

The Senior Project

and

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During his senior year in high school, Carl (not the student's real name), "an uncommonly serious, attentive, and cooperative student" (Rod Harkins, personal communication, December 10, 1997), undertook an independent study project reflecting his capacity for learning and his interests. He researched the musical influences and style of Johan Sebastian Bach and Bach's composition, *Toccatina and Fugue in D Minor*. Under the musical mentorship of Dr. Harkins, Carl was given the required course materials for a freshman music theory course at a local university and completed the 5-week course independently in 1 week after school. Carl worked with his mentor studying, analyzing, and investigating advanced concepts in orchestration and arranging. Carl applied these concepts, and, following "the long, arduous hours invested in making scoring decisions" he wrote a musical score by hand, creating "an ensemble where instrumental voices, limited in number and range, were used" (Rod Harkins, personal communication, December 10, 1997). Subsequently, Carl recorded his original composition with the assistance of college students in a sextet playing "a new and largely successful musical setting of Bach's organ work for Tuba and Euphonium Ensemble" (Rod Harkins, personal communication, December 10, 1997). The recording of this arrangement was played during Carl's presentation to a panel of judges during a presentation at the end of his senior year. Carl, in researching a self-selected topic, working with a mentor knowledgeable in his selected area of study, creating a product that reflected his

research, and presenting his research and product to a panel of judges, had completed a senior project.

The idea of the senior project was conceived in Medford, OR, in 1986 as a curricular experience designed to measure a 12th grader's knowledge of core concepts learned throughout his or her years in school (Chadwell, 1991, 1992). The model has four central components: a research paper on a student-selected and teacher-approved topic, the development of a related product/project, a portfolio documenting the project's development, and a presentation before a review panel of community members (Egelson, Harman, & Bond, 2002; Sills-Briegel, Fisk, & Dunlop, 1996). Specific rubrics are used to assess each component (see Appendix A, B, and C; Osher, Summers, & Andren, 1988; Taaffe, 2002). Students are guided through the process by a mentor and maintain documentation of their progress with a portfolio (see Appendix D).

The senior project, also known as Graduation by Exhibition (Barnett, 2000; Sills-Briegel, Fisk, & Dunlop, 1997), Exit Exhibition (Cushman, 1990), Senior Exit Essay Project (Barrett & Ludden, 1997), Rite of Passage Experience (Cushman, 1990), Senior Exit Project (Troutman & Pawlowski, 1997) and Graduation Project (Houston & Tharin, 1997), is a practice gaining national attention in schools throughout the United States, with some schools requiring completion of the assessment as a graduation stipulation (Bond, Egelson, & Harman, 2002; Egelson, Robertson, & Smith, 2002; Summers, 1989). In the early 1990s, more than 60

schools nationwide had adopted senior projects as steps toward better preparing students for the future and raising school standards.

Paula Egelson, head of the Senior Project Program at the South Eastern Regional Vision for Education (SERVE), a federally funded research laboratory located in Greensboro, NC, has conducted research on the impact of senior projects on participating schools. In the spring of 1998 and spring of 1999, SERVE collected data through surveys about the impact of senior projects from "approximately 1,800 students, 180 parents, 170 faculty members, and 16 senior project coordinators" (Egelson, Harman, & Bond, 2002, p. 3). Results of this 1999 study indicate that "75% of students agreed and/or strongly agreed that their writing, research, speaking, planning, and time-management skills had improved as a result of the senior project participation" (Egelson, Harman, & Bond, p. 3). Furthermore, parents' and senior project coordinators' "degree of agreement was even higher—over 80%" (Egelson, Harman, & Bond, p. 3).

In 1999–2000, a field study of eight North Carolina schools was conducted; four senior project schools and four control schools were selected. Researchers identified four "treatment schools that had institutionalized Senior Projects" for at least 4 years, with all seniors participating in senior projects and with "all the program components (research paper, product, portfolio, presentation)" in place (Egelson, Harman, & Bond, 2002, p. 4). Control schools were

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selected to match each senior project school based on staff size, size of student body, percent of students in the federal free lunch program, percent of minority students enrolled at the school, overall performance in the state testing program, and urbanicity. A variety of measures, including focus groups, writing assessments, achievement test scores, and surveys, were used to examine possible differences between senior project and control schools.

Results of the study indicated several statistically significant ($p < .05$) “association[s] between the type of school (senior project schools vs. control schools)” and “whether students’ perceptions of specific skills were *learned* and *reinforced*” in the students’ high school classes (Egelson, Harman, & Bond, 2002, p. 16-17). Students who responded to surveys about senior project sites indicated a more positive association with the following specific skills than did their counterparts at the control schools: writing a research paper, preparing and presenting a speech, carrying out a plan, and conducting interviews. Furthermore, similar findings indicated that students at senior project schools perceived the following skills to have been reinforced more in their classes than the students at control schools: preparing and presenting a speech, conducting research, and locating appropriate references. Additionally, teachers at senior project schools indicated using “rubrics and extended projects to assess student performance more often than control teachers” (Egelson, Harman, & Bond, p. 20).

