrichment: General Exploratory Experiences

One of the enduring problems of teaching to nurture creativity is how to motivate students to act on their interests in a creative and productive way. The major purpose of Type I enrichment is to include within the overall school program carefully selected experiences that are purposefully developed to be highly motivational and to expose students to a wide variety of disciplines, topics, ideas, concepts, issues, and events that are not ordinarily covered in the general curriculum. Students may not know whether they will develop a sustained interest in a particular topic if they have not been exposed to the topic. Type I experiences should be selected and planned to be exciting and appealing to students and might be presented to all students in the classroom, grade level, or cross-grade group. A good menu of Type I experiences should be diversified across many topics and curricular categories. Such diversification improves the probability of influencing broader ranges of student interest and, accordingly, increasing the number of students who will select an area in which they may like to pursue follow-up activities.

To qualify as a bona fide Type I experience, any and all planned activities in this category have to be purposefully designed to stimulate new or present interests that may lead to more intensive follow-up on the parts of individual students and small groups of students and that may lead to creative productive activity. An activity can be called a Type I experience only if it meets the following three conditions:

1. **S**tudents are aware that the activities invite them to various kinds and levels of follow-up.
2. **T**here is a systematic debriefing of the experience to learn who might want to explore further involvement and the ways in which follow-up on the activity might be pursued.
3. **T**here are many opportunities, resources, and encouragement for diverse kinds of follow-up. An experience is not a Type I if every student is required to follow-up on an activity in the same or similar way. Required follow-up is a regular curricular practice and it almost always fails to capitalize on differences in students' interests and learning styles. Type I activities that encourage maximum student involvement and hands-on problem solving, or activities that require discussion, debate, and confrontations with topics and issues, are much more effective in prompting the kind of affective reactions that help students to personalize a topic and to make a commitment to more intense follow-up.

Type II Enrichment: Group Training Activities

Type II enrichment consists of instructional methods and materials that are purposefully designed to develop a broad range of process skills in the following five general categories:

> (1) Cognitive training, (2) affective training, (3) learning how to learn training, (4) research and reference procedures, and (5) written, oral, and visual communication procedures. The term "process skills" includes all of these categories. Specific skills within each of these general categories can be found in a taxonomy of Type II thinking skills at http://www.gifted.uconn.edu/sem/typeiips.html (Renzulli, 1977b).

Within each category of Type II enrichment, the targeted skills exist along a continuum ranging from very basic manifestations of a given skill to higher and more complex applications of any given process. Skills such as conditional reasoning or recording data from original sources can be taught to students at any grade, but the level and complexity of the specific activities will vary according to the students' developmental levels. Primary-grade students, for instance, can learn observational and data-gathering skills by counting and recording the number of times different kinds of birds come to a bird feeder during a given period of time. These data might be presented by using simple tallies or pictograms. Older students can develop the same skills on higher levels by observing and recording pulse and blood pressure measures while controlling for factors such as age, height/weight ratios, and specified periods of exercise. The advanced mathematics and computer skills of older students might enable them to engage in more sophisticated statistical analyses of their data. As an example, a group of fourth- and fifth-grade students from an elementary school in Western Australia engaged in a long-distance race with another group of students in a different state using the Nike Plus System. The system consists of a measurement device that connects to the runner's shoe and to an iPod, which then downloads information on speed and distance run by a student to a calculator on the Nike Web site. The calculator gives information about energy expended. These students were able to calculate how far they had to run to burn the calories consumed when eating different kinds of food. A podcast made by these students telling of this "Race around Australia" is available at http://www.teachertube.com/view_video.php?viewkey=13d65899f9d0522a893f.

There are three different methods for presenting Type II enrichment. The first method consists of planned systematic activities that can be organized in advance for any unit of instruction within the general curriculum. These kinds of Type II activities are planned in advance and form a part of an ongoing framework to develop a comprehensive "scope and sequence" of process-oriented activities that parallel regular curriculum topics. The Race around Australia

mentioned is one of this type of enrichment that was integrated into physical education and science. The main criterion for selecting Type II activities in this category is that the activity bears a direct or indirect relationship to the subject matter being taught.

The second method for presenting Type II enrichment consists of activities that cannot be planned in advance because they grow out of students' reactions to school or nonschool experiences. In other words, this dimension is characterized by responsiveness to student interests rather than preplanning. Enrichment in this dimension can also fill the motivational goal of the model by stimulating interests that may lead to more intensive follow-up in the form of Type III enrichment. An example of this kind of Type II enrichment is given by middle-school teacher Jennifer Winslett from Birmingham, Alabama. She tells her story in Figure 3.4. Student and teacher interest drove the skills instruction in this unit developed by Jennifer and her students.

My fellow colleagues and I decided to implement a student driven interest study program as a part of our pull-out program. We felt it was vital to student success. Our desire was to instill the value of life-long learning in our students. We began by revisiting the existing pull-out program schedule and making appropriate revisions. The new schedule allowed each student to attend a one hour interest study class once a week in addition to attending a three hour curriculum based class once a week.

Students were given an interest inventory which drove class instruction. Students were placed in classes according to their interests. We also felt it was very important for the teacher to not only express an interest in the class, but have a passion for the topic as well. It was important for the students to see our enthusiasm for learning and as a result motivate their own learning.

As a young adult, I aspired to become a nurse anesthetist. I began my college career as a nursing major, thus taking many biology and physiology classes. Naturally, I took on the role of facilitating learning in the interest area of the human body. My class, Doctor Doctor, began with an introduction to the human body. Students were introduced the different body systems and took a superficial look at the function of each. I noticed during this introduction that my students were extremely interested in the heart.

During the next class, I showed students how to check vital signs, including pulse rates, blood pressures, and respiratory rates and allowed students to practice with each other using actual instruments used in the medical field. I then posed the question, "how does exercise affect your vital signs?" Various answers were yelled out and I could see their wheels turning. After a few minutes of intense conversation, students stood and participated in various exercises such as jumping jacks for five minutes.

They then rechecked their vital signs and compared them to initial vital signs taken at rest. I extended this lesson beyond the classroom by asking students to complete the same exercises over the course of the next week on a daily basis, check their pulses, and record their findings.

The next week during classes they again exercised for five minutes, checked vitals, and compared their findings. Students concluded that exercise increased vital signs, yet after a week of exercising vital signs decreased after exercise. They also began asking questions about the effects of smoking on exercise, resulting in a conversation about the effect smoking as well as other unhealthy practices have on vital signs and overall health. As a result of their interest, a video clip was viewed. The video clip explained the effects of unhealthy practices and heart disease. Students were able to see inside blood vessels, plaque residue, build-up and how a heart attack resulted.

The clip prompted more questions and more research. To conclude the study, I partnered with St. Louis University School of Medicine via Distance Learning and Virtual Field Trips. The program, Adventures in Medicine and Science: Pig Heart Dissection, focused on teaching students not only the anatomy of the heart, but also the flow of blood through the heart. We were able to see an instructor at St. Louis University and dialogue with him as he guided us through the process. Each pair of students had a pig heart to dissect and study. The instructor was also able to see us and students were able to converse with him as well. Students were able to see an actual human heart; one that was healthy and one that was enlarged due to heart disease.

Hands-on learning as well as expert exposure allowed my students a once in-a-lifetime experience. It is my belief that students were not only inspired to learn more and dig deeper, but also inspired to lead healthy lives. The impact of this program was phenomenal. My students have already begun to inquiry about this type of learning experience in the future.

Jennifer Winslett – Birmingham

Figure 3.4. Doctor, doctor – Story of interest-driven skills instruction.

The third method for presenting Type II enrichment consists of the activities that are used within the context of already initiated Type III investigations. Activities used in this way represent the best application of inductive learning. Simply put, an individual or a group learns a process skill because they need the skill to solve real and present problems. Traci Ingleright is an elementary enrichment teacher in Birmingham, Alabama. In 2007, Traci had 86 elementary students in grades 3 through 5 who completed Type III experiences. For these young students to be successful, Traci had to teach them certain process skills as a group. Some of the skills they learned were how to refine a research question from a wide variety of interests, how to conduct research and gather data, how to use the school copier and Fax machine, how to properly answer a telephone,

how to prepare for a telephone interview and to interview adults, and many more similar skills. Individual children also had to learn skills specific to their projects. One girl learned how to sew for her dress designing project. A boy learned to make flyers to spread the word about his project – gathering diapers for babies in foster care. Another boy had to learn how to speak to public meetings because he was asked to be the spokesperson for Operation Lifesaver (read about him at http://www.oli.org/enewsletter/FromTheStates.html).

