GIFTED EDUCATION
INTERNATIONAL

Gifted Education International
28(1) 19–40

DOI: 10.1177/0261429411424382
gei.sagepub.com
SAGE

A virtual learning application of the schoolwide enrichment model and high-end learning theory

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Abstract
Remarkable advances in instructional communication technology (ICT) have now made it possible to provide high levels of enrichment services to students online. This paper describes an Internet-based enrichment program based 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 program, called Renzulli Learning System (RLS), extends the pedagogy of the Schoolwide Enrichment Model (SEM) to various forms of enrichment as well as first-hand investigative and creative endeavors. In this paper, a brief overview is provided about the SEM, the organizational framework upon which the RLS is based. This section will be followed by summaries of the Three-Ring Conception of Giftedness and the Enrichment Triad Model, the two theories underlying SEM, and the final section presents a detailed description of the RLS.

Keywords
instructional communication technology (ICT), enrichment, Internet-based enrichment, creative productivity, Renzulli Learning System (RLS), Schoolwide Enrichment Model (SEM), Three-ring Conception of Giftedness, Enrichment Triad Model, gifted education

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> You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.
>
> — R. Buckminster Fuller

Introduction

How can we develop both academic giftedness and creative productivity? How can we develop the potentials of all children? What services should be provided to students who are identified for gifted and talented programs, as opposed to enrichment opportunities that should be provided for all students? How can we modify the regular curriculum for high achieving students? Can enrichment and gifted programs help to develop academic gifts and talents? How can we help children learn to think creatively and value opportunities for creative, self-selected work? The Schoolwide Enrichment Model (SEM) is the organizational framework of our programming model that addresses these questions. The model is organized around three service delivery components, including (1) strength-based student portfolio that contains information about academic achievement, preferred areas of interests, learning styles, and preferred modes of expression; (2) curriculum compacting, a systematic procedure for modifying and differentiating the curriculum for high-achieving students; and (3) enrichment learning and teaching, with three types of enrichment opportunities based on the Enrichment Triad Model.

The SEM also includes a continuum of services concept that includes separate organizational approaches (e.g. special classes, pull-out programs, grade skipping, and differentiation in the regular classroom), which overcomes the 'one best way' to develop high levels of talent in young people. Each approach has advantages and disadvantages, but an integration of services between and among various approaches will maximize the value of any combination of organizational structures. It will also provide opportunities for more students than the 3–5% usually served in traditional programs for gifted students.

A brief history of the Schoolwide Enrichment Model

The original Enrichment Triad Model (Renzulli, 1977), the curriculum core of the SEM, was developed in the mid-1970s and initially implemented as a gifted and talented programming model in school districts in Connecticut and the northeast of the United States. The model, initially field-tested in several districts, proved to be quite popular and requests from all over the country for visitations to schools using the model and for information about how to implement the model increased. A book about the Enrichment Triad Model (Renzulli, 1977) was published, and increasing numbers of districts began implementing this approach. It was at this point that a clear need was established for research about the effectiveness of the model and for other vehicles that could provide technical assistance for interested educators to help develop programs in their schools. Different types of programs based on the Enrichment Triad Model were designed and implemented by classroom, gifted education and enrichment teachers, and we began to see differences both in programs and in student productivity. Our curiosity was peaked, and thus began almost 30 years of field-testing, research and dissemination.

Theories underlying schoolwide enrichment: the Renzulli Learning System

The Three-Ring Conception of Giftedness

Present efforts to develop giftedness are based on a long history of previous theoretical or research studies dealing with human abilities (Sternberg and Davidson, 1986) and a few general conclusions from current research on giftedness. In their latest edited volume on conceptions of giftedness, Sternberg and Davidson (2005) provide a critical background for this discussion of the SEM. The first conclusion is that giftedness is not a unitary concept, but there are many manifestations of gifts and talents, and therefore single definitions cannot adequately explain this multifaceted phenomenon. The confusion about present theories of giftedness has led many researchers to develop new models for explaining this complicated concept, but most agree that giftedness is developed over time and that culture, abilities, environment, gender, opportunities and chance contribute to the development of gifts and talents.

The SEM focuses on the development of both academic and creative–productive giftedness. Creative–productive giftedness describes those aspects of human activity and involvement where 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. Learning situations designed to promote creative–productive giftedness emphasize the use and application of information (content) and thinking skills in an integrated, inductive and real-problem-oriented manner. In the SEM, traditional academic gifts are developed using curriculum compacting, acceleration, differentiated instruction and various forms of academic enrichment. Our focus on creative productivity complements our efforts to increase academic challenge when we attempt to transform the role of the student from that of a learner of lessons to one of a first-hand inquirer, one who can experience the joys and frustrations of creative productivity (Renzulli, 1977). This approach is different from the development of giftedness that tends to emphasize deductive learning, and the acquisition, storage and retrieval of information. In other words, creative–productive giftedness enables children to work on issues and areas of study that have personal relevance to the student and that can be escalated to appropriately challenging levels of investigative and creative activity.

Why is creative–productive giftedness important enough to question the traditional approach that has been used to select students for gifted programs on the basis of test scores? Why do some people want to rock the boat by challenging a conception of giftedness that can be numerically defined by simply giving a test? The answers to these questions are simple and yet compelling. Our research (Reis and Renzulli, 1984; Renzulli, 1978, 2005, 2006) has proven that there is much more to identifying human potential than the abilities revealed on traditional tests of intelligence, aptitude and achievement. Furthermore, history tells us that it has been the creative and productive people of the world, the producers rather than the consumers of knowledge, who have been recognized in history as ‘truly gifted’ individuals. Accordingly, the SEM integrates opportunities for both academic giftedness and creative–productive giftedness.

The SEM is based on Renzulli's (1978) Three-Ring Conception of Giftedness, which defines gifted behaviors rather than gifted individuals. This conception encompasses three interrelated components (see Fig. 1) and is described as follows.