The senior project is recognized as a viable educational program at a time when our nation’s education system is being questioned and when “alternatives to traditional senior year” are being proposed (The National Commission, 2001, p. 5). The National Commission on the High School Senior Year stated that the “primary goal of high schools should be graduating students who are ready (and eager) to learn more, capable of thinking critically, and comfortable with the ambiguities of the problem-solving process” (pp. 9–11). Unfortunately, following extensive research and focus group meetings, the commission determined that high school seniors are not prepared to enter college or the work world. Furthermore, they noted that the senior year should “broaden experiences to include service or demanding work-based learning, or culminate earlier classroom experience in a senior project” (p. 28).

The commission made references to the positive impact of senior projects, which are recognized as a challenging alternative that “can help connect students to their futures as citizens, employees, and employers, and lifelong learners” (The National Commission, 2001, p. 32). The value of the model is that it requires “all seniors to showcase . . . [and demonstrate] their capabilities for research, creative thinking, rigorous analysis, and clear written and oral communication” (The National Commission, p. 33). Moreover, of the seven national programs recommended as models for improved achievement, three were senior project sites. Similarly, among the eight nationally renowned programs that pro-

vided education alternatives, the commission highlighted eight, three of which were recognized for their senior project requirements.

The senior project model presents a defensible, credible educational model that incorporates many of the elements of exemplary models in gifted education. Advocates of appropriate curricular practices for the gifted will find similarities between the senior projects and these models and strategies: the Enrichment Triad Model (Renzulli, 1999), service learning (Lewis, 1991), independent study (Johnsen, 2001), the Autonomous Learner Model (Betts, 1985; Betts & Neihart, 1986), the Creative Problem Solving Model (Parnes, 1977), the Self-Directed Learner Model (Treffinger, 1975), mentorship strategies (Milam, 2001), and product development (Karnes & Stephens, 2000). A model that can include all students and allow for differentiation is highly desirable; the senior project is one such paradigm.

The Research Paper

The first stage of the senior project involves the student identifying and selecting an area of interest that stretches the student in his or her learning. While the student may have some knowledge of the selected field, the research should allow the student to expand beyond his or her current knowledge base in order to continue to grow or stretch. Advocates of gifted education generally support this type of learning, which encourages students to grow in self-

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selected areas of interest (Maker & Nielson, 1995). The Autonomous Learner Model includes “Investigations” (Betts & Neihart, 1986), which provide students the opportunity to conduct mini-research projects on self-selected topics, a component of Dimension 3 of the model, “Enrichment Activities.” “In-Depth Study,” in Dimension 5, allows the student the opportunity to explore topics independently.

Both investigations and in-depth study require students to develop contracts that document their learning plan, including a detailed organizational plan of why the student will undertake this area of study, how he or she will acquire information, what resources will be utilized, a timeline, and how the research will culminate in a final presentation (Betts & Neihart, 1986, p. 176). Likewise, the senior project incorporates a learning agreement plan, including written statements from students about their intended area of study, why they have selected it, how it stretches their learning, how they will relate this to their product or project, who their mentor will be, their intended project timeline, and the resources that will be needed to execute the plan (See Appendix E, Appendix F).

The Enrichment Triad Model (Reis & Renzulli, 1985; Renzulli & Reis, 1985) provides students the opportunity to conduct independent research in Type III Enrichment. As in the senior project model, Type III activities allow for the formulation of a problem by the student and the methods by which the student will address this problem. Renzulli and Reis advocate Type III activities because they challenge students to “investigate activities and artistic productions in which the learner assumes the role of a firsthand inquirer; the student thinking, feeling, and acting like a practicing professional” (p. 395). Mentors, too, may be part of the learn-

ing process for the student in the Enrichment Triad Model. The model also fosters the development of higher level thinking skills inherent in problem solving, synthesizing information, and applying new knowledge to the solution of a real-world problem. Similarly, the senior project model is recognized for providing students the opportunity to utilize critical thinking skills in the design, execution, and evaluation of their research, product, and presentation. Upon reflection of the Enrichment Triad Model, Renzulli (1999) articulated how this model, and others similar to it (such as senior projects), allows students to construct knowledge. Recognized as an inductive model of inquiry, where students acquire new information in situations most like real-world problem solving, the Enrichment Triad Model “represents the kinds of learning that take place outside of formal learning or traditional classroom situations but that can be integrated into school learning with the proper engineering” (Renzulli, p. 19). Likewise, senior projects, through the facilitation of the educator, offer students the opportunity to identify purposeful lines of inquiry and to approach them with the appropriate level of difficulty for their abilities as students develop learning plans, desired outcomes, and embark on experiences of their own choice (see Appendix G).