Type III Enrichment: Individual and Small Group Investigations of Real Problems

Type III enrichment leads to creative productive activity on the part of youngsters. It consists of investigative activities and the development of creative products in which students pursue roles as firsthand investigators, writers, artists, or other types of practicing professionals. Although students pursue these kinds of involvement at the more junior level than adult professionals, the overriding purpose of Type III enrichment is to create situations in which young people are thinking, feeling, and doing what practicing professionals do in the delivery of products and services. Type III enrichment experiences should be viewed as vehicles in which students can apply their interests, knowledge, thinking skills, creative ideas, and task commitment to self-selected problems or areas of study. In addition to this general goal, there are four objectives of Type III enrichment:

1. To acquire advanced-level understanding of the knowledge and methodology used within particular disciplines, artistic areas of expressions, and interdisciplinary studies
2. To develop authentic products or services that are primarily directed toward bringing about the desired impact on one or more specified audiences
3. To develop self-directed learning skills in the areas of planning, problem finding and focusing, organizational skills, resources utilization, time management, cooperativeness, decision making, and self-evaluation
4. To develop task commitment, self-confidence, feelings of creative accomplishment, and the ability to interact effectively with other students and adults who share common goals and interests

This type of enrichment is defined in terms of the pursuit of real problems. Real problems have four characteristics. (1) It must have a personal frame of reference for the individual or group pursuing the problem. For example, Davis, whom we mentioned earlier, became interested in train crossing safety because three of his friends died in an accident on a train crossing. (2) Real problems do not have existing or unique solutions for the people addressing the problem. If there is an agreed-on or correct solution or set of strategies for

solving the problem, it is more appropriately classified as a training exercise. Even simulations that are based on approximations of real-world events are considered to be training exercises if their main purpose is to teach content or thinking skills. (3) A problem is "real" because people want to bring about some form of change in actions, attitudes, or beliefs on the parts of a targeted audience or they want to contribute something new to the sciences, arts, or humanities. By "new," we mean new in the local rather than global sense. We do not expect young people to make contributions that are new "for all mankind." For example, if a group of young people gather data about their running as in the Race around Australia example given earlier, the data and resulting analysis would be new in the sense that they never existed before and the insights would be new for these youngsters. (4) Real problems are directed toward a real audience. "Real audiences" are defined as persons who voluntarily attend to information, events, services, or objects. Consider, for example, a student who works to have novelty cigarette lighters banned because of safety concerns. He could present his research findings to his classmates to rehearse his presentation and get feedback, but an authentic audience might be the fire marshals and city council members, who are able to enact regulations that would ban the sale of these unsafe items.

While there is nothing inherently wrong with using simulated problems for training and learning, there are benefits to encouraging students to pursue real problems of particular interest to them in which they can learn real-life skills. Alane Starko (1986) studied students who participated in Triad programs for at least four years. They were compared to students who qualified for such programs but received no services. Results indicated that students who became involved in independent study projects of the type suggested here more often initiated their own creative products both *in and outside of school* than did students in the comparison group. The group in the Enrichment Triad Program reported more than twice as many creative projects per student as the comparison group and reported doing more than twice as many creative products outside of school on their own time (1.03) than the comparison group (0.50). Hébert (1993) also showed that experiences with Type III activities in elementary school laid a solid foundation for continued creative productivity in later years; even when students were not encouraged to engage in these kinds of activities in middle and high school, they continued to pursue creative independent projects outside of school. The young people Hebert interviewed discussed how their Type III experiences helped them later in school. The planning, research, and time management skills they learned stood them in good stead in middle and high school. These young people also talked about the life-shaping effects their early independent projects had on them: their early Type III projects had a significant impact on their later career choices.

Brianne Burrowes, now a journalism major at the University of Montana, was such a student – a teenager intrigued by magazines. Encouraged by her

enrichment teacher, and given the appropriate training and opportunity, she started her own e-zine and was featured in the national *ELLEgirl* magazine. We interviewed Ms. Burrowes for this chapter, and the full interview is given in Appendix A.

Five Essential Elements of Type III Enrichment

Five essential elements that typify Type III enrichment are focus on individual or group interests, focus on advanced-level knowledge, focus on methodology, a sense of audience, and authentic evaluation.

A Focus on Individual or Group Interests
Problems being pursued through this type of learning experience must be based on individual or group interests. In the spirit of acting as facilitators of learning, teachers and other adults can provide guidance toward the formulation of a problem, but they must avoid at all costs crossing the line from suggestion to prescription. The role of adults is primarily that of assisting students in problem finding and focusing. Some Type III problems will be specific to individual students. Other Type III problems will be of more general interest to a group of students. It is possible to guide students in this situation to become involved in different ways with the same problem or problem area. In most cases, the division of labor that takes place in group Type III situations causes a broader range of talents to be developed and promotes the kind of real-world cooperativeness and mutual respect that we are attempting to achieve in high-end learning. Problems that require a diversity of specialties also create opportunities for more personalization on the parts of individuals in the group. When each person feels that she or he owns a part of the problem, the first characteristic of a real problem is met.

The Focus on Advanced-Level Knowledge
Type III enrichment should draw on authentic, advanced-level knowledge. If we want young people to approximate the roles of practicing professionals, then it is important to examine the characteristics of persons who have displayed high levels of expertise in their respective domains of knowledge. During the past three decades, cognitive psychologists have devoted much research to the topic of experts and expertise and the role of knowledge in attaining expert performance. Glaser (1988) summarized some of the key characteristics of expert performance, and these characteristics can be used to provide guidance for this dimension of the Enrichment Triad Model:

- Experts mainly excel in their own domain and spend much more time than novices analyzing information within their respective fields of study.
- Experts also perceive large, meaningful patterns in their domain and they have an understanding of how knowledge is organized in their domain.

- They tend to represent problems at deeper levels by creating a conceptual categories rather than categories based on surface or superficial features.
- They are goal oriented, and they access knowledge mainly for its applicability to present problems.
- Finally, experts develop self-regulatory skills such as judging problem difficulty, apportioning time, of asking questions, revealing their knowledge, and predicting outcomes.

For students to gain higher levels of expertise in a topic or domain, time spent on independent projects has to increase significantly and the amount and complexity of knowledge available to students pursuing advanced studies and investigations must also be expanded. While the amount of advanced level of knowledge that teachers possess is a major determinant of the level of courses they teach, technology has made access to experts relatively easy. Consider again the example of Jennifer Winslett, who was able to partner with an instructor at the University of Louisville through distance education technology to teach her students about the heart. She did not need to be an expert herself but could tap into another person's expertise for her students.

A Focus on Methodology

The use of authentic methodology is an essential element of Type III enrichment. Because one of the goals of Type III enrichment is to help young people extend their work beyond the usual kinds of reporting often resulting from student research (read "looking up information"), the end result of a Type III investigation should be a creative contribution that goes beyond already existing information that is typically found in encyclopedias and other "all-about" books. *Methodology* often defines a field of organized knowledge, and the methodology of most fields can be found in certain kinds of guidebooks or how-to manuals. These how-to books are the key to escalating studies beyond the traditional report approach that often passes for research. Furthermore, every field of knowledge can also be partly defined by the kinds of data that represent the raw material of the field. New contributions to a field result from one of two types of occurrences: (1) investigators may apply well-defined methods of the field to the process of making sense out of random bits and pieces of information – in other words, synthesizing information in a new way as in the example of Joshua Schachter's development of del.icio.us, (2) or investigators may develop new methods to work with well-known pieces of information, such as in the example of Terence Tao's development of more efficient digital cameras.

Some investigations require levels of sophistication and equipment that are far beyond the reach of young investigators, but all fields of knowledge have entry-level and junior-level data-gathering opportunities. We have seen scientifically respectable questionnaire studies on food and television preferences carried out by primary-grade students. A group of middle-grade students

gathered and analyzed water samples as part of a large regional study on the extent and effects of acid rain. This work was so thoroughly and carefully done that the students' findings were requested for use by a state environmental agency. A fifth-grade student wrote a guide book that was adopted by his city's government as the official historical walking tour of the city; another elementary student convinced all the fire marshals in the State of Alabama to ban the sale of novelty cigarette lighters, which posed a safety risk to children and adults alike. In a small town in Alabama, a group of students decided to interview elderly citizens before "they were all gone" and were instrumental in establishing a museum for their town with priceless historical objects garnered from the senior citizens. These examples reflect the success and high levels of product development attributed to the proper use of authentic methods and techniques, even when the techniques are carried out at a somewhat junior level compared with the techniques used by adult inquirers. The facilitating teacher's role in providing methodological assistance is to help students identify, locate, and obtain resource materials and/or persons to provide assistance in the appropriate use of investigative techniques.