Gifted behavior consists of traits and aptitudes that reflect an interaction among three basic clusters of human characteristics – above-average ability, high levels of task commitment and high levels of creativity. Individuals capable of developing gifted behavior are those possessing, or capable of developing, this composite set of traits, using them interactively and applying them to any potentially valuable area of human performance. Persons who manifest or are capable of developing an interaction among the three clusters require a wide variety of educational opportunities and services that are not ordinarily provided through regular instructional programs (Renzulli and Reis, 1997: 8).

Longitudinal research supports this distinction between academic giftedness and creative–productive giftedness. In Perleth, Sierwald, and Heller's Munich Longitudinal Study of Giftedness (1985–1989), for example, differences were found between students who demonstrated creative–productive giftedness as opposed to traditional academic giftedness. Most of the confusion and controversy surrounding the definitions of giftedness can be placed into perspective if we examine a few key questions. Is giftedness or creativity an absolute or a relative concept? That is, is a person either gifted or not gifted (the absolute view), or can varying degrees of gifted behaviors be developed in certain people, at certain times, and under certain circumstances (the relative view)? (see Fig. 2) Is giftedness or creativity a static concept (i.e. you have or you do not have it) or is it a dynamic concept (i.e. it varies within persons, cultures, and among learning/performance situations)?

We believe that a fundamental change must occur in the way that we view giftedness. For the last two decades, we have advocated *labeling the services students receive rather than labeling the students*, for we believe that a shift should occur from an emphasis on the traditional concept of 'being gifted' (or not being gifted) to a concern about the *development of gifted and creative behaviors* in students who have high potential for benefiting from special educational opportunities, as well as the provision of some types of enrichment for all students. This change in terminology may also provide the flexibility in both identification and programming endeavors that encourages the inclusion of at-risk and underachieving students in our programs. Our ultimate goal is the development of a total school enrichment program that benefits all students and concentrates on making schools places for talent development for all young people. We believe that *a rising tide lifts all ships*! Every student benefits, from our highest achievers to struggling learners, when schools create an atmosphere that respects individuality and diversity and when opportunities, resources and encouragement are made available to maximize the strengths of all students.

The Enrichment Triad Model

In order to understand the qualitative differences in learning guided by the Enrichment Triad Model it is necessary to review briefly the pedagogy or learning theory upon which Triad is based. All learning exists on a continuum ranging from basic learning or deductive (sometimes called didactic) approaches at one end of the continuum to inductive or

high-end learning approaches at the other. Both models of learning and teaching are valuable in the overall process of schooling, and a well-balanced school program must make use of basic and high-end approaches as well as the combined approaches between the two ends of the continuum.

The deductive model of learning

Although many names have been used to describe the theories that define the ends of the continuum, we simply refer to them as the deductive model and inductive model. The deductive model is familiar to most educators and guides most of what takes place in classrooms and other places where formal learning is pursued. The inductive model, on the other hand, represents the kind of learning that typically takes place outside formal school situations. A good way to understand the difference between these two types of learning is to compare how learning takes place in a typical classroom with how someone learns new material or skills in real-world situations. Classrooms are characterized by relatively fixed time schedules, segmented subjects or topics, predetermined sets of information and activities, tests and grades to determine progress, and a pattern of organization that is largely driven by the need to acquire and assimilate information and skills that are deemed important by curriculum developers, textbook publishers and committees who prepare lists of standards. The deductive model assumes that current learning will have transfer value for some future problem, course, occupational pursuit or life activity, and it is built almost exclusively on information (content) derived from predetermined standards, textbook publishers or test makers. We call this kind of information 'to-be-presented knowledge'.

Deductive learning is based mainly on the factory model or human engineering conception of schooling. The underlying psychological theory is behaviorism, and the theorists most frequently associated with this model are Ivan Pavlov, E. L. Thorndike and B. F. Skinner. At the center of this ideology is the ability to produce desirable responses by presenting selected stimuli. In an educational setting, these theories translate into a form of prescriptive and structured training for purposes of knowledge and skill acquisition. A curriculum based on the deductive model must be examined in terms of both what and how something is taught. The issue of what is (or should be) taught has always been the subject of controversy, ranging from a conservative position that emphasizes a classical or basic education curriculum to a more liberal perspective that includes contemporary knowledge and life-adjustment experiences (e.g. driver's education, sex education, computer literacy). Overall, American schools have been very effective in adapting what is taught to changes taking place in society. Recent concerns about the kinds of skills that a rapidly changing job market will require have accelerated curricular changes that prepare students for careers in technological fields and a postindustrial society. Nowhere is this change more evident than in the emphasis currently placed on thinking skills, interdisciplinary approaches to curriculum, and the use of technology in the learning process. These changes are favorable developments, but the deductive model still limits learning because it *restricts* both what is taught and how the material is taught. There is nothing inherently 'wrong' with the deductive model, however; it is based on a limited conception of the role of the learner. It fails to consider variations in interests and

learning styles, and it always places students in the roles of lesson learners and exercise doers rather than authentic, first-hand inquirers.

The inductive model of learning

The inductive model, on the other hand, represents the kinds of learning that ordinarily occur outside formal classrooms in places such as research laboratories, artists' studios and theaters, film and video production sets, business offices, service agencies and almost any extracurricular activity in which products, performances or services are pursued. The names most closely associated with inductive learning are John Dewey, Maria Montessori and Jerome Bruner. The type of learning advocated by these theorists can be summarized as knowledge and skill acquisition gained from investigative and creative activities that are characterized by three requirements. First, there is a personalization of the topic or problem – the students are doing the work because they want to. Second, students are using methods of investigation or creative production that approximate the modus operandi of the practicing professional, even if the methodology is at a more junior level than that used by adult researchers, filmmakers or business entrepreneurs. Third, the work is always geared toward the production of a product or service that is intended to have an impact on a particular audience. The information (content) and the skills (process) that are the substance of inductive learning situations are based on need-to-know and need-to-do requirements, what we call 'just-in-time knowledge'. The importance of using just-in-time knowledge (as opposed to to-be-presented knowledge), and as we will see later, is one of the greatest assets of having a technology-based learning system that takes advantage of the vast storehouse of knowledge available on the Internet.