Often, the areas of senior project research involve careers that students are interested in pursuing following graduation, allowing them the opportunity to research and work with mentors in these fields (see Appendix H). This learning opportunity frequently results in the students deciding to continue to pursue the field in college, but many also decide that they no longer desire to study the field once they learn more about the skills needed or when they see firsthand the day-to-day routine of a professional,

which may not have matched their idealized vision of the occupation. Again, the Autonomous Learner Model is similar in that career involvement is explored in Dimension 2 when students consider questions about their potential careers, investigate possible occupations, and work alongside a professional mentor in that field (Betts, 1985). Frequently, the mentors are from the local community or surrounding areas, thus bringing outside experts into the lives of students and creating a learning community that extends beyond the confines of the school walls.

Management, organizational, and research skills—components of the senior project model—are central concepts in the Self-Directed Learning Model (Treffinger, 1975; Treffinger & Barton, 1988), which is also designed for use with learners of various ability levels. In this model, students pursue independent studies through the facilitation or guidance of their instructor in a fashion similar to that of the senior project. In both models, the teacher and student share assessment responsibilities. Treffinger outlined a continuum of assessment, whereby the student gradually learns to assume the primary role in defining learning objectives and identifying appropriate means of assessing his or her work. Treffinger suggested that, early in the student’s development toward self-directed learning, the teacher maintains a role in evaluating the student by “clarifying the nature of the objectives, and the kinds of evidence that will be accepted in meeting them, and communicates that information to the student at the beginning of instruction” (p. 57). As students become more independent in the learning process, their roles in assessment are “extended, so that pupils take part in conferences with their teachers” and “develop and apply criteria for evaluation of their own work . . . in cooperation with the teacher” (Treffinger, p. 57). Finally, in

the last phase of the model, the learner operates independently to identify “goals, objectives, and instructional procedures, and thus should be in an excellent position for assessing the evidence that the objectives have been attained” (Treffinger, p.57). The Self-Directed Learner Model and senior projects provide specific guidelines to assist students in monitoring their progression as they work through their project (see Appendix E and F).

In both senior projects and the Self-Directed Learner Model, the instructor’s role is critical. Rather than a classroom climate driven by teacher-prescribed goals, objectives, assessments, and evaluations, senior projects and self-directed learning support a more student-centered approach to learning. The pupil participates with the teacher to become more independent in guiding his or her learning and evaluation. A learning contract may also be executed by the student to establish the purpose of the study, the activities, timelines, and how the project will be assessed. As with the Autonomous Learner Model and the Enrichment Triad Model, senior projects and the Self-Directed Learner Model encourage students to become responsible for designing their educational outcomes.

The concept of independent study is recommended in teaching the gifted “as a means for differentiating and individualizing instruction” (Johnsen, 2001, p. 495). In the independent study model, students are encouraged to examine real-life problems because of their authenticity. Student learning is guided and monitored by the teacher, is planned, and “is similar to [a process] used by a practicing professional” through “[focusing] on life-like problems that go beyond the regular class setting” (Johnsen, p. 496).

In senior projects, as with the Self-Directed Learner Model, the teacher is critical to the success of the independent

study. The instructor must remain actively engaged in monitoring student progress and will need to evaluate each learner’s abilities continually, providing needed instructional support to scaffold learning. Educators may need to provide instruction in research skills, assist the student in locating resources, or both. The facilitator should consistently remain flexible and allow student interest to develop at its own pace, model independent study habits, recognize student improvement, and meet with the learner and his or her parents regularly to discuss progress (Johnsen, 2001). While senior projects are intended to provide students the opportunity to show the skills they have learned throughout their K–12 education experiences, educators may still need to provide the support outlined by Johnsen, giving students mini-lessons to assist them with their continued growth.

Johnsen’s (2001) model includes several steps similar to those in the senior project: student-selection of a topic of study, the development of an organizational plan to help students map out their problem, developing purposeful questions that will “lead to quality independent studies” (p. 508), choosing a method of study, gathering information, developing a product, sharing the information gleaned from the study with an authentic audience, and evaluating the study.

Developing Projects

The product or project phase of senior projects requires students to link their research to a tangible creation, establish a solution for a problem cited in their research, or participate in a service-learning project. The senior project model incorporates the product development in order to “bring together the complex cognitive, affective, and cognitive skills students learn to apply to planning, organization, resource use, and time

management in a more naturalistic manner” (Maker & Neilson, 1995, p. 174).