A Sense of Audience

Products and services resulting from this kind of involvement have to be targeted to real audiences. This sense of audience that students develop in connection with their work is an essential element in the success of many Type III projects. This sense of audience gives students a reason to improve the quality of their products and to develop effective ways of communicating their results with interested others. The sense of audience is also a primary contributor to the creation of task commitment and concern for excellence and quality that have to characterize Type III investigations. A large part of the facilitating teacher's effort must be focused on helping students find appropriate outlets and audiences for their most creative efforts. In real life, creative and productive individuals have the same concern. The reason most creative and productive people create and produce is their intended impact on the audience. Type III investigations provide the same kind of personal satisfaction and self-expression that result from bringing an important piece of work to fruition. Placing an emphasis on outlets and audiences helps students take one small but often neglected first step in the overall process of product development – to consider what people in a particular field produce and how they typically communicate their results to other interested persons. We can look to the activities of practicing professionals and the how-to books for guidance in this instance. In many cases, young artists and scholars will be restricted to local outlets and audiences, but there will be occasions when products of unusual excellence can be shared with larger audiences. Jane Newman, now professor in gifted and talented education at the University of Alabama, started her teaching career years ago as a teacher of gifted students in Albertville, Alabama. She tells

> Some of the projects that I facilitated lasted 2 years. In the early 1980s I had a group of students who were interested in the history of their town – it was a small town, my town, and they wanted to read about the history of Albertville, but there was nothing., They went to the library, but there was nothing. So they said, "Well, we need to write a history!" We got involved, we got a grant, and we got a consultant from the University of Alabama to come down and teach us how to collect oral history from the senior citizens. This project was a 2 year project and it gave the students something to do after school. We lived in a rural area and there was not really a lot to do after school and on weekends. It turned into a nice project. We published a hardbound book with illustrations and pictures. It was adopted by the school system as a textbook for 3rd and 4th grade students, and it still is one of the textbooks.
>
> Also aside from that, as the students were interviewing these older citizens from the area, they would say, "Well, I have this old plough back there in the shed that I don't have a use for. If you want it, you can have it." Or they'd say, "I have this mortar and pestle that we used to grind corn on and we don't use it anymore." So our kids got the mayor of the town to donate this caboose that was just sitting around and we turned it into a museum and it is still there. And people donated things. My husband and I cleaned out my parents' house. My grandparents had lived there, and we had all these pieces of old farm equipment. I would have kept them, but my husband said, "No, we can't take those to Birmingham." So we donated those to the museum, and people can go and see what the settlers from that area used and what life was like.
>
> Jane Newman, Birmingham

Figure 3.5. Interview with Jane Newman.

the story of how her students created a history book about their town that was adopted by the local school district as an elementary history textbook (Figure 3.5).

An important role Jane played was to find a funding source and to find a knowledgeable person to teach her students how to do the things they wanted to do. Teachers should always help students gain a perspective for more comprehensive outlet vehicles and audiences beyond local communities. Many organizations, for example, prepare newsletters and journals at state and national levels, and virtually every interest group has a broader array of Web sites and other means for electronic communications. A youngster from Alabama was featured in the newsletter of a state organization that deals with foster children and orphans, and another became a spokesperson for a national organization. Exploring external audiences will help young people develop

standards of quality and will also provide them with real-world experiences about the rigors and challenges of reaching out to wider audiences.

Authentic Evaluation

Work carried out using a Type III enrichment approach should be evaluated in an authentic rather than an artificial manner. The ultimate test of quality in the world outside of school is whether products and services achieve the desired impact on clients or selected audiences. It is for this reason that Type III products should never be graded or scored. This traditional school practice is antithetical to the ways in which work is evaluated in the real world. A guide such as the Student Product Assessment Form (Renzulli & Reis, 1997; available at http://www.gifted.uconn.edu/sem/pdf/spaf.pdf) can be used to provide students with categorical feedback, but even this instrument should only be used to help students refine and improve their work. Teachers and other adults should take the role in the feedback process of a "resident escalator." Sensitive and specific recommendations about how particular aspects of the work can be improved will help students move slowly but surely toward higher and higher levels of product excellence. Feedback should be specific and encouraging to avoid student discouragement and to reconfirm a belief in the overall value of their endeavors.

Teachers as Facilitators of Type III Investigations

Teachers who facilitate Type III activities fulfill a range of duties, such as project manager, facilities supervisor, supply clerk, coach, secretary, production manager, caterer, transportation manager, and cheerleader. Few students, especially young ones, naturally have the deep interest and task commitment to sustain them through a semester or year-long investigation without help. Without help and proper support, students may start a project and fail to carry it to completion. Completing a high-quality product does not automatically occur; it requires interest, self-motivation, and direction, as well as the acquisition of critical thinking and planning skills (Newman, 2006).

There are a variety of ways to accomplish this objective. Schlichter (1986, 2009) proposed using the Talents Unlimited Model as a Type II skills training model. The Talents Unlimited Model consists of the following work-related thought processes: productive thinking, communication, forecasting, decision making, and planning (Schlichter & Palmer, 2002). These processes help improve students' critical and creative thinking skills in the classroom context and provide a framework for improving the chances of success of independent projects. According to several research studies (Burns, 1987; Gubbins, 1982; Schack, 1986; Starko, 1986), personal variables such as locus of control, self-concept, self-efficacy, grade, gender, learning style preferences, achievement, and Type II orientation lessons have a significant impact on students' decisions

to start an independent project. Newman (2005, 2006) found that students who used the Talents Unlimited Model model to focus and plan their investigations were significantly more likely to complete projects successfully than were students who had not received such training (100% versus 79%). The talents most helpful, according to these students, were productive thinking (for interest finding), decision making (for narrowing the topic to a single research question), and planning.

Case Study: The Lightbulb Expo

Traci Ingleright, an enrichment teacher in Hoover, Alabama, is an excellent example of a teacher who nurtures creative productivity in her classroom. She has perfected the process over several years, and in spring 2007, 86 of her third-, fourth-, and fifth-grade students completed independent projects (T. Ingleright, personal communication, October 16, 2007). Ms. Ingleright encourages her students to read the newspapers and watch the news. They regularly talk about current events. She takes this approach a step further, however. She encourages her students to think of a situation or problem in their lives or their community that they can change. The first step in the development of Type III investigations is a process she calls "Ten Questions." She has the youngsters write down as many topics as possible that they might wish to investigate. She then has a conference with each student to get to that one topic that most interests them, and for which they can find resources and information. After they have identified their topic of interest, she asks them to write down ten questions: ten things they want to know about their topic. In finding resources, students search the school and community libraries, and then make copies of the pages containing pertinent information, as well as the bibliographical information of the resources. These pages are stored in the three-ring binder that each student has so they can easily find the information later when they create their bibliography. The process is fluid, and students sometimes have to change topics when they cannot find enough information. They also search the Internet for information and resources.

A requirement of the project is that each student should gather as many sources of information as possible, including real people who might be interviewed. The school has installed a telephone in the enrichment room for the purpose of allowing students to place and receive telephone calls connected to their projects. These students have to learn many process skills to complete their investigations successfully – research skills, data-gathering skills, telephone etiquette, how to keep accurate records, how to keep journals of their progress, and how to handle multiple pieces of mail and email that come in response to their queries.

To simplify the process, Ms. Ingleright has developed a system for communicating with students and their parents through regular meetings and emails.

She also has two mail areas – one for students to leave her mail, which often consists of questions or requests for help, and one where students can pick up their mail. Each student has a basket where they keep their supplies and a three-ring binder for keeping track of research materials, journal entries, activity logs, and mail.

When students have gathered enough information to start formulating answers to their ten questions, they create their first product – a research paper based on the ten questions. The paper includes a bibliography. Students also prepare for a public event where their projects are displayed. This event is called the Lightbulb Expo, and for the Expo each student prepares a display board in three parts: the middle part portrays their research question and research findings. On one side they portray what action they have taken to solve their problem, and on the other side they put information under the heading "What can you do?" Each student is available to answer questions about their project. Several students also prepare interest development centers to be donated to the school library for the use of teachers and students. What is most interesting, though, are the out-of-school results of the projects. The student activities do not just revolve around research, a paper, and an exhibition.

The following examples of creative productivity come from the Spring 2007 Lightbulb Expo. One third-grader, Collin, became aware of the large foster children population in Birmingham. His research question was "What can I do to reduce the number of foster children?" His first solution was that Ms. Ingleright should adopt some children. When she gently declined, he had to find other solutions. He contacted 14 foster care agencies in the Birmingham area, and through his research realized that adoption of all the children in these homes would not be possible. He had to change his research question, and then became aware of an urgent need for diapers and baby formula for the many babies in the foster care system. Also being a baseball player, he decided to involve his friends in the junior baseball leagues in collecting products for foster babies. He found a ready audience. Coaches and parents of boys in the baseball league contributed generously. A former professional baseball player visited the school for an unrelated reason and was promptly introduced to this young boy. The upshot was that the Birmingham Barons baseball team held a benefit game for foster children, and the Atlanta Braves contributed to his campaign. Collin's B.A.B.I.E.S. campaign (Baseball Assisting Babies In Emergency Situations) collected over 5,000 boxes of diapers that he donated to Birmingham Area children's homes. The Alabama Baptist Children's Homes published a story about Collin's help in their Spring 2007 *LifePrints* newsletter available at http://www.abchome.org/publications.html.

Another boy, a fourth-grader called David, discovered that many novelty cigarette lighters sold at gas stations were actually illegal, because they have no safety mechanisms. He mounted a campaign to get these lighters banned in his town. With the help of the Hoover fire chief, he has spoken with every

fire marshal in the state of Alabama, and they have all agreed to help this now 10-year-old boy do what he needs to do to get these lighters banned.

Katy is a young lady who became concerned about homeless women and discovered a charity called Clara's Closet in nearby Tuscaloosa. This charity was founded by a lawyer in Tuscaloosa, who was Mrs. America 2005 and also happened to be a friend of Ms. Ingleright. With this woman's help, Katy collected professional clothes for women in need and donated a truckload of clothes to Clara's Closet.