All resources, information, schedules and sequences of events necessary for a high-quality product are directed toward the goals of high-end learning, and evaluation (rather than grading) is a function of the quality of the product or service as viewed through the eyes of a client, consumer or other type of audience member. Everything that results in learning in a research laboratory, for example, is for present use. Therefore, looking up new information, conducting an experiment, analyzing results or preparing a report is focused primarily on the present rather than the storage of information for some future use. Even the amount of time devoted to a particular project cannot be determined in advance because the unfolding nature of the problem and the unknown obstacles that might be encountered as the project evolves prevent rigid, predetermined schedules. What is undoubtedly most significant about using relevant knowledge and methods in this type of learning is that it is much more likely to 'stick' beyond the test-taking events that are typically associated with traditional didactic learning.

In summary, the deductive model has dominated the ways in which most formal education is pursued, and the track record of the model has been less than impressive. One need only reflect for a moment on his or her own school experience to realize that with the exception of basic language and arithmetic, much of the compartmentalized material learned for some remote and ambiguous future situation is seldom used in the conduct of daily activities. The names of famous generals, geometric formulas, the periodic table and parts of a plant learned outside an applicable, real-world situation are usually quickly

forgotten. This is not to say that previously learned information is unimportant, but its relevancy, meaningfulness and endurance for future use is minimized when it is almost always learned apart from situations that have personalized meaning for the learner.

Inductive learning, on the other hand, focuses on the *present use* of content and processes as a way of integrating material and thinking skills into the more enduring structure of the learner's repertoire. It is these more enduring structures that have the greatest amount of transfer value for future use. When content and processes are learned in authentic, contextual situations, they result in more meaningful uses of information and problem-solving strategies than the learning that takes place in artificial, preparation-for-the-test situations. If individuals involved in inductive learning experiences receive some choice in the domains and activities in which they are engaged, and if the experiences are directed toward realistic and personalized goals, this type of learning creates its own relevancy and meaningfulness, as in the types of enrichment that we advocate in the SEM.

High-end learning theory

To understand the essence of high-end learning is to compare how learning takes place in a traditional classroom with how someone might learn new material or skills in real-world situations. The majority of classrooms are characterized by an organizational pattern largely driven by the need to acquire and assimilate information and skills imposed from *outside* the classroom. Contrast this type of learning with the more natural chain of events that takes place in research laboratories, business offices or film studios. In these situations, the goal is to produce a product or service. All resources, information, schedules and events are directed toward this goal, and looking up new information, conducting experiments, analyzing results or preparing a report are activities focused primarily on the *present need* for information rather than for a distant future. It is these present uses that have the greatest amount of transfer value for future use. When content and processes are learned in authentic, contextual situations, they result in more meaningful uses of information and problem-solving strategies than the learning that takes place in overly structured, prescribed classroom situations. In short, high-end learning applies two concepts – (1) high-end learning and (2) the often used (and abused) concept, real-world problems – to the inductive model of learning.

High-end learning is based on the ideas of a small number of philosophers, theorists and researchers (e.g. John Dewey, Albert Bandura, Howard Gardner, Maria Montessori, Philip Phenix, Robert Sternberg, E. Paul Torrance and Alfred North Whitehead). The work of these theorists, coupled with our own research and program development activities, has given rise to the concept that we call 'high-end learning'. The best way to define this concept is in terms of the following four principles:

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. Consequently, 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 (i.e. knowledge) and process (i.e. thinking skills and methods of inquiry) are learned within the context of a real and present problem. Therefore, attention should be given to opportunities to personalize student choice in problem selection, the relevance of the problem for individuals and groups who share a common interest 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 is to enhance knowledge and thinking skill acquisition gained through *teacher instruction* with applications of knowledge and skills that result from *student construction* of meaningfulness.

Many educators have asked us how these principles differ from the traditional goals of didactic learning. To address these questions, we used an inductive rather than deductive approach – that is, rather than making a list from the theoretical literature or our own expectations about goals and outcomes, we examined activities taking place in high-end learning situations, evaluated student work and teacher involvement, and drew conclusions based on these actual experiences. In other words, we did exactly what we are recommending students do as they go about pursuing problems through the use of the Renzulli Learning System (RLS). After carefully examining the work of numerous students and questioning many teachers who participated in research on high-end learning, we were able to identify the following list of specific outcomes. Not all outcomes occurred in every learning situation, and the levels to which any individual or group achieved these outcomes vary.

The ultimate goal of learning guided by these four principles is to replace dependence and passive learning with independence and engaged learning. Although all but the most conservative educators will agree with these principles and outcomes, controversy exists about how these (or similar) principles and outcomes may be applied in everyday school situations. Some might view these principles as yet another idealized list of generalities that cannot be easily manifested in schools already overwhelmed by prescribed curriculum and deductive models of teaching. For this reason, we recommend setting aside some time during which students will have opportunities to participate in high-end learning experiences sometime during their school week. The most difficult part of facilitating high-end learning is getting teachers to stop prescribing and replace traditional instruction with the kinds of 'guide-on-the-side' responsibilities that are used by mentors and coaches. People in these roles instruct only when there is a direct need to accomplish a task necessary for developing a product or service. Many teachers who have served in extracurricular activities such as yearbook advisors, drama club directors, 4-H Club advisors or athletics coaches already have the techniques necessary for high-end learning.

The teacher's role in these activities is to guide students as they find and focus a real-world problem, lend a hand as they locate content and methodological resources, and help them understand how to use the resources. For example, an interest-based group of students examined the incidence of acid rain in the northeastern part of the United States. Using what we call a 'how-to book' obtained from the RLS web site, the teacher taught students how to prepare slides for microscope analysis and, with the aid of a

microprojector, showed them how to identify contaminants in their rainwater samples. Direct instruction should take place *only* when the acquisition of a new skill needs some explanation and demonstration by the teacher.

