

Chapter 3

Research Design and Methodology

Overview of this Research Project and the Rationale for Using a Qualitative Research Design

The primary focus of this study was to document the process of implementing portfolio assessment. I investigated the ways that portfolios and portfolio assessment were initially defined and implemented by science teachers at MVGS. During the 1995-1996 school year, teachers at MVGS began to explore the concept of portfolio assessment and to experiment with the uses of this alternative assessment tool. This study explored the viewpoints of three chemistry teachers and twelve students from the teachers' respective classes. The data collection focused on teacher and student definitions of portfolio assessment and its translation into practice in individual classrooms.

Hammersly and Atkinson (1983) maintain that qualitative research methods allow the researcher to directly participate in the daily lives of the participants. This type of research also allows the researcher to observe interactions, ask questions and listen (Hammersly and Atkinson, 1983). This type of methodology also allows the researcher to probe more deeply into the issue or topics being studied. My research questions were questions could best be answered using qualitative methodology.

Rationale for Conducting the Study at MVGS

The features of this school setting that made it appropriate for studying the transition into portfolio assessment include:

- 1) the school size,
- 2) the abundance of instructional resources, and
- 3) the time line for implementation of portfolio assessment.

The school was small. It had approximately 200 students and twelve faculty. The resources available for instruction were plentiful and the administration was supportive of the change.

The official science departmental implementation of portfolio use occurred in the fall of 1996. At this time, all faculty in the science department were using portfolios as a part of their student assessment.

The science team assessment package consisted of a number of items including multiple-choice tests, laboratory reports, quizzes, homework and portfolios. I observed the initial planning phase of the implementation in the fall of 1995 and spring of 1996 and also documented some of the pilot phases of the process.

Description of the School Setting

The mission statement of MVGS provides a good introduction to the school. The statement reads as follows:

The Mountain Valley Governor's School, dedicated to leadership in innovative, instructional practices and effective service to students and teachers, provides a unique environment in which individuals explore the interconnections between science, math, technology, and society and develop the necessary skills and perspectives to impact the needs of a constantly changing society.

Excerpts from an information brochure distributed to perspective students and their parents give more insight into MVGS. The first statement is taken from a section entitled "Purpose, Philosophy, and Program" :

One look at the Governor's School tells you it is different and distinctive. MVGS is a specialized regional public school for science, mathematics, and technology. It is an institutional change agent which is involved in improvement of science and mathematics teaching and learning for the entire Mountain Valley. The schedule, teacher-student relationships, organization, and course offerings focus on the special attributes and needs of the highly-motivated science and mathematics student. Studies by government, industry, and private educational foundations have pointed to the need for increased emphasis on science and mathematics education in the schools. The school systems in the Mountain Valley, in partnership with colleges, universities, and local industry have responded to the need in a cooperative, pace-setting fashion. It has become a model that has been replicated several times in [the state] and across the nation.

Course offerings at MVGS are distinctly different from courses offered at other regional high schools. Referring again to the above mentioned brochure, the courses offered at MVGS are configured differently. The curriculum places an emphasis on:

- (1) the connection that exists between and among various disciplines,
- (2) applications in real-world situations,
- (3) collaboration between and among students and faculty,
- (4) modeling of innovative approaches to learning,
- (5) integration of technology, and
- (6) sound foundational preparation.

Course enrollment for all students consists of one mathematics course, one science course, and one elective course each trimester, in addition to an entire year of Computer Applications and Technologies. During the Intersession, which occurs between the Thanksgiving and Winter holidays, each student focuses on one single research related elective course. This course assists students in completing projects that will be displayed at the annual Research Forum held in January of each year.

The physical space of the school is arranged to support the curriculum outlined above. The main building contains five classrooms that have laboratories, administrative offices, and associated work spaces. There is also a modular unit consisting of three mathematics classrooms located close to the main building and directly to the left of a technical school. A materials science classroom/laboratory used by MVGS is located in the technical school. A high school is located across a parking lot in front of and adjacent to the MVGS main building.

The main building is designed primarily for function and not for external visual appeal. It is utilitarian in design and has little landscaping or external decoration. The inside of the building, however, is another story entirely. The walls in the hallway are lined, directly below where the wall and ceiling meet, with enlarged photographs of past MVGS students who are actively engaged in the learning of science and mathematics. Students are depicted using computers, calculators, microscopes and other implements used by 'real' scientists and mathematicians.