Many of the students in this program were able to achieve real-world results with their projects, and you can read a newspaper story about them in the April 26, 2007, edition of the *Birmingham News*. Not all the projects were as spectacular as these examples, but all these students gained immeasurably in skills, knowledge, and self-confidence. Many of the adults who had mentored and helped the youngsters with their projects, including the Hoover fire chief and Mrs. America 2005, attended the final Lightbulb Expo evening to pledge their continued support.

APPLYING IDEAL LEARNING SITUATIONS WITHIN SCHOOL STRUCTURES

There are a variety of school structures within which these kinds of ideal acts of learning can be accommodated. These structures range from opportunities classroom teachers can make for creative work on the part of their students within their regular curriculum, to special grouping strategies and elective or pullout classes.

Regular Classroom and Curriculum Opportunities

Classroom teachers can create opportunities for independent and semi-independent projects that stem from the regular curriculum by giving students choices in exhibiting what they have learned. Instead of requiring a research paper or a written exam, teachers may give students the choice of a wide variety of products. Some possible product choices are suggested in Table 3.1.

Some classroom activity may be used as training for creative productivity and may not result in real-world problem solving, products, and services. The second author of this chapter taught sixth-grade students for several years in a school that integrated social studies and literature. Part of the regular curriculum was studying Greek and Roman history and geography and integrating literature studies consisting of Greek and Roman myths, as well as the works of Homer. This curriculum was usually taught in the second quarter, before the winter holidays. As a culminating activity, students were given a 3 × 3 grid containing nine possible products, of which they had to complete three (Table 3.2). Beyond these nine products, students always had an open

Table 3.1. *Product planning guide*

Artistic Products

Architecture	Batik	Landscaping	Puzzles
Murals	Exhibits	Terrariums	Car design
Decoration	Cartoons	Mosaic	Sewing
Sculpture	Book cover/designs	Collage	Puppets
Filmstrips	Fabric design	Silk screens	Set design
Slide shows	Maps	Movies	Tin ware
Comic strips	Mobiles	Videos	Pottery
Yearbook	Fashion design	Aquariums	Iron work
Advertisements	Jewelry	Painting	Weaving
Drawing	Diorama	Web pages	Calligraphy
Graphic design	Furniture design	Package design	Tessellations
Photography	Wood carvings	Postcards	Multimedia presentations
Engraving	Political cartoons	Posters	
Etching	Horticultural design	Computer graphics	

Performance Products

Skits	Dance	Films/videos	Interpretive song
Role playing	Mime	Reader's theater	Composition
Simulations	Puppet shows	Poetry readings	Chorale
Theatrical performance	Dramatic dialogues	Improvisations	Concerts
Vocal	Comic performances	Musical performance	Parades
Athletic events	Demonstrations	Experiments	Reenactments

Spoken Products

Debates	Lecture	DJ shows	Book talks
Speeches	Mock trials	Panel discussions	Chronicles
Radio plays/podcasts	Songs	Celebrity roasts	Forums
Advertisements	Sales promotions	Narrations	Sign language
Poetry readings	Simulations	Sermons	Puppet shows
Storytelling	Demonstrations	Dedication ceremonies	Book reviews
Poetry for two voices	Telephone conversations	Weather reports	Audiotapes
Interviews	Eulogies	Rap songs	Infomercials
Oral histories	Announcements	Town crier	Master of ceremony
Newscasts	Comedy routines	Guided tours	Oral reports

Visual Products

Videos	Layouts	Ice sculptures	Maps
Slide/digital photo shows	Models	Demonstrations	Diagrams
Computer printouts	Pottery	Cartoons	Mobiles
Sculptures	Proclamations	Travel brochures	Set design
Table settings	Computer programs	Athletic skills	Experiments
Advertisements	Timelines	Blueprints	Caricatures
Puppets	Diagrams/charts	Lists	Silk screening
Calendars	Sketches	Multimedia presentations	Graphic organizer
Musical scores	Graphs	Graphic design	Photography
Book jackets	Collages	Painting	Fashion design

Table 3.2. *Activity grid for Homer's* Odyssey

Design a coin	**Mapping Odysseus' travels**	**Timeline**
Choose any character from the book to honor with a coin. Design a coin and create it. Present it with a plaque containing an address explaining why the character was worthy of this honor.	Create a map of ancient Greece. Indicate on the map the route Odysseus traveled. You may represent the map any way you choose. You may use Google Maps, you may make a three-dimensional map, or any other type of map you wish.	Create an illustrated timeline for the travels of Odysseus from the time he left Troy until the time he is reunited with his family in peace. You may present the timeline in table form or graphically.
Greektionary	**Holiday Tree Ornament**	**Create Your Own Odyssey**
Choose five word roots from the accompanying list. Use each as the trunk of your tree and find as many English words that contain the Greek root as you can to form branches of the tree. You may present the tree in any form.	Choose a character, object, or symbol from the Odyssey. Create a Christmas tree ornament depicting this character, object, or symbol. Write an entry for the *Ithaca Trading Company Holiday Catalogue* describing your ornament.	Create a fictitious character. Write of his/her odyssey and all the adventures along the way. Also tell how he/she overcame adversity.
Write a Poem	**Write Your Own Myth**	**Create a Board Game**
Look at the accompanying example of an hexameter poem. Write your own hexameter poem about Odysseus. You may put it to music to create a song.	Study the attributes of a myth. Use this knowledge to create your own myth. You can place it in any time or place. You may present your myth any way you like. You may present it in written form, or as a play, or as a one person show, or any other way that will highlight the activity.	Use the facts in the story of Odysseus' travels to create a board game. See the accompanying rules and examples page to help you.

choice – they could decide to pursue any project of their choice. The grid is reproduced in Figure 3.6. All students were required to complete the center activity – creating a holiday ornament symbolizing an idea, person, or object from Homer's *Odyssey*. The teacher brought into class a four-foot-high holiday tree, and students could hang their ornaments as they completed them, making a presentation on the meaning of the ornament, and what it symbolized in Homer's tale. Students also wrote a description of the ornament suitable for a catalogue, and all the descriptions with illustrations were collected into the *Ithaca Trading Company Holiday Catalogue*. The catalogues were reproduced and each student took home a catalogue. The annual Odyssey holiday tree was put on display in the school foyer two weeks before school closed for the holidays.

Other activities were designed to tap into student's interests and style preferences and still present an opportunity for students to showcase what they had learned. It gave ample opportunity for creativity. Students who chose to create a game had the pleasure of playing their games with classmates. In the

process, they learned how to refine rules and make the game as user-friendly as possible.

If we had to do it again, we would invite the sixth-graders to put together a presentation of Homer's *Odyssey* consisting of the best examples of each activity. This presentation could then quite easily be presented as a podcast. The teacher would certainly have a Web site where the podcast could be posted. Students could be presenters or filmographers or recorders or the technicians transferring and editing videotape and audiotape into podcast format. Another student might be in charge of lighting or sound or even the Web master.

The same class of four- and fifth-grade students showcased in Race around Australia regularly produces class podcasts viewable on www.podkids.com.au. These podcasts cover a wide variety of curriculum-related topics. Episode 14 posted in August 2007, for example, features an interview with Elaine Forrestal, the author of a book read all over Australia for National Reading Day. The students also created a Web page about the book, *Someone Like Me*. With podcasting and blogging technology freely available today, teachers and students can be endlessly creative in extending their regular curriculum. This podcast is an excellent example of a Type I enrichment opportunity that evolved into a Type III enrichment situation. In the process, students had to learn many Type II skills – how to record a speaker, how to ask good questions, how to prepare the podcast, and how to post it.

Even without the addition of technology to record the visit, students can have the benefit of an author visit, whether in person or via video. A third-grade teacher in New Orleans regularly invites her graduate professor, who is a well-known children's author of Louisiana tales, to visit her classroom to read her books to students and answer student questions. There are also author interviews available online. Many authors have Web sites, and bookstores will often host podcasts of author interviews.

This is not the only way to incorporate the Enrichment Triad Model into the literature classroom. There are a variety of ways student writing can be published. With the advent of computers and printers and a wide variety of software, self-publishing has become as easy as putting the work together and printing it out. There are many competitions for student authors, and specialized works, such as the Albertville history that Jane Newman's students wrote, will always be in demand.

Gretchen Anderson of Middlebury, Massachusetts, was 9 years old when she began adapting recipes found in Louisa May Alcott's books to include modern ingredients and cooking methods with the encouragement of her classroom teacher. Her book, *The Louisa May Alcott Cookbook,* was published in 1985 and was sold by the Louisa May Alcott Museum for several years. Gretchen went on to earn a doctorate in literature.

Every classroom teacher has to deal with those students who complete their work before their peers. Some students will quietly sit and read while they wait for the rest of the class to finish, but there are always those students who get in trouble while they wait. One solution is to encourage those students to pursue an independent investigation.