The Enrichment Triad Model is the theoretical 'heart' of the SEM (Renzulli, 1977) and the pedagogical basis of the SEM. It was originally designed as a gifted program model to encourage creative productivity on the part of young people by exposing them to various topics, areas of interest and fields of study, and to further train them to *apply* advanced content, process-training skills and methodology training to self-selected areas of interest using three types of enrichment. The original Triad Model has three types of enrichment (see Fig. 3): type I enrichment is designed to expose students to a wide variety of disciplines, topics, occupations, hobbies, persons, places and events that would not ordinarily be covered in the regular curriculum. Type II enrichment includes materials and methods designed to promote the development of thinking and feeling processes. Type III enrichment involves students who become interested in pursuing a self-selected area and are willing to commit the time necessary for advanced content acquisition and process training in which they assume the role of a first-hand inquirer.

A book written by a fifth-grade student named Gretchen from Haynes School in Sudbury, MA, highlights the kinds of products produced when the Enrichment Triad Model is used. Gretchen had two passionate interests as a fifth grader: the literature of Louisa May Alcott and cooking. Gretchen had read all of Louisa May Alcott's books and identified in each book any specific food mentioned. She researched the recipes of the time that would have been used to make the food (such as buckwheat cakes), field-tested each recipe (including making substitutions for ingredients no longer available) and created an original cookbook. Gretchen spent a year and a half working on a cookbook that combined vignettes of scenes from *Little Women* and *Little Men* with many authentic 19th-century recipes for making the foods described in the novels. *The Louisa May Alcott Cookbook* was accepted and became the first book contracted by Little Brown with a child author. In Gretchen's type III, both the process she used and the final product involved high levels of creative engagement and clear evidence of creative work.

'Real-world problem' defined

The term 'real-world problem' has been tossed around so freely and easily in education circles these days that it has become little more than a hollow cliché. Because a good deal of the focus of high-end learning is on the pursuit of real-world problems, we feel obligated to provide the reader with as precise a definition as possible about this oft-used but frequently elusive (and illusive) term. High-end learning situations are designed to promote the kind of student engagement described above, and a key concept in organizing and delivering services for this type of learning is *application*. High-end learning consists of *applying* relevant knowledge, research skills, creative and critical thinking skills and interpersonal skills to the solution of real problems.

High-end learning focuses on the pursuit of real problems and should be viewed as the vehicle through which everything – from basic skills to advanced content and processes – comes together in the form of student-developed products and services. In much the same way that all the separate but interrelated parts of an automobile come together

at an assembly plant, we view this form of learning as an assembly plant of the mind. This kind of learning represents a synthesis and an application of content, process and personal involvement. The student's role is transformed from one of lesson learner to first-hand inquirer, and the role of the teacher changes from an instructor and disseminator of knowledge to a combination of coach, resource procurer, mentor and, sometimes, a partner or colleague. Although products play an important role in creating these authentic learning situations, the development and application of a wide range of cognitive, affective and motivational processes are the major goals of this type of learning.

The Renzulli Learning System: a four-step procedure

Every teacher has had the satisfaction of seeing a child 'turn on' to a topic or a school experience that demonstrates the true joy and excitement of both learning and teaching. We have sometimes wondered how and why these high points in teaching occur, why they do not occur more frequently, and why more students are not engaged in highly positive learning experiences. Teachers are also painfully aware of the boredom and lack of interest that so many of our young people express about so much of the work they do in school. Highly prescriptive curriculum guides, endless lists of standards to be covered, and relentless pressure to increase achievement test scores have often prevented us from doing the kind of teaching that results in those joyous but rare times when we have seen truly remarkable engagement in learning.

One teacher we interviewed as part of a research project dealing with high engagement in learning said, 'I could easily improve student enthusiasm, enjoyment, and engagement if I had about a dozen teaching assistants in my classroom!' Comments like these combined with the understanding that an almost infinite number of resources are now available through the Internet, inspired the development of the RLS at the University of Connecticut's Neag School of Education. With sponsorship by the University of Connecticut Research and Development Corporation and income from subscriptions, the system continues to be developed and researched to provide the highest levels of learning and student engagement. So how does this happen?

The use of instructional technology, and especially the Internet, has evolved rapidly over the past decade. First-'generation' use of technology consisted mainly of what might be called worksheets online, with the added advantage of providing students with immediate feedback about correct responses and subroutines for remediating incorrect answers. This generation was not unlike the teaching machines of the 1950s. The next generation consisted mainly of courses online, and although this innovation enabled students to have access to teachers and professors with expertise beyond what might be available locally, it usually followed the same pedagogy as traditional courses (i.e. read the chapter, answer questions, take a test). The third generation was a great leap forward because of the advent of hypertext. Students could now click on highlighted items in online text to pursue additional, more advanced information, and the kinds of scaffolding that consumes more time than most teachers can devote to individualized learning.

The RLS might best be viewed as the next generation of applying instructional technology to the learning process. This program is *not* a variation of earlier generations of

popular e-learning programs or web-surfing devices being offered by numerous software companies. It is a totally unique use of the Internet that combines computer-based strength assessment with search engine technology, thus allowing true differentiation in the matching of thousands of carefully selected resources to individual strengths as well as learning styles and interests. The RLS also has what might best be called theoretical integrity because it is based on high-end learning theory in the form of the Enrichment Triad Model (Renzulli, 1977) and numerous research studies dealing with model implementation (Reis and Renzulli, 1994). With minimal skills in the use of the Internet, and only a small amount of the teacher's time, schools easily make use of a system that gives teachers the equivalent of 'a dozen assistants' in their classrooms. The RLS is a four-step procedure that is based on more than 30 years of research and development dealing with the diagnosis and promotion of advanced-level thinking skills, motivation, creativity and engagement in learning.