Creativity is a central component in the Creative Problem Solving (CPS) Model (Isaksen & Parnes, 1985; Parnes, 1977; Parnes, Noller, & Biondi, 1977), emphasizing the importance of generating a multitude of possible solutions for a problem prior to executing a solution. The philosophy of CPS—idea generation, development, and problem solving—is critical to the success of all students, including those involved in senior projects.

As with other skills necessary for successful completion of the senior project, students demonstrate proficiency in skills learned throughout their years in school, including the ability to solve problems. The senior project model allows students to illustrate skill mastery in their development of creativity through the steps that parallel the CPS model. In CPS and senior projects, students grow through identifying issues or problematic situations and developing a learning plan based on investigating these concerns. In CPS, students list objectives, goals, and purposes and generate evaluation criteria. Likewise, in senior projects, students plan how they will undertake their study and develop a strategy for learning. Both CPS and senior projects involve finding data through the collection of information related to the objectives and exploring the facts. CPS helps students develop decision-making skills about how to tackle their problems and examine the issues from various perspectives.

Products are critical steps in the learning process, and they provide “tangible evidence of what has been learned through study and investigation” (Karnes & Stephens, 2000, p. 1). Products are recommended assessment tools, providing the learner with greater individuality and creativity in deciding how he or she will exhibit the knowledge gleaned from research. Furthermore,

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product development allows students to showcase and apply their knowledge in a format that “goes way beyond [paper-and-pencil tests] and combines much more, such as advanced content, process skills, and organizational aspects” (Karnes & Stephens, p. 3; see Appendix I). Senior projects allow students the opportunity to create a product or participate in a service-learning project.

The student’s level of engagement in a service-learning project is also a critical consideration for the student, the teacher, and the mentor. Three levels of engagement, or degrees of service, have been articulated by Terry and Bohnenberger (1999). In the lowest level of involvement, Community Service, students participate in service activities by “tutoring, working in a nursing home, shelving books at a local library and generally becoming more aware of the community,” with less emphasis on learning than the other levels (Terry, 200, p.4). In Community Exploration, students participate in the community through internships or other community ventures where “information from the real world is shared, understood, and explored at a more authentic level than reading from a textbook” (Terry, p. 5). While Community Exploration emphasizes learning, it is less emphatic about “direct service to community” (Terry, p. 5). Community Action, however, involves students in authentic decision making and problem solving. Students can make a “positive impact on their community, which empowers them to make a difference in the real world” (Terry, p. 5). Students are engaged in service and learning at a high degree in this stage. Educators, mentors, and parents should encourage gifted students participating in service learning projects, senior projects, or other similar curricular programs to strive for an appropriately challenging degree of service engagement (see Appendix J).

The project component of senior projects allows students to achieve the

same benefits that Lewis (1991) outlined, with the goal of helping students achieve other skills while working toward resolving a community need. Students recognize a problem in the community, create a service-learning plan to address this challenge, and execute the plan. Communication skills, time management, reflection, citizenship, and self-evaluation—skills that are critical for success in college and the workplace—are often integral components of the project component. Lewis encouraged students to pursue service projects, or social action projects, in order to solve real problems facing people, challenging students to reach out to their communities, which will lead them in “helping to design a better future” (p. 2). Lewis listed the personal gains students may receive from completing social action projects, including taking charge of their personal life, increasing self-confidence, showing the world their work and their voice, and asserting and enjoying their rights.

Research on service-learning projects indicates positive outcomes for students purposefully engaged in these meaningful activities. Billig and Fiske (2000) documented the power of service-learning programs through a review of research on service learning from 1990 to 1999. Research indicates an increase in communication, a sense of educational competence, and a personal and social responsibility in secondary students participating in quality service-learning programs. Service learning has positively affected students’ ability to relate to culturally diverse groups, increased their civic responsibility, positively affected achievement, spawned greater interest in career exploration, and bolstered the teaching and learning environment of schools and communities.

Senior projects also require students to select a mentor who is knowledgeable in their selected area of study. Mentorships have been described as

“exciting opportunities” for extended, in-depth learning with adults who can “offer expertise, experience, and resources that may be beyond the capabilities of the school setting” (Milam, 2001, p. 523). Gifted students especially can benefit from relationships with mentors through the development of advanced skills and concepts, learning information about their topic of choice outside the confines of the classroom, and networking with specialists and other “influential people” (Milam, p. 525). Mentors advise students about realistic research and project choices, monitor and document the progress of the senior project phases, and provide insight into the student’s overall effort and growth through a culminating statement in a letter to the senior project coordinator. Milam noted that the value of mentorship programs has been well documented in the literature.

Milam (2001) and Mattson (1983) have offered advice on seeking and selecting mentors. As with any interaction that involves students and the general public, educators and parents are cautioned to screen participants carefully and monitor the relationship between the student and the mentor. With the appropriate conditions, mentorships have been shown to be beneficial learning opportunities for both the gifted students and the mentors, creating a vital link between the community and school (Beck, 1989; Beecher, 1995; Betts, 1985; Clasen & Clasen, 1997; Cox, Daniel, & Boston, 1985; Kaufmann et al., 1986; Reilly, 1992; Torrance, 1984).