Curriculum Compacting

Curriculum compacting (Reis, Burns, & Renzulli, 1992) is a relatively simple procedure whereby teachers can allow students to buy time for independent projects. Through curriculum compacting, a teacher can streamline the regular curriculum for students who are capable of mastering it at a faster pace. It is defined as "the process of identifying learning objectives, pretesting students for prior mastery of these objectives, and eliminating needless teaching or practice of mastery that can be documented. The time saved through this process may be used to provide either acceleration or enrichment for students" (Reis et al., 1992, p. 10). The compacting process occurs in eight steps:

1. Identify the relevant learning objectives in the subject area or grade level.
2. Find or develop a means of pretesting students on one or more of these objectives before instruction.
3. Identify students who may benefit from curriculum compacting and should be pretested.
4. Pretest students to determine mastery levels of the chosen objectives.
5. Eliminate practice, drill, or instructional time for students who have demonstrated prior mastery of these objectives.
6. Streamline instructions of those objectives students have not yet mastered but are capable of mastering more quickly than their classmates.
7. Offer enrichment or acceleration options for students whose curriculum has been compacted.
8. Keep records of this process and the instructional options available to compacted students.

Tannenbaum (1986) called a similar process "telescoping," which he describes in the following way: students "complete the basics in the least amount of time, thereby sparing themselves the tedium of dwelling on content that they either know already or can absorb in short order" (p. 409).

Many students can benefit from curriculum compacting, because they already know much of the curriculum before they study it in school. Recent studies have shown that 78–88% of fifth- and sixth-graders who read at the average–to–above average reading level could pass pretests on basal comprehension skills at about 92–93% accuracy before these were covered in the basal

curriculum. Reis et al. (1993) found that as much as 40–50% of the basal curriculum could be eliminated for 10–15% of all students with no deterioration in grades and test performance.

Compacting is not enrichment but provides opportunity or time in the school day for students to engage in enriching activities. Think of compacting as diagnosis and prescription. This is an educational technique used for decades in remedial education. The difference is, however, that we are not identifying objectives that students have not mastered, but we are identifying objectives and skills that students have already mastered. Curriculum compacting provides time for a variety of activities: accelerated instruction of content and enrichment of regular content through the pursuit of the depth and complexity, self-selected reading, or interest-based independent investigations. Detailed information on curriculum compacting and how to do it can be found at http://www.gifted.uconn.edu/sem/semart08.html and in the book *Curriculum Compacting* (Reis et al., 1992).

Enrichment Clusters

Inserting a block of time into the school week during which inductive learning is the major focus of all student activity is an excellent way of making a time for highly engaging learning activities. One way to structure such a block of time is to create an enrichment cluster program (Renzulli, Gentry, & Reis, 2003). In an enrichment cluster program, educators focus on student-driven learning, turning students' attention toward authentic learning applied to real-world problems. Enrichment clusters allow groups of students who share a common interest to come together each week during a specially designed time to produce a product or targeted service based on that common interest. Activities in the clusters center around six key questions:

1. What do people with an interest in this topic or area of study do?
2. What products do they create and/or what services do they provide?
3. What methods do they use to carry out their work?
4. What resources and materials are needed to produce high-quality products and services?
5. How and with whom do they communicate the results of their work?
6. What steps need to be taken to have an impact on intended audiences?

Eight guidelines differentiate an enrichment cluster from a traditional course, mini-course, or unit of instruction.

Focus on application of content and process. The golden rule of enrichment clusters is that all cluster activity be directed toward the production of a product, performance, or service for an authentic audience.

Allow students and teachers to select the clusters in which they wish to participate. In most formal schooling situations, students have few choices.

Enrichment clusters emphasize product or service development, so it is worthwhile to help students examine their preferences and interests. There are many interest surveys and style preference surveys available to help teachers and students accomplish this. The family of *Interest-A-Lyzers* (Renzulli, 1977a) help students get in touch with potential interests through a series of open-ended questions. A self-assessment instrument entitled *Inspiration* (Gentry & Renzulli, 1995) fulfills a similar purpose for teachers.

Group students across grade levels by interest areas. In the out-of-school world, people are most often grouped by interest or common tasks, and not by age or grades. Enrichment clusters aim to follow a real-world pattern of organization and learning, and therefore we recommend that cluster enrollment range across two or three grade levels. Age becomes imperceptible when there are strong commonalities of interest, and many benefits result when a younger student's unpolished but creative idea is teamed up with an older student's know-how or extended experience in a certain segment of the task.

Do not use predetermined unit or lesson plans. This is perhaps the most difficult guideline for beginning cluster facilitators to deal with. It is crucial that facilitators and students work together to develop the scope and sequence of the cluster. Start-up activities can be selected and developed by facilitators, but how a cluster develops from there depends on the interests and skills of the students involved. This development takes place through discussion and the cluster facilitator takes the role of resource person, finding resources and know-how needed to produce the product or deliver this service agreed on through discussion. Not having predetermined lesson plans does not mean the cluster will involve fun and games only.

Guide clusters with authentic methods and advanced content and materials that investigators and creative professionals use. Manuals or how-to books can be called "mentors in print" because they supply information about how professionals in a particular field of study go about carrying out investigative, creative, or action oriented work. The Internet is a vast storehouse of how-to information. Cluster facilitators can also ask professionals in various fields for recommendations of resources.

Provide opportunities to develop multiple talents with in an enrichment cluster through division of labor. Not all students in a cluster should do the same task. In real-world productivity, there is a division of labor and everyone contributes in his or her own area of interest and developing expertise. What connects the group is a common purpose, but each member makes a unique contribution to the overall enterprise. The division of labor concept is valuable in cluster planning because it encourages teachers to help young people explore multidimensional products. It is also possible to have several different outcomes within a single cluster. Individuals or small groups of students may choose to move in divergent directions within the general topic area, thereby creating several different products and services within a single cluster.

Set aside designated time blocks for enrichment clusters. Student-driven learning can take place in any classroom, but the pressures imposed by top-down curricular requirements and today's emphasis on preparation for standardized tests place limits on the amount of inductive learning that can take place in most classrooms. We recommend that schools set aside specially designated time blocks during the week when inductive learning becomes part of all students' learning experiences. A block of time ranging from one hour to one half-day per week provides ample time for effective clusters. To allow for total faculty availability and opportunity to create the critical mass of interested students in each cluster, schedule all of the clusters at the same time for the whole school. If it is not possible for the whole school to participate, or if not all faculty value student-driven learning, grade-level teams may agree on the time for clusters. Individual teachers can also schedule time for clusters if no one else wants to participate. This is not an optimum situation. The fewer participating teachers there are, the fewer choices are available for students, unless the teacher can prevail upon parent and community support to facilitate clusters.

Suspend the customs of regular schooling. Many regulations and traditions guide schools and classrooms. Cluster time, however, has to be different from the regular school environment. We would like to see across-grade grouping by interest, focus on products and services rather than the acquisition of predetermined knowledge, and facilitation instead of teaching that follows traditional lessons or unit plans. Also be aware that group size may vary considerably from one cluster to another. Cluster size should depend on how many students are interested and how many students a teacher feels comfortable accommodating. Cluster work should not be graded and should mimic real-life work situations as best as possible.

School of Design – Metairie Academy

A magnet school in Louisiana, Metairie Academy, has embraced the concept of enrichment clusters. Three times a week during the last hour of the school day, students and teachers come together for cluster time. Clusters range from art clusters for primary students to a cooking cluster for older students that incorporate mathematics and chemistry in the development and testing of recipes. Of course, it has the added bonus that students and teachers can sample the results of the cluster!

One of the clusters was featured in a local magazine, *New Orleans Homes and Lifestyles* (January 2007). A group of 15 third-, fourth-, and fifth-grade students participated in an interior design cluster presented by Ms. Watson, a language arts teacher who also holds an interior design degree. After the devastating floods in New Orleans, many students were dealing with the loss of possessions and personal space. These students chose to design new bedrooms

The Quilting Bee

Pictures in fabric, family stories, expressions of beauty, geometric shapes. All these things are quilts!

Do you want to know the history of quilts, help design quilts, find out how they are made, how they have been used? Come to Mrs. De Wet's quilting bee and try your hand at FABRIC ART!

Figure 3.6. The quilting bee advertisement.

for themselves. Since this was the first time many of the students had ever chosen fabric and paint colors, Ms. Watson spent time explaining the color wheel, dividing the color spectrum into summer, fall, winter, and spring tones. A parent of one of the boys in the cluster manages an interior design store in the neighborhood. He came to speak to the cluster and showed them how to draft their rooms in quarter-inch scale on graph paper. He donated wallpaper and fabric sample books and invited students on a field trip to his store where they could look at fabric samples and experiment with furniture and fabric on the store's computers. Students had to learn and use many academic skills in executing the products, such as measuring, calculating price per yard of fabric, and creating scale drawings of their bedrooms. They then created colored boards and shoebox dioramas of their dream bedrooms. At last report, several of these students have been able to execute their designs in their own homes.

The Quilting Bee

As an example for those interested in facilitating an enrichment cluster, an outline of possible activities for a sample enrichment cluster is given here. The first step in organizing a cluster is making it known to the student body. For this purpose, an advertisement is created that gives some indication of the topic and scope of the cluster. An advertisement for a quilting bee cluster is given in Figure 3.6.