Step 1: Strength assessment using the electronic learning profile

The first step consists of a computer-based diagnostic assessment that creates a profile of each student's academic strengths, interests, learning styles and preferred modes of expression. The online assessment, which takes about 30 minutes, results in a personalized profile that highlights individual student strengths and sets the stage for step 2 of the RLS. The profile acts like a compass for the second step, which is a differentiation search engine that examines thousands of resources that relate specifically to each student's profile. Student profiles can also be used to form groups of students who share common interests. A project management tool guides students and teachers to use specifically selected resources for assigned curricular activities, independent or small-group investigative projects and a wide variety of challenging enrichment experiences. Another management tool enables teachers to form instructional groups and enrichment clusters based on interests and learning style preferences. Teachers have instant access to student profiles, all sites visited by students on the web, and the amount of time spent in each activity. Parents may also access their own child's profile and web activities, and in order to promote parent involvement there are opportunities for students to work on some of their favorite activities with their parents.

Step 2: Enrichment differentiation databases

In step 2 the differentiation search engine matches student strengths and interests to an enrichment database of 17,000 enrichment activities, materials, resources and opportunities for further study that are grouped into several categories: virtual field trips; real field trips; creativity training; critical thinking; summer programs; projects and independent study; online classes and activities; research skills; contests and competitions; research; fiction and non-fiction books; and how-to books.

These resources are not intended to inform students about new information or to occupy time surfing around the web. Rather, they are used as vehicles for helping students find and focus a problem or creative exploration of personal interest that they might like to pursue in greater depth. Many of the resources provide the methods of

inquiry, advanced-level thinking and creative problem-solving skills, and investigative approaches that approximate the modus operandi of the practicing professional. Students are guided toward the *application of knowledge* to the development of original research studies, creative projects and action-oriented undertakings that put knowledge to work in personally meaningful areas of interest. The resources also provide students with suggestions for outlets and audiences for their creative products. The RLS helps accomplish the goals of high-end learning for students of varying interests, abilities and learning styles and who have their own unique vision for creative products.

Teachers are also provided with multiple resources for managing the individualized activities of their students: a set of learning maps is provided for each of the 14 enrichment resource databases and for the many other resources available, teachers can download numerous curricular activities for use in their classrooms, and management tools classify and cross-reference activities by subject area, thinking skill and subject matter standards.

Our goal in this approach to learning is to promote high levels of engagement by providing a vehicle that enables a student's engagement in *thinking, feeling and doing like a practicing professional*, even if they are operating at a more junior level than adult scientists, artists, writers, engineers or other adults who pursue knowledge in professional ways.

Research on the role of student engagement is clear and unequivocal – high engagement results in higher achievement, improved self-concept and self-efficacy, and more favorable attitudes toward school and learning. A strong body of research points out the crucial difference between time spent and time engaged in school achievement. In the recently published international Program For International Student Assessment PISA (2006) study, the single criterion that distinguished between nations with the highest and lowest levels of student achievement was the degree to which students were engaged in their studies. This finding took into account demographic factors such as ethnicity and the socioeconomic differences among the groups studied. In a longitudinal study comparing time spent with time engaged on the achievement of at-risk students, Greenwood (1991) found that conventional instructional practices were responsible for the students' increased risk of academic delay. A study by Ainley (1993) reported that there were important differences in achievement outcomes favoring engaged over disengaged students of similar ability.

The resources available in step 2 also provide students with places where they can pursue advanced-level training in their strength areas and areas of personal interest. Online courses and summer programs that focus on specific academic strengths and creative talents are ways that any school or parent can direct highly able and motivated students to resources that may not be available in the regular school program.

Step 3: The Wizard Project Maker

A special feature of the RLS is a project organization and management plan for students and teachers called 'the Wizard Project Maker'. This guide allows teachers to help students use their web-based explorations for original research, investigative projects and the development of a wide variety of creative undertakings. The sophisticated software

used in this tool automatically locates potentially relevant web-based resources that can be used in connection with the student's investigative activity. This management device is designed to fulfill the requirements of a type III enrichment experience, which is the highest level of enrichment described in the Enrichment Triad Model. Specifically, the Wizard Project Maker provides students with the metacognitive skills support to:

- define a project and set a goal;
- identify and evaluate both the resources to which they have access and the resources they need (e.g. time, Internet sites, teacher or mentor assistance);
- prioritize and refine goals;
- balance the resources needed to meet multiple goals;
- learn from past actions, projecting future outcomes; and
- monitor progress, making necessary adjustments as a project unfolds.

Metacognition is generally defined as understanding and monitoring one's own thinking. The Wizard Project Maker helps students make the best use of web resources, it helps to focus their interests as they pursue advanced-level work, and it is a built-in safeguard against using the RLS to merely surf around the web. It also establishes a creative and viable responsibility for teachers in their role as 'the guide on the side'. By helping students pursue advanced levels of challenge and engagement through the use of the Wizard Project Maker, students see teachers as mentors rather than taskmasters or disseminators of knowledge. The Wizard Project Maker also has a metacognitive effect on students, i.e. they have a better understanding about what the investigative learning process is all about. As one teacher recently said, 'The Wizard Project Maker helps my students understand ''the why'' of using the Internet.' A Wizard Project Maker template is attached to this paper and Wizard software is built into the system to help students acquire resources for the various sections of this planning device.

Step 4: The Total Talent Portfolio

The final step in the RLS is an automatic compilation and storage of all student activity from steps 1, 2 and 3 into an ongoing student record called the Total Talent Portfolio. A management tool allows students to evaluate each site visited and resource used, students can complete a self-assessment of what they derived from the resource, and, if they choose, they can store favorite activities and resources in their portfolio. This feature allows easy return access to ongoing work. The portfolio can be reviewed at any time by teachers and parents through the use of an access code, which enables teachers to give feedback and guidance to individual students and provides parents with information about students' work and opportunities for parental involvement. The portfolio can also be used for:

- providing points of reference for future teachers;
- making decisions about possible class project extra credit options;
- selecting subsequent enrichment preferences;
- designing future projects and creative activities;
- exploring online courses and competitions;

- participating in extracurricular activities;
- deciding on electives in middle and high school; and
- guiding college selection and career exploration alternatives.