The Presentation

Senior projects culminate in the presentation of the project by the student to a panel of evaluators. Students present a speech about their paper and project and answer questions posed by the judges. The evaluation panel is comprised of

educators and community members with expertise in the student's area of study. The value of communication skills, particularly public speaking, is emphasized as students share information about their paper, their project or product, and their reflections about the experience.

The value of an authentic audience with whom students may share their products is emphasized in the Enrichment Triad Model. Furthermore, the importance of creativity in product development and the relationship of an authentic audience in the development of the product has been noted by Renzulli and Reis (1985), who wrote that "it is this sense of audience which helps give students a reason for wanting to improve the quality of their products and develop effective ways of communicating their results with interested others" (pp. 413–414). In senior projects, the presentation, or Senior Boards, is the final phase, which allows students the opportunity to verbalize their learning in a formal assessment. Schools rarely provide students the opportunity to speak publicly about an area in which they are knowledgeable, yet employers and college faculty often ask students to make such presentations on the job and in the classroom, respectively. Gifted students, too, need the opportunity to develop the presentation skills necessary for success in senior projects and other life experiences.

Research indicates that gifted students need learning opportunities like those incorporated in the senior project in order to be intellectually challenged and to achieve gains in creative, productive behaviors and in initiating their own investigations (Starko, 1986, as cited in Renzulli & Reis, 1994). The components of the senior project echo strategies outlined by prominent scholars in gifted education. Recognition of this model as a method of preparing all students for college, work, and life, (Wolk, 2000), as well as its merits as a program

with national recognition, suggest that senior projects are a sound curricular practice that challenges students academically and may yield special benefits not found in other instructional practices (Dunn, 2001; McDonald, 1993). For gifted students, senior projects offer a variety of learning experiences that combine best practices in educating high-ability learners.

Further research on senior projects and gifted students is needed. Current literature documents outcomes for all students, but no such inquiries document the experiences of the gifted with this model. Evidence of achievement, satisfaction, and attitudes of the gifted, their parents, and their teachers is needed to establish the value of the senior project as a meaningful learning opportunity for the gifted. Analysis of case studies, surveys, and other qualitative and quantitative measures would aid educators in understanding the impact of senior projects on gifted 12th-grade students. **GCT**

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Appendix A. Paper Evaluation Guide

All four of the following areas must be passed in a highly competent (HC) or competent (C) manner in order to receive a passing grade. An NE (not evident) rating requires remediation and revision.

Area 1: Ideas and Content	HC	C	NE
The paper has a well-developed introductory paragraph and thesis that the writer proves or disproves through sophisticated research evidence and effective elaboration.			
Supporting paragraphs are thoroughly developed with supplementary material that support and illustrate the writer's POV.			
The writing is clear, focused, and interesting, with details that are carefully selected to provide strong, accurate support.			
There is evidence of a clear purpose that controls the paper throughout.			
The paper contains an insightful conclusion.			
Area 2: Organization			
The organization of the paper is logical.			
The paper has a beginning that captures the reader's interest, and the ending is natural and satisfying.			
The structure is obvious, with transitions that are smooth and effective in sentences, paragraphs, and ideas.			
Area 3: Style: Word Choice/Fluency/Voice			
The vocabulary is varied and natural.			
The sentence length and structure are varied.			
The words draw clear images.			
The paper reflects a strong sense of voice well suited to the audience.			
Area 4: Conventions and Research/Documentation			
The writer demonstrates a grasp of standard writing conventions and uses conventions effectively to enhance readability. Errors tend to be so few and so minor that the reader can easily overlook them unless editing for publication.			
The paper has proper documentation of sources (at least 5 or more) and uses MLA documentation guidelines.			
There is appropriate and accurate citation of quotes and paraphrases.			

Note. From *The Graduation Project: Guidelines for Implementation*, by S. Houston & M. A. Tharin, 1997, conference session presented at the Senior Project Institute, Charlotte, NC. Reprinted with permission.

Appendix B. Project Phase Rubric

	Exceptional	Capable	Functional	Not Functional
Use of Time				
Risk Factor				
Application of Knowledge				
Problem Solving				
Use of Sources				
Ethical Strand				
Verification Strand				
Creativity (Extra)				
Quality (Extra)				

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Appendix B continued

Project Phase Descriptors

Use of Time

Exceptional	The student far exceeds the minimum time requirement and demonstrates consistent, efficient, and thoughtful use of time.
Capable	The student meets or goes beyond the minimum time requirement and demonstrates a pattern of time management skills.
Functional	The student just meets the minimum time requirement, with random use of time-management skills.
Not Functional	The student does not meet the minimum time requirement and lacks any evidence of time management.