The facilitator might choose to emphasize any feature of the topic in the introductory meeting. For our example, the facilitator brings in several quilts from her home. The first one she shows is the first quilt she ever made. Another is a quilt her grandmother made from scraps left over from family clothing. Each piece of fabric has a history and connects closely to her family history. Another quilt is a memory quilt made by students as a birthday gift to her. She tells the story of each quilt and invites students to touch and examine the quilts. She elicits a discussion on colors, patterns, and fabrics found in the quilts, as well as the construction of each quilt. She then draws students' attention to a variety of books she has brought to the meeting that covers many aspects
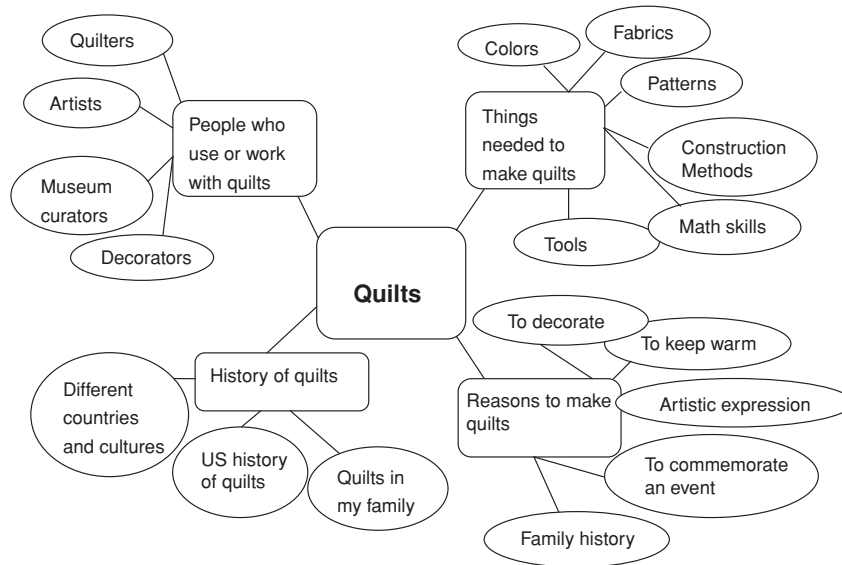
Figure 3.7. Concept web for the quilting bee.

of quilt making. She gives students ample time to page through the books and comment on what interests them. She then spends time with the students brainstorming possible topics for investigation using a concept web. A sample concept web is given in Figure 3.7.

Once this web is created, the facilitator surveys students to see which aspect of quilting interests them. She might discover that one student is particularly interested in her own family history as expressed by quilts. Several other students are interested in the preservation of quilts and old fabric. Another set of students would love to make baby quilts to donate to the local homeless shelter. She asks students to gather in their interest groups and come up with a list of ideas and resources they would need to accomplish their goal. She ends the session by informing the students that they would receive a visit at the next cluster meeting from a group of ladies who form the neighborhood quilting bee.

The teacher functions as a facilitator in this cluster. She does not necessarily have to know much about quilting to facilitate the cluster. She needs to prepare introductory materials and information and lead the discussion on possible directions for this quilting cluster. After the first meeting, she would need to contact a museum employee or find another person knowledgeable in the preservation of fabrics. She will also need to guide students in planning their activities, help them find the necessary resources, and gain the necessary skills to complete the projects. The student interested in her family history might need to learn oral history data-gathering skills to record interviews with family members. They may decide to publish a little family history book complete with family trees and family photographs. The students wishing to make quilts may

need a mentor from the visiting quilting bee to help them in the construction of quilts. An exhibition of the students' quilts may be arranged at a local fabric or quilting store before donating them to the homeless shelter.

A large number of ideas and guidelines for enrichment clusters may be found at www.gifted.uconn.edu/clusters/.

Electives and Pullout Programs

Student-driven learning with the goal of creative productivity is especially suited to electives and pullout programs. These school structures are often not subject to the same rigid requirements for "covering the material" or preparing for standardized tests as are regular classrooms. Creative teachers who are willing to forego control over every aspect of learning can profitably use these learning situations to allow students to pursue their own interests.

An international school in Ecuador has instituted an elective program for their middle-school students called *Choose Your Own Adventure!* These classes meet twice weekly and have the expressed purpose of providing students with the opportunity to further advance exploration of their topic of interest into Type III investigations. As a first step, teachers in the middle school survey students by means of an interest survey created by the teachers, and they survey the parents using the *Things My Child Likes to Do* instrument (http://www.gifted.uconn.edu/sem/pdf/thingsdo.pdf). The teachers then come up with a list of possible topics; these have included Fun With Dance, Animal Dissections, Rock of Ages (focusing on rock music), Sounds and Images Short Film Workshop, Girls Rock (a cluster for girls only to select their own interest topic), Moviemaker (focusing on how to use Microsoft Moviemaker software), Study Skills, and First Edition (focusing on creating a student newspaper).

Another example of electives mimicking real-world working situations is described on the Web site *Epistemic Games* (www.epistemicgames.org). Shaffer (2006) describes epistemic games as games that help players learn the ways of thinking – the epistemologies – of the digital age. Epistemic games, he says, "can help players learn to think like engineers, urban planners, journalists, lawyers, and other innovative professionals, giving them the tools they need to survive in a changing world" (p. 59). These epistemic games allow students to participate in simulations of real-world work and help them develop ways of thinking and knowing that are valued in the real world. This is another way of saying that students engage in a personalized act of ideal learning, creating an authentic product for an authentic audience, using real-world professional methodologies and ways of organizing knowledge. One of these games that classroom teachers may be able to replicate is called *Journalism.net.* Middle-school students have played the roles of science reporters, writing for the *Wisconsin Science Journal,* and high school students have worked as civic reporters for the *South Madison Times.* Editions of these publications containing student work can

be seen at http://epistemicgames.org/eg/?category_name=journalism-game. Researchers at the University of Wisconsin-Madison have seen the following results of this game:

1. Science.Net players developed the epistemic frame, the skills, knowledge, values, identity, and epistemology, of journalists.
2. The process of revising to editor copyedits helped the reporters to develop this frame through their story writing.
3. This binding of skills, knowledge, and values support players' new community-based understanding of science (Magnifico & Shaffer, in preparation).

Working with professional journalists and editors of a newspaper or other publication helps students gain professional skills and mindset. Collateral learning occurs as they research science subjects in the community. Similar games have been developed for students to work as urban planners (*Urban Science*), animators designing creatures for an animated movie (*Digital Zoo*), and working as negotiators on the ethics of transplanting animal organs into humans (*The Pandora Project*). There are many computer simulations and games available on the Internet and for sale commercially. While the educational quality of some of these games are suspect, many educators and researchers are developing high-quality games and platforms that will support the kind of student-centered learning we are advocating in this chapter.

Renzulli Learning Systems

Remarkable advances in instructional communication technology (ICT) have now made it possible to provide high levels of enrichment and the kinds of standards-based differentiation with academic rigor that facilitates powerful learning services to students who have access to a computer and the Internet. The Renzulli Learning System (RLS) is a strength-oriented Internet-based enrichment program that is built on a high-end learning theory that focuses on the development of creative productivity through the *application* of knowledge rather than the mere acquisition and storage of knowledge. The RLS goes beyond the popular "worksheets-online" or courses online that, by and large, have represented the early applications of ICT in most school situations. These early applications have been based on the same pedagogy that is regularly practiced in most traditional teaching situations, thereby minimizing the full capacity of ICT, and in many cases simply turning the Internet into a gigantic encyclopedia rather than a source of information for the application of knowledge in powerful learning situations.

The RLS is a comprehensive program that begins by providing a computer-generated profile of each student's academic strengths, interests, learning styles, preferred modes of expression, as well as academic challenge level. A search

engine then matches Internet resources to the student's profile from four-teen carefully screened databases that are categorized by subject area, grade level, state curricular standards, and degree of complexity. A management system called the Wizard Project Maker guides students in the application of knowledge to teacher- or student-selected assignments, independent research studies, or creative projects that individuals or small groups would like to pursue. Students and teachers can evaluate the quality of students' products using a rubric called the Student Product Assessment Form, as mentioned earlier. Students can evaluate each site visited, conduct a self-assessment of what they have gained from the site, and place resources in their own Total Talent Portfolio for future use. RLS also includes a curriculum acceleration management system for high achieving students that is based on the many years of research and widespread use of the curricular modification process called curriculum compacting, also discussed earlier.

Teacher functions allow downloading of hundreds of reproducible creativity and critical thinking activities as well as numerous offline resources for lesson planning and curricular integration. Management functions allow teachers to group students by interests and learning styles. The management tools also allow teachers to place teacher-selected resources in individual, whole class, or selected students' portfolios for classroom or special project use. Teachers can oversee all students' activity including where and when students have been online using the RLS, projects or assignments under way or completed, and areas where curriculum has been compacted. The system can be used at home and during summer, and parents can view their son's or daughter's work on the system. The principal or designated project manager can also examine all activity taking place in a given building or program. This feature allows for accountability, system assessment, and guidance in staff development and program planning needs. The RLS also provides individual differentiation, with appropriate levels of academic challenge for every student in a way that honors differences and ensures that true differentiated learning occurs for each child with engaging, challenging work in areas of interest.