The Total Talent Portfolio 'travels' with students throughout their educational career. It can serve as a reminder of previous activities and creative accomplishments that they might want to include in college applications and it is an ongoing record that can help students, teachers, guidance counselors and parents make decisions about future educational and vocational plans.

The Renzulli Learning System and high-end learning

A wide range of programs based on the Enrichment Triad Model were developed by classroom teachers and gifted education specialists in different school districts across the country that serve diverse populations of students at all grade levels. Many examples of creative student work were completed as part of the enrichment opportunities built around the Triad Model.

Teachers using the model worked very hard to access resources to provide enrichment for students, but the many responsibilities of classroom teachers and the amount of time required to track down resources made this a daunting task. In the RLS, thousands of resources and enrichment materials are provided for teachers and students with the click of a mouse. This system is unique in that these resources are individually tailored to students' abilities, interests and learning styles and these resources can be accessed in school, during after-school programs or even at home when students want to pursue enriched learning opportunities on their own.

The Enrichment Triad Model was designed to encourage advanced-level learning and creative productivity by (1) exposing students to various topics, areas of interest and fields of study in which they have an interest or might develop an interest, (2) providing students with the skills and resources necessary to acquire advanced level content and thinking skills and (3) creating opportunities for students to apply their skills to self-selected areas of interest and problems that they want to pursue.

Type I enrichment is designed to expose students to a wide variety of disciplines, topics, occupations, hobbies, persons, places and events that would not ordinarily be covered in the regular curriculum or that are extensions of regular curriculum topics. In schools using this approach, an enrichment team of parents, teachers and students often organizes and plans type I experiences by contacting speakers, arranging mini-courses; conducting overviews of enrichment clusters, demonstrations or performances; using Internet resources; or ordering and distributing films, slides, CDs, DVDs, videotapes or other print or non-print media. It is often difficult to rally teams of teachers, parents and students on an ongoing basis; however, the RLS provides type I enrichment opportunities by making virtual field trips, online activities that challenge student thinking, exciting web sites, books, videos and DVDs related to areas of special interest, and other exposure activities associated with independent projects readily available, without a lot of planning time. Obviously, the RLS does not replace parent, teacher and student involvement in the development of type I experiences that might be viewed as the

motivational 'hook' that causes individual students to become turned on to a particular topic or area of study, but it supports the ongoing implementation of exposure opportunities that some students may subsequently pursue in greater depth or even consider for a future career.

Type II enrichment consists of materials and activities designed to develop a broad range of higher-level thinking processes and advanced inquiry skills. Some type II enrichment is general, and usually provided to groups of students in their classrooms or in enrichment programs. This general type II training includes the development of (1) creative thinking, critical thinking and problem solving; (2) affective processes and co-cognitive skills; (3) a wide variety of specific how-to-learn skills; (4) skills in the appropriate use of advanced-level research and reference materials; and (5) written, oral and visual communication skills. Teachers can use the RLS to access general type II enrichment activities (e.g. a lesson in creative thinking) and make them available to students online or in print form for whole-group or small-group instruction, or an online activity can be recommended for individuals or small groups to pursue on their own.

Other type II enrichment is specific, as it cannot be planned in advance and usually involves advanced instruction in an interest area selected by the student. For example, students who become interested in botany after a type I enrichment on this topic would pursue additional training in this area by reading advanced content in botany; compiling, planning and carrying out plant experiments; and more advanced methods training for those who want to go further and pursue a type III enrichment in that area. In a regular classroom, this kind of exploration might require substantial support, guidance and possibly some advanced planning by the teacher. Following and supporting students in the multitude of individual projects that might exist in a single class could become taxing for a teacher to do alone. Now take an example from the RLS: a small group of students become interested in mechanical engineering after a virtual field trip that dealt with some of the world's most imaginative bridges. They located resources on the Internet that provided instruction for designing, planning and building a model of a bridge. They also found a number of model bridge competitions to which they subsequently submitted their designs. The RLS enabled the students to pursue this high-end learning opportunity with less aid from the teacher than might have been required otherwise.

In the RLS, type II training is embedded across many of the enrichment activities listed above. A quick tour of the various categories reveals the vast array of resources that can be used for all three types of enrichment in the Triad Model. When several students are using the RLS, a fun, informative way to support student self-regulation and autonomy in learning is to take a 'tour' through their enrichment activities with them.

Our experience in using the Enrichment Triad Model over the years has shown that types I and II enrichment and/or interests gained in the regular curriculum or out-of-school activities will motivate many students to pursue self-selected topics in greater depth. We call these advanced types of involvement type III enrichment, which is defined as individual or small-group investigations of real problems. When students choose to become involved in type III enrichment, they usually are interested enough in a topic to pursue a self-selected area of study in great depth. They also are willing

to commit the time necessary for advanced content acquisition and process training in which they assume the role of a first-hand inquirer.

In the RLS, the type III component can emerge from almost any of the enrichment options that students choose to pursue. They can, for example, get an idea for what they might like to learn more about by becoming involved in a virtual field trip or a real field trip. They might find an idea from a creativity training exercise or critical thinking activity. The most logical way for students to become involved in a type III project is by pursuing an independent study or by becoming involved in a contest or a competition. We have also found that students may become interested in doing in-depth research by using any of the other components of the RLS such as special topic web sites, fiction, nonfiction, how-to books, summer programs, online activities and research skills. There are also numerous options in the RLS for students to pursue type III studies in specialized areas (e.g., Math League, Invention Convention, National History Day Competition, to mention only a few of the hundreds of available options).