Risk Factor

Exceptional	A risk/stretch/challenge is exceedingly evident as the student explores a new area, demonstrates a new skill, or extensively expands on previous knowledge and skills. The learning stretch is relative to individual students and can relate to an emotional, intellectual, or physical risk.
Capable	A risk/stretch/challenge is clearly evident.
Functional	A moderate to limited risk is evident.
Not Functional	No risk or learning stretch is evident.

Application of Knowledge

Exceptional	Obvious depth and complexity of knowledge is evident in completion of the project. The student is able to apply the knowledge in creating and evaluating his or her own project.
Capable	The use of general knowledge is evident in student application.
Functional	The use of superficial knowledge is evident in student application.
Not Functional	The student demonstrates rote learning or little or no understanding of how content knowledge applies to product.

Problem Solving

Exceptional	The student analyzes complex problems and uses sophisticated and appropriate problem-solving skills (i.e., metaphorical thinking or brainstorming) to overcome such difficulties as insufficient and/or inadequate resources, time, materials, and procedures. He or she is persistent, flexible, and open to new solutions, advice, and processes.
Capable	The student uses moderate analysis in solving of problems (i.e., asks questions, makes phone calls). He or she has an understanding of the basic difficulties and might try several times to solve the problem before quitting.
Functional	The student has superficial and/or limited problem solving skills. He or she attempts to solve the problem, but usually gives up too soon, asks only a few questions, and resists new ideas.
Not Functional	The student has no basic understanding of what causes the problem or how to solve it (or even that there is a problem).

Use of Sources

Exceptional	The student <i>independently</i> uses a broad and diverse variety of sources such as mentors, written literature, media, and computer generated information.
Capable	Acceptable use of sources of information and/or skill instruction is evident. The student requires some direction.
Functional	The student uses a limited number of sources (a parent or one written source). He or she needs continual prompting or direction.
Not Functional	No use of outside sources is evident.

Ethical Strand

Exceptional	The student demonstrates an exceedingly high degree of integrity, honesty, and responsibility. He or she appreciates the contribution of others and rarely, if ever, violates own standards of high expectations.
Capable	The student demonstrates an awareness of the ethical standards, but might be inconsistent in the application of them.
Functional	The student demonstrates a random application of ethical standards.
Not Functional	The student shows no awareness of ethical standards or a personal need to apply them.

Verification Strand

Exceptional	The student is self-directed and turns in all verification pieces on time. The required verification items, as well as additional student choices, are thoughtfully and neatly written and organized.
Capable	The student turns in the required verification pieces with some teacher direction.
Functional	The student collects and organizes the required project verification pieces. He or she does not go beyond the required list and needs continual direction and prompting to complete and turn items in on time.
Not Functional	The student does not turn in required verification pieces and needs constant reminders.

Creativity* (Extra)

- Exceptional** The student demonstrates an innovative and unusual application of knowledge in design and construction of product or process. He or she synthesizes general knowledge strands into original patterns, thus creating own unique style, presentation, or voice.
- Capable** The common use of creative skills is evident. The student modifies and adapts others' ideas in creation of own design.
- Functional** The student demonstrates limited evidence of creativity (i.e., sees marginal connections, relies on standard methods and models).
- Not Functional** No evidence of synthesis of knowledge and skills is evident. The student is not interested and does not attempt to create own style or voice.

Quality* (Extra)

- Exceptional** Superior craftsmanship, pride, and attention to detail are evident. The student knows specifically how quality is addressed in the project and through practices and persistence reaches quality.
- Capable** Attention to detail is evident, as well as knowledge of the major standards of quality. Though quality may not be produced, there is evidence that the student strived for standards of excellence.
- Functional** The student overlooks many details in desire to finish. He or she cannot easily identify quality standards in project.
- Not Functional** The student disregards details and work is disorganized, sloppy, or hastily done. He or she has no understanding of quality in terms of the project.

Note. *Since one of the requirements of the physical project is to risk and try something new, it might not be possible for students to produce a creative or top-quality product or process the first time around. Also, not all physical projects are creative in nature, such as running a marathon or volunteering at a hospital. Therefore, quality and creativity can be given extra points on the final evaluation sheet on those type of projects).

From *Senior Project Seminar Workbook* (pp. 14–15) by C. Osher, J. Summers, & P. Andren, 1988, Medford, OR: Far West Edge. Copyright ©1988 by Far West Edge. Reprinted with permission.

Appendix C. Presentation Evaluation Guide

All three of the following areas must be passed in a highly competent (HC) or competent (C) manner in order to receive a passing grade. An NE (not evident) rating requires scheduling a second presentation within a specified date.