In research on the RLS, Dr. Gara Field of The University of Georgia investigated the use of RLS to increase students' reading fluency and comprehension when they were able to use RLS for three hours per week. In this study (2007), quantitative procedures were used to investigate the use of the RLS on reading fluency and comprehension in two schools, an urban middle school where a majority of students are placed at risk due to poverty or other factors, and a suburban elementary school in a middle-class neighborhood. The sample included 385 students from two schools with administrators who volunteered to have students in both schools participate in the study. An experimental design was used with random assignment of students to treatment and control groups, and recommended follow-up procedures to explore specific group and individual differences were used. After only 16 weeks, students who participated in

the RLS demonstrated significantly higher growth in reading comprehension, significantly higher growth in oral reading fluency, and significantly higher growth in social studies achievement than those students who did not participate in the RLS. Persons interested in examining the RLS can tour the Web site at www.renzullilearning.com, and further descriptive information can be obtained at info@renzullilearning.com.

CONCLUSION

What causes some people to use their intellectual and creative abilities to generate concrete creative products while others do not? What is it that motivates people like Edison and Curie, Bill Gates and Jane Goodall to be creative producers where others might have similar talents but fail to turn their creative ideas into useful products? Is it possible to educate youngsters to become creative producers? It is our contention that it is indeed possible and in fact urgently necessary to provide youngsters the opportunities to develop skills, learn how to put creativity theory into practice, and prepare for the challenges they will face in the twenty-first century.

To achieve this goal, we must create opportunities for students to pursue questions of personal interest to them. Teachers have to facilitate this kind of learning intentionally, helping students find resources and mentors, whether in person or in print, and find audiences and outlets and, above all, help them to put their abilities to work on problems and areas of study that have personal relevance to the student and that can be escalated to appropriately challenging levels of investigative activity while emphasizing the use and application of information (content) and thinking processes in an integrated, inductive, and real-problem–oriented manner.

APPENDIX A
INTERVIEW WITH BRIANNE BURROWES

DE WET: Where did your interest in magazines start? Did you have a school experience (elementary through high) that helped with that?

BURROWES: My interest in magazines began in sixth grade. My Mom bought me my very first grown up magazine and I was beyond excited. It was the *Seventeen* Back-to-School issue and it featured the girls from Clueless. I walked around reading that magazine and I felt so cool. Then, the more I read the magazine the more I craved another, and then another. Suddenly I was begging my mom to read Cosmo at 12 years old! (She wouldn't allow it – so I sneaked issues into my room once I was in eighth grade.) I found something in magazines that I had been craving in my life. I always was a "dorky" girl. I was very smart and popular among my group of friends, but I had to face the reality that guys just weren't that interested in a girl with curly hair and glasses who loved to wear bright pink Bonne Bell lip gloss.

Anyway, as I read these magazines I started becoming obsessed with the advice from all of these teens and young women who just had it all. They got along with their parents, had a great boyfriend, wore amazing clothes, and I started to want that life. I never had an older sister that I could go to for advice, so Seventeen magazine became that older sister for me.

Shortly after my magazine obsession began, just reading magazines wasn't good enough for me any more. I always knew I wanted to be a writer, only up until that point I thought I wanted to write books. One day I was sitting in class bored out of my mind and the thought came to me, "Why don't I just create my own magazine?" This was around the same time that my family got the Internet for the first time and I had a wealth of information at my fingertips. So, I created an eight-page magazine called "Limited," ran off 20 copies on my computer's printer, and distributed them to my friends.

Then, in seventh grade I was taking a Gifted and Talented class from Tamara Fisher at Polson Middle School. In this class she said something that would forever change my life. She wanted us to think about what job we could do–if we could do anything in the world that we wanted to–and she then wanted us to use her class as an opportunity to do that. I realized then that this was my opportunity to create my own magazine, with the assistance and guidance of a really amazing teacher. I created the second issue of *Limited* that year. This time it had about thirty pages, and was more like a real magazine.

The following year, when I was in eighth grade, I took that same class and Miss Fisher presented us with that same question. I chose to stick with the same project, and create *Limited* again, but this time I had a new goal in mind. I wanted it to be even more like a real magazine – complete with a celebrity on the cover who had been interviewed by me. Through my Mom's connections, I was able to interview Kellie Martin (who, at the time, was playing Lucy Knight alongside Noah Wylie on "ER"). Martin also has appeared in "Christie," "As Life Goes On," etc.

When I entered high school I met another great teacher, Judie Woodhouse, who opened my eyes to the world of journalism. Through her, I learned that my passion for writing could be put to the most fulfilling use yet-through journalism. I quickly rose the ranks on the Polson High School newspaper, the *Salishian*. By my sophomore year, I was co-editor. I was editor-in-chief my junior and senior years.

Then, my junior year in high school, Fisher's Gifted and Talented course was offered at PHS. I re-arranged my schedule the second I heard because I just had to get in. It was there that I made my fourth magazine, this time titled *UnLimited*. I realized I wanted to communicate to girls that their potential is unlimited, and I wanted a title to reflect that. With my newly acquired knowledge from the high school paper and yearbook of Adobe Pagemaker, I created, wrote, edited, designed, and published *UnLimited*. I printed 500 copies on our self-publishing yearbook printer. It was the same quality as

our yearbook. Then, I sent my magazine to various magazines that I loved – *Seventeen, CosmoGIRL!* and *ELLEgirl. ELLEgirl* loved it so much, that they included a blurb on it in their magazine that told readers where they could check out my magazine. After that, I received more than 300 requests for magazines, which I filled and sent. In total, I printed 800 copies of that issue in high school, not to mention it was posted on the Web, and has received numerous viewings since then.

DE WET: How did you develop the skills to publish a magazine online?

BURROWES: I actually didn't publish the magazine online. My distribution process is detailed above. The magazine was converted into an Adobe pdf and the computer technician at Polson High School posted the pdf to our school Web site for me.

DE WET: Did you have any adults who were particularly encouraging or instrumental in developing your interest and/or skills?

BURROWES: Yes – there are five people, who I all consider to be mentors, who have been crucial in helping me grow and become a better writer and editor. First, Tamara Fisher, who I discussed above, was the first one to see a spark in me and give me the opportunity to make my dream happen. Second, Judie Woodhouse, who I talked about above as well, was crucial in teaching me everything I know about the media. Woodhouse shaped me when I was green and her touch will continue to affect everything I do for the rest of my life. Third, is my mentor Autumn Madrano. I met her through *CosmoGIRL*! While in high school, I applied to be a *CosmoGIRL!* reader contributor. Autumn, an editorial assistant at the time, immediately bonded with me (we were both West Coast girls) and to this day we keep in touch. She still is at CG!, now as copy chief. I had the opportunity to meet her for the first time in person two years ago when traveling to New York City for the MTV reality show, "Miss Seventeen." She also was the person who helped me get my first national magazine appearance – a written blurb rating the "hotness" of a guy in their "Boy-O-Meter" section. Fourth, is a journalism professor who now works for the University of Maryland, named Michael Downs. He helped me hone my craft and was always a believer in my dreams and passions. The School of Journalism at UM is one of the top ten journalism schools in the country, according to reviews by Hearst. The only thing is that they used to focus more on newspapers – not magazines. He helped me fight against the "glass ceiling" of old-school journalism, by allowing me to change assignments and make them "magazine friendly." Finally, Rita Munzenrider, who currently serves as my boss (she is the director of University Relations here at UM), has believed in me and given me opportunity after opportunity. She is the one who believed in me enough to promote me to the position of Editor-in-Chief of the Montanan, UM's alumni magazine, at the age of 22.

DE WET: What drove your decision to pursue journalism?

BURROWES: Passion – I've always had a voice inside of me that's told me I was born to be a writer. As cheesy as it sounds, writing is as critical to me as eating and breathing. I truly believe I would die if I could never write.

Ultimately the reason I pursue journalism is because I want to tell the stories of those who don't have the means to speak for themselves – either because they can't, they're not allowed to or because they don't have a platform for doing so. I want to weave my words to tell their story and share their experience with the world. I am someone who craves feeling connected, and journalism provides that opportunity for me.

DE WET: What did you learn from your magazine experience?

BURROWES: Making *UnLimited* magazine in high school taught me that even though I was in a small town in Montana with a population of 4,500 people, I could still break into the magazine industry. Whenever life discourages me I can always look at that magazine and know that I did it – on my own. It's an incredibly empowering feeling and it helps me to believe that I really can do whatever I set my mind to – whatever it happens to be. I'm very fortunate to have had amazing parents and a lot of great mentors in my life who have always told me that I can do anything my heart desires. It's now my goal to share that message with people everywhere – especially young women.

DE WET: How are those experiences driving what you do today?

BURROWES: These experiences are driving what I do today in every way. *UnLimited* opened so many doors for me. It brought me the mention in *ELLEgirl,* it helped me establish new and important connections in the magazine industry and it helped the producers choose me for Miss Seventeen. I can say that *UnLimited* has affected my job in every way, even to this day.

DE WET: Have your experiences at college changed your future plans and dreams in anyway?