As one enters the door, directly to your right, there is a white marker message board for the students. This board contains reminders of important dates, i.e., science fair competitions and national test days (SAT/ACT/CLEP). It also includes information about financial aid and scholarship opportunities. In addition to this general information, there are also individual messages for students from various staff and faculty members.

A glass-enclosed case hangs on the wall on the same side of the hall. It contains recent photographs of current students who attended the latest project forum. As you proceed a little further into the building there are prominently displayed orange and red poster boards with the names and colleges attended by school alumni, whose various academic awards are also displayed. A television monitor is mounted in the hallway which displays announcements for the school day. Reminders of important events are also advertised here. Along the hallway leading to the classrooms there is a pay telephone, a soft drink machine complete with an aluminum recycling receptacle and a coin-operated photocopier. Student lockers also line the hallway between the classrooms.

Description of the Students

MVGS primarily serves students in grades ten through twelve, although some students from one high school are enrolled as ninth graders. Mountain City schools and Davidson County schools provide transportation for their students that attend MVGS. All other students from the five other school systems are responsible for their own transportation and most students drive or ride with other students or are transported to school by their parents.

Students attend the school in one of two shifts. The morning shift runs from 8:15 a.m. to 11:00 a.m., and the afternoon shift runs from 12:15 p.m. to 2:35 p.m. Faculty meetings and lunch take place during the break between the two shifts. Students were always present during my observations of the middle block of time. Students attend their home schools when they are not at the governor's school and take their English, history, and foreign language classes there. Only math, science, and computer technology courses are taught at MVGS.

The students are selected to attend MVGS by their home school systems which pay tuition to MVGS on a per student basis. Students complete an application for admission to MVGS. The application, created by MVGS, see Appendix A, is submitted to the individual school systems and not to MVGS directly. This multi-page document includes:

- 1] an information sheet for applicants and parents,
- 2] a personal information sheet about the student,
- 3] a student position statement sheet,
- 4] a student profile sheet, and a
- 5] a teacher recommendation form.

Ethnic break-down of the 1996-97 population of students at MVGS is illustrated in Figure 1.

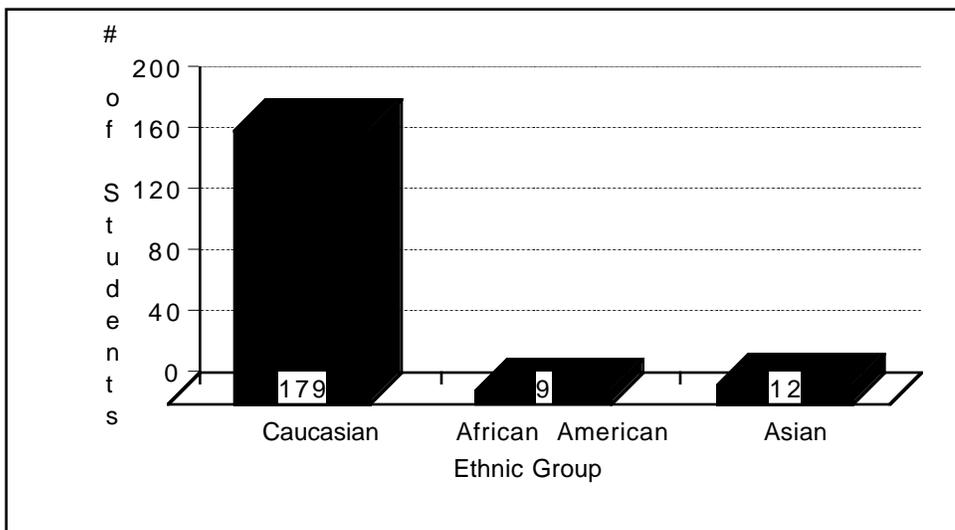


Figure 1. 1996-97 Ethnic breakdown of students at MVGS.

As for gender break down, there is little difference between the number of females and males served at the school. Figure 2 illustrates the gender breakdown.