	HC	C	NE
Area 1: Effective Communicator			
The student's communication skills are clearly and effectively demonstrated in a well-organized, creative manner.			
The student exhibits poise and gestures to emphasize meaning.			
The student uses expressions and a level of language appropriate to the audiences and situation.			
Area 2: Project Description/Explanation			
The student's description of the project/product demonstrates the knowledge mastery from the research-based paper.			
The presentation includes a clear statement of the project's purpose and provides specific supporting details and evidence of preparation and practice with a satisfying conclusion.			
There is evidence that the student has evaluated his or her own skills and work on the project.			
Area 3: Extemporaneous Responses			
The student shows strong understanding and insight of his or her project by confidently and accurately responding to panel comments and questions.			

Note. From *The Graduation Project: Guidelines for Implementation*, by S. Houston & M. A. Tharin, 1997, conference session presented at the Senior Project Institute, Charlotte, NC. Reprinted with permission.

Appendix D Portfolio Rubric

In order for the portfolio to receive a grade, the student must

- complete a research paper
- fulfill the mentor requirement
 - Mentor-verified
 - 10-hour minimum contact hours completed
- give a presentation before the board of judges on Boards Night

Most of the individual components of the portfolio have already received grades from your English teacher (i.e., research paper, letter of intent, letter to the judges, resume, etc.). The final portfolio grade is an indication of your efforts to keep up with your materials and to display them professionally, attractively, and proudly.

	Exceptional		Commendable		Competent		Unacceptable	
Completeness	All required elements are included and completed in full	55	One required item is missing or insufficiently completed	50	Two required items are missing or insufficiently completed	40	Three or more required items are missing or insufficiently completed	0
Quality of Responses	All responses and entries are elaborate and error free	15	Responses lack elaboration but are adequate and error free	10	Responses are minimal; several mechanical/spelling errors appear	5	Many responses lack elaboration; errors appear throughout the portfolio	0
Appearance	Appropriate elements of the portfolio are typed and are professional in appearance	15	Portfolio is neatly typed and pages are clean and unsmudged — but portfolio lacks a truly professional appearance	10	Portfolio is assembled with little effort toward excellence but is neat and typed	5	No effort shown to make the portfolio professional in appearance; some pages crumpled or smudged; handwritten sections	0
Personal Pride and Effort	Student's care is obvious throughout; great effort shown in assembly of portfolio with creativity apparent in added graphics, etc.	15	Portfolio is well done, but little effort is shown to make it an item of excellence with added personal touches	10	Portfolio is without outstanding merit and is done merely to fulfill the requirement; little reflection of student's individuality	5	Portfolio shows a decided lack of effort to make the portfolio reflect pride in its completion	0

Note. From *Wheeler High School Senior Project Student Handbook 2002–2003*, by J. Taaffe, 2002, <http://www.wheelerhigh.com>. Reprinted with permission.

Appendix E Carl's Senior Project Proposal

Briefly describe the topic of your research (3–4 sentences).

I am researching the Baroque period, mainly Bach, his music, and his influence. I would probably focus on his development of the fugue. Also, the fact that several of his sons were composers will be a major part of the paper.

Why did you choose this topic?

I chose this topic because I have intense interest in music. I also like some of the songs of that time, and I would like to arrange songs in this style.

Have you had any previous experience(s) related to this topic? If so, to what degree?

No, I have not. I can transpose music to some degree.

What do you hope to gain from your research investigation?

I would like to learn how the Baroque period developed and how Bach influenced it.

How do you plan to demonstrate your topic through a project or product?

I intend to arrange Bach's *Tocatta and Fugue in D Minor* for a tuba-euphonium ensemble.

Appendix F Carl's Description of Product

Topic of Project : The Instrumental Music of Johann Sebastian Bach

What form will your product take?

computer disc	art work	community involvement
videotape	photography	portfolio
<u>audiotape</u>	model/construction	
charts, maps, graphs	other (explain)	

How does the product reflect your academic stretch?

I have never arranged any songs before.

What materials will you need?

Staff paper, audiotape, tubas, and euphoniums.

What, if any, expenses do you anticipate?

On the pieces of the original music that I have to use for arranging.

How much time do you estimate will be required to create this product?

About 20 hours.

Appendix G Excerpts From Carl's Senior Project

Why am I writing this paper?

Since my eighth-grade year in school, I have had an intense interest in music. During that year, I listened to every recording of orchestras, bands, and brass ensembles that I could get my hands on. My favorite recordings were albums of the Canadian Brass, a world-famous brass quintet. In the two albums that I bought, there were two songs arranged for the quintet that were originally written by Johann Sebastian Bach. The first was *Fugue in G Minor*, nicknamed "Little" for its comparison to the second work on the albums, *Tocatta and Fugue in D Minor*. Both of these pieces enthralled me, and I began looking for a way to play these songs on my tuba after a short time.