BURROWES: My experiences at college have not dramatically changed my future or my dreams in anyway. If anything, it has helped reaffirm that I am on the right path and that creating magazines is what I want to spend my life doing. Since graduating in January of 2007, I have worked on the *Montanan.* Up until the end of June I was an editorial assistant. I now am the editor-in-chief. In July I went to New York City and Los Angeles to interview for jobs, but my boss missed my work so much, that she then offered me the editor-in-chief position. Obviously, this was something I couldn't pass up. I am currently in love with my job and doing everything I can to grow and learn more about the magazine industry every day. My plan is to be here for the next year or so, and then I want to move to New York City or Los Angeles and write for women's magazines. I one day hope to be editor-in-chief of a major national magazine for women – such as *In Style* or *Glamour.*

REFERENCES

Albert, R. S., & Runco, M. A. (1986). The achievement of eminence: A model on a longitudinal study of exceptionally gifted boys and their families. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (pp. 332–357). New York: Cambridge University Press.

Barbe, W. B., & Swassing, R. H. (1979). *Teaching through modality strengths: Concept and practices.* Columbus, OH: Zaner-Bloser, Inc.

Bloom, B. S. (Ed.). (1985). *Developing talent in young people.* New York: Ballantine Books.

Board, J. (1991). *A special relationship: Our teachers and how we learned.* Wainscott, NY: Pushcart Press.

Burns, D. E. (1987). *The effects of group training activities on students' creative productivity* (doctoral dissertation, The University of Connecticut, 1982). *Dissertation Abstracts International*, **48**, 3072A.

Dewey, J. (1916). *Democracy and education.* New York: MacMillan.

Dunn, R., Dunn, K., & Price, G. E. (1975). *Learning style inventory.* Chappaqua, NY: Rita Dunn & Associates.

Field, G. B. (2007). *The effect of using Renzulli Learning on student achievement: An investigation of Internet technology on reading fluency and comprehension.* Unpublished doctoral dissertation, University of Connecticut.

Gentry, M., & Renzulli, J. S. (1995). *Inspiration: Targeting my ideal teaching and learning situation.* (Interest Inventory). Storrs, CT: The National Research Center on the Gifted and Talented.

Glaser, R. (1988). Thoughts on expertise. In C. Schooler & W. Schaie (Eds.), *Cognitive functioning and social structure over the life course* (pp. 81–94). Norwood, NJ: Ablex.

Goertzel, M. C., Goertzel, V., & Goertzel, T. G. (1978). *Three hundred eminent personalities.* San Francisco, CA: Jossey Bass.

Gregorc, A. (1985). *Inside style: Beyond the basics.* Maynard, MA: Gabriel Systems, Inc.

Gruber, H. E. (1986). The self-construction of the extraordinary. In R. J. Sternberg & J. E. Davidson, J. (Eds.), *Conceptions of giftedness* (pp. 247–263). New York: Cambridge University Press.

Gubbins, E. J. (1982). Revolving door identification model: Characteristics of talent pool students (doctoral dissertation, The University of Connecticut, 1982). *Dissertation Abstracts International*, **43**, 2630A.

Hébert, T. P. (1993). Reflections at graduation: The long-term impact of elementary school experiences in creative productivity. *Roeper Review*, **16**, 22.

Hunt, D. E. (1975). Person-environment interaction: A challenge found wanting before it was tried. *Review of Educational Psychology*, **45**, 209–230.

Kolb, D., Rubin, I., & McIntyre, J. (1971). *Organizational psychology: An experimental approach.* Englewood Cliffs, NJ: Prentice Hall.

Lubow, A. (2007). Painting the edge. *Smithsonian Magazine*, October 2007.

Mackenzie, D. (2007). Primed for success. *Smithsonian Magazine*, October 2007.

Magnifico, A. M. & Shaffer, D. W. (in preparation). Writing beyond the curriculum. Retrieved on November 27, 2007, from http://epistemicgames.org/eg/?p=382.

Myers, I. B. (1980). *Gifts differing.* Palo Alto, CA: Consulting Psychologists Press.

Newman, J. (2005). Talents and Type IIIs: The effects of the Talents Unlimited Model on creative productivity in gifted youngsters. *Roeper Review*, **27**(2), 84–90.

Newman, J. L. (2006). *Talents and Type III's: A guide for becoming a better creator, decision maker, planner, forecaster, and communicator.* Mansfield, CT: Creative Learning Press.

New Orleans Homes and Lifestyles, January 2007. Retrieved on January 21, 2008, from http://neworleanshomesandlifestyles.com/in-this-issue/articles/news/school-of-design-1715.html.

Phenix, P. H. (1964). *Realms of meaning.* New York: McGraw-Hill.

Piaget, J. (Ed. and Trans.). (1981). *Intelligence and affectivity. Their relationship during child development.* Annual Reviews Monograph. Palo Alto, CA: Annual Review.

Reis, S. M., & Renzulli, J. S. (in preparation). A follow-up study of high creative producers who participated in an Enrichment Triad based program.

Reis, S. M., Burns, D. E., & Renzulli, J. S. (1992). *Curriculum Compacting: The complete guide to modifying the curriculum for high ability students.* Mansfield Center, CT: Creative Learning Press.

Reis, S. M., Westberg, K. L., Kulikowich, J., Caillard, F., Hébert, T., Plucker, J., Purcell, J. H., Rogers, J. B., & Smith, J. M. (1993). *Why not let high ability students start school in January? The curriculum compacting study* (Research Monograph 93106). Storrs, CT: The National Research Center on the Gifted and Talented, University of Connecticut.

Renninger, K. A. (1989). Individual patterns in children's play interests. In L. T. Winegar (Ed.), *Social interaction and the development of children's understanding* (pp. 147–172). Norwood, NJ: Ablex.

Renninger, K. A. (1990). Children's play interests, representation, and activity. In R. Fivush & J. Hudson (Eds.), *Knowing and remembering in young children* (pp. 127–165). Emory Cognition Series (Vol. III). Cambridge, MA: Cambridge University Press.

Renninger, K., & Wozniak, R. H. (1985). Effect of interest on attentional shift recognition and recall in young children. *Developmental Psychology*, **21**, 624–632.

Renzulli, J. S. (1977a). *The interest-a-lyzer.* Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S. (1977b). *The enrichment triad model: A guide for developing defensible programs for the gifted.* Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S. (1978a). What makes giftedness? Re-examining a definition. *Phi Delta Kappan*, **60**, 180–184, 261.

Renzulli, J. S. (1978b). What makes a problem real? Stalking the illusive meaning of qualitative difference in gifted education. *Gifted Child Quarterly*, **26**, 148–156.

Renzulli, J. S. (2005). A quiet crisis is clouding the future of R&D. *Education Week*, **24**(38), 32–33, 40.

Renzulli, J. S., & Reis, S. M. (1997). *The schoolwide enrichment model: A how-to guide for educational excellence* (2nd ed.). Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S., & Smith, L. H. (1978). *The learning style inventory: A measure of student preference for instructional techniques.* Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S., Gentry, M. & Reis, S. M. (2003). *Enrichment clusters: A practical plan for real-world, student-driven learning.* Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S., Leppien, J. H., & Hays, T. S. (2000). *The Multiple Menu Model: A practical guide for developing differentiated curriculum.* Mansfield Center, CT: Creative Learning Press.

Revans, R. (1982). *The origins and growth of action learning.* Bikley, UK: Chartwewll-Bratt.

Robinson, K. (2001). *Out of our minds: Learning to be creative.* Oxford, UK: Capstone Publishing.

Rogers, A. (2007). Site seer. *Smithsonian Magazine,* October 2007.

Schack, G. (1986). Creative productivity and self-efficacy in children (doctoral dissertation, The University of Connecticut, 1986). *Dissertation Abstracts International*, **47**, 905B.

Schlichter, C. L. (1986). Talents Unlimited: Applying the multiple talent approach in mainstream and gifted programs. In J. S. Renzulli (Ed.), *Systems and models for developing programs for gifted and talented* (pp. 352–390). Mansfield Center, CT: Creative Learning Press.

Schlichter, C. L. (2009). Talents Unlimited: Thinking skills instruction for all students. In J. S. Renzulli, E. J. Gubbins, K. S. McMillen, R. D. Eckert, & C. A. Little (Eds.), *Systems and models for developing programs for the gifted and talented* (2nd ed., pp. 433–457). Mansfield Center, CT: Creative Learning Press.

Schlichter, C. L., & Palmer, W. R. (2002). Talents unlimited: Thinking skills instruction as enrichment for all students. *Research in Schools*, **9**(2), 53–60.

Shaffer, D. W. (2006). *How computer games help children learn.* New York: Macmillan.

Starko, A. J. (1986). The effects of the revolving door identification model on creative productivity and self-efficacy (doctoral dissertation: The University of Connecticut, 1986). *Dissertation Abstracts International*, **47**, 339A.

Sternberg, R. J. (1988). Mental self-government: A theory of intellectual styles and their development. *Human Development*, **31**, 197–224.

Story, C. M. (1985). Facilitator of learning: A micro-ethnographic study of the teacher of the gifted. *Gifted Child Quarterly*, **29**(4), 155–159.

Tannenbaum, A. J. (1986). Giftedness: A psychological approach. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness.* New York: Cambridge University Press.

Torrance, E. P. (1981). Predicting the creativity of elementary school children (1958–80) – and the teacher who "made a difference." *Gifted Child Quarterly*, **25**, 55–62.

Walberg, H. J., Rasher, S. P., & Parkerson, J. (1980). Childhood and eminence. *Journal of Behavior*, **13**, 225–231.