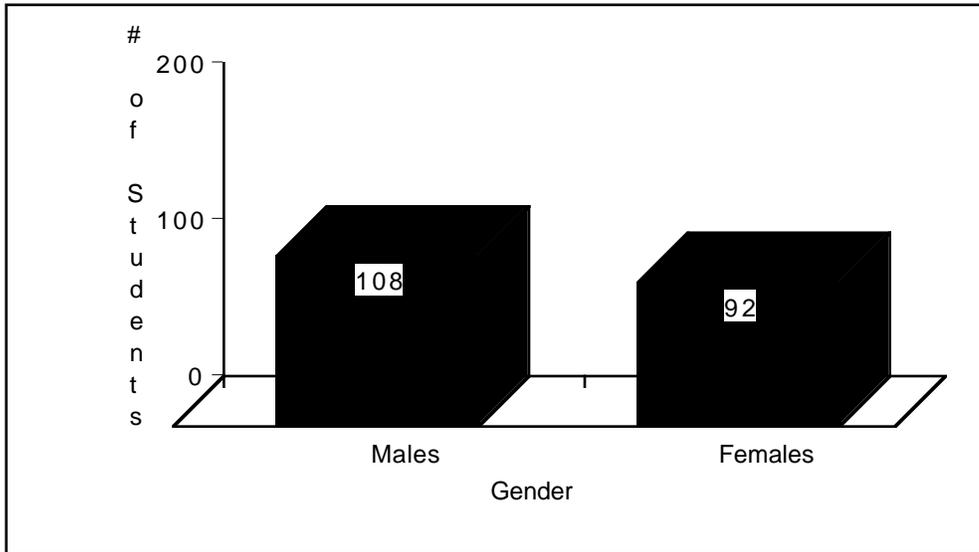


Figure 2. 1996-97 gender breakdown of students at MVGS.

Another question about MVGS students is where do they come from geographically? The graph denotes all counties sending students to MVGS. The 1996-97 class is representative of past years' enrollments, with the exception of Jackson County. This county generally has at least one student attending MVGS. Figure 3 displays enrollment by school system.

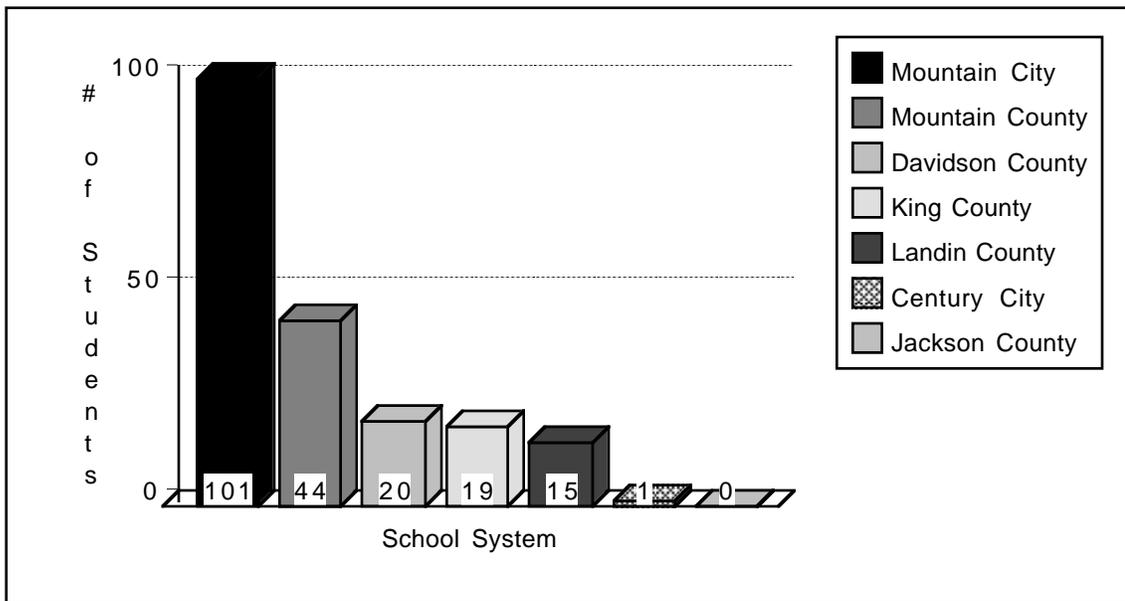


Figure 3. 1996-97 enrollment by school system at MVGS.

The structure of the school gives the students a great deal of freedom and flexibility. They do not abuse the fact that they are allowed many privileges that are denied to students at other schools. For example, they are allowed to store their lunches in the refrigerator in the teachers' workroom. They are allowed to move from the classrooms to get soft drinks from the machine and visit the bathroom virtually without a word spoken to their teachers. They are also allowed rather easy access to the telephone in the office or conference room even though a pay phone is located in the hallway for their use.