Type III enrichment is different from the types of projects and reports that students typically do in connection with their regular schoolwork. The best way to describe this difference is to list the three things that make a problem 'real' to a student. First, real problems are based on a sincere interest of the student rather than one assigned by the teacher. It is something the student *wants* to do rather than something he or she is assigned to do. You may discuss and provide guidance in helping a student find and focus a problem, and the problem might be within the general curriculum area you are covering, but the subject or theme on which a student chooses to work must represent a personalization of the topic for him or for her.

The second distinguishing feature of working on a real problem is that the student will use the methods of investigation of the practicing professional. They are going to do what the real geologist, scenery designer or community activist does, even if it is at a more junior level than an adult professional working in one of these fields. This focus will help to distinguish a bona fide type III project from the ritualistic reports that students typically complete by merely gathering and summarizing information from reference books or Internet sites. The most powerful tools for giving students the know-how of authentic methodology, such as *How-To Books For Conducting Research and Creative Projects*, can be found in the enrichment database under the category 'how-to books'. Take a quick tour of this enrichment category to get a 'feel' for the many exciting books that provide the skills for helping students become practicing professionals. And think about using some of the material in these books for whole-class and small-group lessons on teaching research and investigative skills. We have found that teaching young people a practical data-gathering technique such as questionnaire design, for example, will motivate them to identify a problem that allows them to use their new skill on a problem in which they have a personal interest.

The third characteristic of a real problem is that it is always geared toward an audience other than, or in addition to, the teacher. In the adult world, practicing professionals carry out their work because they want to have an impact on one or more relevant audiences – others who voluntarily attend a performance, read a newsletter or go to a science fair. Presenting to classmates occasionally may qualify as a real audience, but such presentations should be viewed more as practice sessions for more

real-world settings such as a presentation to the local historical society, submission of one's writing to a magazine that publishes poetry or short stories or entering an invention contest. The enrichment category entitled *Contests and Competitions* will give you and your students many ideas about opportunities for audiences in all areas of student interest. And the *Websites* category includes many organizations and professional societies that produce journals and newsletters where high-quality student products might be included. These organizations are also excellent sources for resources in specialized areas of study, and some of them even provide online mentoring services for students.

The goal of type III enrichment is to transform the role of the student from a person who merely acquires information to a role in which she or he is thinking, feeling and doing like the practicing professional by actually engaging in *authentic* activities. Reeves et al. (2002) describe authentic activities in a similar manner. According to these researchers, authentic problems have characteristics that include real-world relevance; ill-defined problems, requiring students to define the tasks and sub-tasks needed to complete the activity; complex tasks to be investigated by students over a sustained period of time; the opportunity for students to examine the task from different perspectives, using a variety of resources; the opportunity to collaborate; the opportunity to reflect – integrated and applied across different subject areas and led beyond domain-specific outcomes; seamlessly integrated with assessment; and polished products valuable in their own right rather than as preparation for something else; competing solutions and diversity of outcome (p. 565).

To help students understand the difference between an authentic type III and the more traditional kinds of reports that they typically do in school, the Wizard Project Maker (see Fig. 62.4) highlights the specific ways in which teachers can provide guidance in helping students find and focus a problem, examine potential outlets and audiences, and obtain the necessary resources to carry out their investigative activities, and as teachers embrace their role as coach, or guide on the side, they realize that their role is active, but requires minimal time because it does not require large amounts of face-to-face instruction.

One of the questions that teachers frequently ask is 'Where will students find the time to do type III projects?' All students can use the RLS, but we have found that above-average ability students – those who can master the regular curriculum at a faster pace than others – can 'buy' some time for enrichment activities through a sub-component of the RLS called curriculum compacting. Essentially, compacting is a process through which the teacher uses formal and informal assessment at the *beginning* of a unit of study to determine which students have already mastered basic skills, and therefore do not need the same amount of practice material as others. Indeed, it is sometimes this excessive practice of skills already mastered that causes many of our more able students to become bored with school! And in subjects such as science and social studies, students may not know the material to be covered, but are eager to select an option that allows them to cover it at an accelerated pace. Many students are especially eager to select this option if they know that it will 'buy' them the time to work on type III enrichment as well as other options in the RLS, using a strategy such as curriculum compacting (Reis et al., 1992; Renzulli and Smith, 1984).

The value-added benefits of learning with technology

The conditions of learning have changed dramatically for young people going to school today. Don Leu and his team of new literacies researchers at the University of Connecticut (2002, 2004) have pointed out that the Internet is this generation's defining technology for literacy and learning and that profound changes have already taken place in higher education, adult learning and the workplace, all situations for which we are preparing the young students who are in our classrooms today. There was a time when teachers and textbooks were the gatekeepers of knowledge, but today virtually all of the world's knowledge is accessible to any student who can turn on a computer and log on to the Internet. One of the dangers of a content-abundant resource such as the Internet, however, is that we might be tempted to simply use it to cram more information into students' heads! But by applying a learner-centered pedagogy rather than a traditional drill-and-practice approach, we can harness the power of the Internet in a way that respects principles of high-level learning developed by the Task Force on Psychology of the American Psychological Association (APA, 1997). A crucial question, therefore, is will we use this information wisely? Or will we simply turn the powerful resources available through the Internet into electronic worksheets, test-prep tutorials and online courses that adhere to the same prescriptive model for learning that almost all reform initiatives have followed thus far – a model that has indeed left so many young people bored, disengaged and behind? Or will the new technologies be the workhorse that can finally allow teachers to truly differentiate learning experiences for all students? These technologies now make it possible to apply to all students the pedagogy typically used with high-achieving students. In an article entitled 'The multiple menu model for developing differentiated curriculum for the gifted and talented' (Renzulli, 1988), a discussion occurs about how a 'gifted education approach' can improve engagement and achievement for all students. With almost unlimited access to the world's knowledge, a critical issue for educators is selecting the software and providing the training that will help young people use this access safely, efficiently, effectively and wisely. Leu and his colleagues define the five major skill sets of the new literacies as follows:

1. Identifying important questions.
2. Locating relevant information.
3. Critically evaluating information.
4. Synthesizing information.
5. Communicating effectively.