During my freshman year in high school, I traveled to a wind band concert at the State Clinic with our high school band director. On the way to the concert, the director showed me some brass quintet music that he had bought for the school. Most of the arrangements were Canadian Brass, and one of them was the same arrangement of *Tocatta and Fugue in D Minor* that was performed on the albums that I owned.

The discovery delighted me, and I immediately began running the tuba part through my head, fingering the notes, and humming the tune of the song. When we returned home, the director allowed me to take the tuba part home to work on it. At the time, however, I was

continued on the next page

Appendix G continued

unable to play the demanding technical aspect of the tuba part. I returned the piece to the director and never saw it again.

Over the next 2 years, I obtained several albums of various musical groups that played classical music. Many of the pieces that they played were originally written by Johann Sebastian Bach. Bach's works were my favorite pieces on these albums. A few of these compact discs had both *Fugue in G Minor* and *Tocatta and Fugue in D Minor* on them. One unique album featured the "Little" fugue being played by a tuba ensemble. It was one of the most beautiful songs that I have ever heard.

That account is why I am interested in the work of Johann Sebastian Bach. I feel that he is one of the greatest composers to have ever lived. I want to learn what I can about his music.

What do I already know?

All that I know of Bach's music is what I have learned from various people and compact disc inserts. Bach was one of the major developers of the fugue. He wrote many such pieces for the organ, such as *Fugue in G Minor* and *Tocatta and Fugue in D Minor*.

What I learned

Throughout my research, I have learned many new and useful ideas. Not only have I learned what I wanted to know about the instrumental music of Bach, but I have learned how to work with adversity in the schedules of other people, such as my mentor, or the tuba players that helped me record my arrangement of *Tocatta in D Minor*. I also learned to be patient when the resources I needed were not immediately available. In the end, I believe that the most important thing I learned is that a large-scale research project such as mine is not as difficult as it seems in the beginning.

Appendix H Examples of Senior Projects Completed by Gifted Students

Research	Product
Modern network administration	Implement an instant messaging system for local high school
Importance of music education in the public school system	Organize and produce a benefit concert
Childhood obesity	Compile a cookbook for children and teach a lesson on nutrition to an elementary class
Architectural designs and construction methods of late 19th-century and early 20th-century churches and how they differ from those in Europe	Restore two rooms at local church
Stock market	Develop and present a presentation to the high school faculty about the stock market and how it will impact teacher retirement funds and deferred compensation plans
Television broadcasting	Special report on senior projects for local television station
History of quantum mechanics	Create a new quantum algorithm
History of robotics	Make a robot
Advantages of Linux	Make a check-out system run on Linux
History of computer animation	Create a short 3-D animation
Glassblowing	Make a glass sculpture

Note. Adapted from personal communication with Patricia Bridges, May 29, 2003, and Joyce Taaffe, June 3, 2003.

Appendix I Process Skills Developed During the Creation of Products

Oral Communication Skills

Written Communication Skills

Creativity

Problem Solving

Higher Order Thinking Skills

Analysis
Synthesis
Evaluation

Organizational Skills

Planning
Record Keeping
Time Management

Author Note

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Appendix J Description of Service-Learning/ Community Action Project: NetDay

Two seniors gained permission to work collaboratively to complete their senior projects relating to computer technology. Ryan and Kelly (not students' real names), expressed interests in technology—Ryan in fiberoptic wiring and Kelly in computer graphics. After discussing their mutual interests in computers and discussing their ideas with the school district's technology coordinator and mentor to both students, Ryan and Kelly approached their teacher about the idea of NetDay, a practice gaining nationwide interest in which local businesses supply needed materials and community members donate their time to wiring schools for the Internet, a cost-effective practice that saves schools thousands of dollars and helps schools

provide up-to-date access to the Internet.

Ryan and Kelly gained approval to collaborate on this product-development portion of their senior project because of the extensive time commitment required to secure materials, gain school district approval, contact potential volunteers, design the installation plan, work with the community volunteers to implement the plan, and test the wiring. Through the process of developing and conducting their senior project, these students not only learned more about technology, but also enhanced their interpersonal and time-management skills. Furthermore, they worked alongside technology industry employees living in the community to design the wiring plan,

install the wiring, and evaluate the success of the efforts. The students' leadership skills were also enhanced through having to develop goals and objectives in carrying out their plan.

At the culmination of the experience, Ryan and Kelly presented a PowerPoint presentation to the panel of community judges that incorporated information about their research, including slides with pictures of the team installing wires and students and teachers using the Internet. They explained how the senior project experience had helped them grow not only in their knowledge of technology, but also as leaders. Through this senior project, the school district saved more than \$5,000 in materials and labor costs and fostered the growth of two gifted students.