Description of the Faculty

The following quote was taken from an interview with Dr. Chris Mason, the director of MVGS. (All names used in this study are pseudonyms created to allow anonymity of all participants.) He is very complimentary and supportive of his staff.

Dr. Mason: [10 second pause] You know.....in a place like this you really have to recognize the knowledge, skill and professionalism of the staff itself. Uh, because they are good teachers, they are high achievers just like the kids.

This quote is a good introduction to the faculty at the school. The teachers here were hand selected by the director and are very motivated and hard working individuals. They were respected members of their profession prior to joining the staff of MVGS, as a general rule.

The science faculty are listed in Table 1 with their teaching assignments for the 1996-97 school year:

Table 1
Science Faculty Teaching Assignments for the 1996-97 School Year at MVGS

Teacher	Course
Marjorie Hansen	Governor's School Chemistry
Greg Barkley	Governor's School Chemistry & Contemporary

Cassandra Martin	Precalculus Governor's School Chemistry & Advanced Chemistry Topics
Kevin Jenkins	Biology
Lisa Robbins	Advanced Chemistry Topics, Governor's School Chemistry
Jeff Johnson	Physics

There are three females and three males on the team and five members of the science team are Caucasian, while one is African American. The team leader, Kevin Jenkins, has his Ph. D. Members of the science team are active in local and state science teacher organizations. They hold offices in these organizations and are respected members of their profession.

The age range of the science teachers is 25 to 50. This quote from Dr. Mason again shows the level of experience at the school:

Dr. Mason: Yeah, but you know what the interesting thing is if you look at the average teacher in this school, they have been at it for twenty plus years . . .

Recruiting Participants

While conducting the pilot study at MVGS, I became acquainted with the entire faculty at the school. I worked closely with three science teachers, the director of the school and the guidance counselor during the pilot study phase. Two of the three teacher pilot study participants, as well as the guidance counselor from the first year of the study, are no longer employed at MVGS.

The participants in this study were Greg Barkley, Marjorie Hansen and Cassandra Martin, three teachers of chemistry. Mr. Barkley has been teaching at MVGS for 12 years. Both Mrs. Hansen and Ms. Martin were new to the school this year. Mrs. Hansen was a new teacher who completed her student teaching last spring while I was her university supervisor. Ms. Martin had taught for two years prior to coming to MVGS at another governor's school in this state. Mr. Barkley has taught only at MVGS.

In addition to the teacher participants, twelve students were also selected as participants. The representative students were selected with respect to ethnicity, gender, and academic performance.

Data Collection Using Individual Interviews, Observations and Collected Documents

Data collection involving the teachers included qualitative in-depth interviews. These interviews, described by Kahn and Cannell in 1957 as “conversation with a purpose” provided information concerning teacher background, experience with portfolios, implementation of portfolios in classrooms, beliefs about portfolios and change in these beliefs and definitions over the trimester. I conducted two sets of interviews with each of the three teacher-participants. One interview was conducted in October. See Appendix B for the initial interview protocol/frames. The second interviews were conducted at the end of the trimester in late December and early January. See Appendix B for the final interview protocol/frame.

Data collection with the students was conducted via interviews and observations. The interview time line was similar to that of the teachers with the final interview occurring after the portfolios had been assessed and returned to the students in late November and early December.

Initial observation of teachers introducing portfolio assessment to their students were made in early to mid-September. Observations of teachers and students working on portfolios also were conducted. On the days when students were given part of the class time to work on portfolio I was present. Students often worked in small groups to select pieces for inclusion. They also used the computers in the classroom to create their reflections. Fieldnote accounts of all observations were recorded in the fieldnote journal. All instructions given by the teacher to the students were audio taped and transcribed. Some conversations between individual students were also audio taped and transcribed.

I used the research questions outlined in Chapter Four to help guide my observations. I found that definitional and implementation issues were corroborated via the observations. Using observations provided me

with the opportunity to observe behaviors and conversations relating to portfolios. These observation fieldnotes provided data used to triangulate the findings of this study.

Actual student portfolios, with attached teacher comments, were collected, photocopied and used as an additional source of data. These data were included with transcript and fieldnotes and analyzed as described below.

Analysis of the data began with the systematic indexing of all transcripts derived from interviews. Line by line subject indexes were created to assist in theme emergence. When themes or threads of commonality were identified, the data were coded using the emerged categories.

Introduction to Analyses

Data Collection.