In addition to improved academic achievement and opportunities for creative productivity, which are the major goals of the RLS, there are a series of metacognitive tools that result from computer-based learning environments. Metacognition is generally defined as the monitoring and control of one's own thinking processes. Metacognitive tools are skills that help students organize and self-regulate their learning so that they can make the most efficient use of time, resources and the cognitive skills that contribute to higher levels of thinking. Metacognition involves problem-solving skills such as exploring alternative options and strategies in open-ended problem situations and applying critical-thinking skills such

as examining the sources of evidence, the logic of arguments and how to find and use reliable information. Training and experiences in metacognitive skills may be the single biggest difference between the education provided in high- and low-achieving schools!

Several researchers studying constructivist models of learning and metacognition have developed or modified traditional theories of learning to explain the role of computer environments in mediating the interactions between and among the cognitive, metacognitive, affective and social processes that are involved in learning complex material (Bandura, 1986; Corno and Mandinach, 1983; Pintrich, 2000; Schunk, 2001). Promising results have emerged from these new developments in theory and research on the ways in which computer learning environments facilitate metacognitive skill development.

The Internet can also be a good educational tool for hard-to-reach populations. Researchers from Michigan State University examined the positive effects of home Internet access on the academic performance of low-income, mostly African American, children and teenagers involved in a home Internet project. In this research, 140 children aged 10–18 years old (83% African American and 58% male) living in single-parent households (75%) with a $15,000 or less median income were followed for a 2-year period to see whether home Internet use would influence academic achievement.

The children who participated in the project were online for an average of 30 minutes a day. Findings indicate that children who used the Internet more had higher standardized test scores in reading and higher grade point averages (GPAs) at 1 year and at 16 months after the project began compared with children who used the Internet less, said lead author Linda Jackson. The Internet use had no effect on standardized test scores in math.

'Improvements in reading achievement may be attributable to the fact that spending more time online typically means spending more time reading', said Dr Jackson. 'GPAs may improve because GPAs are heavily dependent on reading skills', she added.

An even more promising trend is emerging as computer use evolves from traditional e-learning (i.e. taking an online course or developing basic skills through computer-assisted instruction) to inquiry-based software that focuses on the *application* of knowledge to creative productivity and investigative research projects that promote high levels of student engagement. Students learn the basic difference between to-be-presented information that characterizes traditional instruction and just-in-time information, which is the hallmark of problem-based learning. Skills such as problem finding and focusing; stating research questions; task understanding and planning; identifying appropriate investigative methodologies; searching, skimming, selecting and interpreting appropriate resource material; identifying appropriate outlets, products and audiences; and preparing effective communication vehicles are all value-added benefits when the learning theory that underlies the Enrichment Triad Model is combined with the vastness of resources available through the Internet.

Summary: the Renzulli Learning System

The RLS is designed to be an aid to busy teachers who seek the tools for effective differentiation as they go about the process of dealing with a broad range of individual

differences, diverse student needs and increased pressures to improve student achievement. Through the use of technology and an approach to learning that is the opposite of highly prescriptive instruction, the RLS provides teachers with the 'dozen teaching assistants' that every teacher would like to have in his or her classroom. The main goal of the RLS is to simultaneously increase achievement and enjoyment of learning by making available an inexpensive, easy-to-use, research-based system that promotes student engagement. Although student engagement has been defined in many ways, we view it as the infectious enthusiasm that students display when working on something that is of personal interest and that challenges them to 'stretch' for the use of materials and resources that are above their current comfort level of learning. Research on the role of student engagement is clear and unequivocal – high engagement results in higher achievement, improved self-concept and self-efficacy, and more favorable attitudes toward school and learning. Numerous students involved in our field tests of the RLS summed it up with one word – 'Awesome!' Interested readers can examine the RLS by going to www.renzullilearning.com and clicking on 'Test Drive Renzulli Learning'.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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Biographies

Joseph Renzulli is a Professor of Educational Psychology at the University of Connecticut, where he also serves as Director of The National Research Center on the Gifted and Talented. His research has focused on the identification and development of creativity and giftedness in young people and on organizational models and curricular strategies for differentiated learning environments that contribute to total school improvement. A focus of his work has been on applying the pedagogy of gifted education to the improvement of learning for all students. He was designated a Board of Trustees Distinguished Professor at the University of Connecticut in 2000, and in 2003 he was awarded an Honorary Doctor of Laws Degree from McGill University in Montreal, Canada. The

American Psychological Association's *Monitor on Psychology* named Dr. Renzulli among the most 25 influential psychologists in the world. Although Joe has obtained millions of dollars in research grants, he lists his proudest professional accomplishment as being the founder of the summer Confratute program at UConn, which began in 1978, and has served thousands of teachers and administrators from around the world.

Sally Reis is a Board of Trustees Distinguished Professor and Professor of Educational Psychology at the University of Connecticut, where she also serves as Principal Investigator of The National Research Center on the Gifted and Talented. She was a teacher for 15 years, 11 of which were spent working with gifted students on the elementary, junior high, and high school levels. She has authored more than 100 articles, 8 books, 30 book chapters, and numerous monographs and technical reports. She has traveled extensively across the country conducting workshops and providing professional development for school districts on enrichment programs and gender equity programs. She is co-author of *The Schoolwide Enrichment Model, The Secondary Triad Model, Dilemmas in Talent Development in the Middle Years*, and a book about talent development in females entitled *Work Left Undone: Choices and Compromises of Talented Females*. Sally serves on the editorial board of the Gifted Child Quarterly, and is a past-president of The National Association for Gifted Children.