This project started in the fall of 1994, when I visited the field site for the very first time for the supervision of student teachers. This activity and other professional tasks continued to bring me to the site. In the fall of 1995, I planned the pilot study while fulfilling the requirements of a graduate course entitled "Education and Anthropology." I conducted the interviews and observations that comprised the pilot study in conjunction with another graduate course entitled "Ethnographic Methods in Educational Research." I generated the research questions and a formal dissertation proposal based on information from data sources identified during the pilot study.

Silverman (1994) outlines four key types of data in a qualitative research project:

- 1] fieldnotes of observations,
- 2] documents/texts,
- 3] interview transcripts and,
- 4] audio-visual or audio recording of events which are used to create transcripts. The data for this dissertation study included all four of the types delineated by Silverman.

The following axioms of Naturalistic Inquiry outlined by Lincoln and Guba (1985) were employed during the analysis of the data:

- Realities are multiple, constructed and holistic.
- Knower and known are interactive and inseparable.
- Only time and context-bound hypotheses are possible.
- All entities are in a state of mutual simultaneous shaping, so that it is impossible to distinguish cause from effect.
- Inquiry is value bound.

Data Sources

Documents.

Silverman (1994) refers to texts and documents as “jumping- off points” for real analysis (p. 59). Written materials often provide me with “official” or “common sense” versions of social phenomena (Silverman, 1994, p. 59). The documents gathered for this study can be separated into three broad categories:

- 1] promotional/media/informational documents,
- 2] science department/teacher created documents, and
- 3] student created documents.

The first category, promotional/media/informational documents, contained information that helped set the contextual stage of this project. Examples of such data included a mass produced brochure used for student recruitment and a video tape designed for the same purpose. These documents helped me to develop a broader understanding of the research site and to capture this information for the purpose of creating thick descriptions of the site and its participants.

The second class of documents, science department/teacher created documents, contained various forms and texts produced by the teachers in the science department at MVGS. Examples of such documents included the student portfolio information sheet distributed to the students and the grading rubric used to assess the finished portfolios. Documents of this type helped me to explain the implementation of portfolio assessment at the site.

The remaining class of documents, student created documents, included photocopies of the chemistry portfolios created by the students

and also a Pluses/Minuses/Interesting Things (PMI) chart. This PMI chart was used at the end of the first trimester to allow the students the opportunity to articulate their ideas concerning portfolios. The data collected via the PMI charts verified the information collected during the student interviews. These charts provided another source for data triangulation.

Fieldnotes.

Bogdan and Biklen (1992) describe creating fieldnotes as the process of capturing a slice of life. That is to say, it is the researcher's best effort to capture objectively and record the details that occurred while observing at the research site. I used numerous visits to the field site to create fieldnote accounts of what was going on. The bulk of this class of data included fieldnote accounts of the teachers introducing portfolios to their students, students working on portfolios in their chemistry classes and fieldnotes of science department meetings. I also included in the fieldnote journal notes recorded about each interview detailing the specifics of the interview not captured via the audiotape.

Interview Transcripts.

I recorded each interview on audiotape and prepared word processed transcripts from the tapes. Transcripts, unlike fieldnotes, help the researcher overcome the tendency to "tidy up" the "messy features of natural conversation" (Silverman, 1994, p.117). These transcripts comprised the greatest amount of the data collected during this research project.

Trustworthiness

This study employed a number of strategies to establish trustworthiness and thus credibility. Lincoln and Guba (1985) delineate ten strategies to establish trustworthiness and these strategies were used in this study.

Prolonged Engagement

Building trust, learning the school culture and testing misinformation are cited by Lincoln and Guba (1985) as purposes for prolonged

engagement. I had been associated with MVGS for two and one half years. This extended period of time allowed me to establish my presence in the research site. It also allowed me to begin to understand the daily activities of the school and the roles of the faculty and staff at the school. I developed a strong rapport with the teachers, administrator and other staff members; they became comfortable with my presence in the school. The students at MVGS were used to having unfamiliar adults in their classrooms; so one more unrecognizable individual did not affect their daily activities.

Persistent Observation

Persistent observation serves to provide depth to the study (Lincoln & Guba, 1985). During these observations the key players, key concepts and important issues are identified. Initial site observations were made during the Spring Semester of 1996 when I conducted a pilot study. During this time, I began to observe the varying roles of the teachers and students in the school.

Observations were recorded during the duration of the data collection. I spent two to four days a week at the research site during the data collection phase of the study. Observational fieldnote accounts were recorded in a journal.

Triangulation

Triangulation refers to the use of different or multiple sources of data to verify the data (Silverman, 1994). I used individual interview transcripts from the three teacher participants and the twelve student participants. I also kept a fieldnote journal in which I recorded data during and after my observations. The use of documents such as teacher created handouts and copies of the student created portfolios with teacher comments were also collected as data sources. These varied sources provided multiple data sources for triangulation.

Peer Debriefing

Peer debriefing serves several purposes. Testing working hypotheses, finding alternative explanations, exploring issues of design,

and clarification are among the purposes outlined by Lincoln and Guba (1985). In order to utilize this strategy, I employed the assistance of numerous colleagues. Two of these colleagues were graduates of Virginia Tech in Curriculum and Instruction; the other person was a cultural anthropologist with no formal teacher education training. Each person met with me and discussed the data and emerging findings as analyses progressed.

Dr. Linda Fore and Dr. Charles Starkey were two of the primary people that served as sounding boards for me during this research study. They listened as I struggled to make sense of my data and offered insight when decisions concerning analyses of the data were made. Dr. Lawrence Hammar and Becky Nelson also played key roles in the peer debriefing process.

Member Checks

Lincoln and Guba (1985) highlight member checks as the most crucial technique for establishing credibility. This technique allows data, analytic categories, interpretations and conclusions to be tested by stake holding members. I used this technique during the research phase of the study. Transcripts were provided to all participants interviewed and they were allowed to check them for accuracy. Any areas where they believed needed to clarification were discussed during the next interview or were noted in the fieldnote journal.

There were only two occasions where a participant wanted to clarify a statement or point made during an interview. One student asked to revisit a topic addressed in the first interview. She remembered a previous experience with portfolio assessment and wanted to share this with me. Another student wanted to talk about her experience with portfolios the previous year in her science course at MVGS. She was able to find her portfolio from the year before and wanted to revisit the process of compiling it with me. She made these comments in her final interview.

Ideally, prior to the production of the final document participants should have access to the document so they can have the opportunity to respond to me and perhaps have me reconsider any erroneous interpretations. In this study this did not occur.

Referential Adequacy

Referential adequacy refers to materials that can be used to provide a representation of the context in which the data were collected. Many types of materials, such as videotapes, documents, and photographs can be collected to provide a holistic picture of the research site. I used publicity materials produced by the school which included photographs of students and other textual documents which depict life at MVGS.

Purposive Sampling

In contrast to traditional random sampling, purposive sampling helps to assure that a maximum range of specific information can be obtained from and about the context (Lincoln & Guba, 1985). In this study, the teacher participants were selected because they were willing participants in this study. Each participant was a chemistry teacher. The teacher participants and their teaching assignments are listed in Table 2.

Table 2
Teacher Participants and Their Teaching Assignments for the 1996-97 School Year at MVGS

Name	Course
Marjorie Hansen	Governor's School Chemistry
Greg Barkley	Governor's School Chemistry & Contemporary Precalculus
Cassandra Martin	Governor's School Chemistry & Advance Chemistry Topics

Selection of the student participants provided twelve student participants, as described below. Each teacher was asked for student volunteers and provided me with more names than needed and I made the final selection. I attempted to select a diverse group of students. The teachers were asked to recruit volunteers and to note the academic ability, gender, and ethnic group of each student. Academic ability was segregated into three groups based on the distribution of grades in the teachers

classroom. The top one-third of the students were identified as the high group, the middle one-third were identified as the middle group and the lower one-third were designated as the low group. One African American female, five Caucasian females, and six Caucasians males were selected as student participants. I made the final student selection making sure I had an equal number of males and females. The ethnic diversity represented in the school is minimal. There was only one African American volunteer and I selected her as a participant. The students selected included one male and one female for each of the categories described in Table 3.

 Table 3
Table Representing Academic Level and Number of Student Participants

Academic Ability	Governor's School Chemistry	Advanced Chemistry Topics
Low	2	2
Middle	2	2
High	2	2

 One student exercised the right to withdraw from the study following the initial interview and prior to the second interview. This student asked that none of the interview data collected be used in this study. In compliance with the consent form Appendix C, approved by the Virginia Tech Institution Review Board (IRB), I honored the student's withdrawal and completed the data collection with the remaining eleven students. Adding an additional student was not possible at this time due to the nature of the initial interviews. This student was a middle ability level white male in the Governor's School Chemistry group.

Audit Trail

The audit trail is established to demonstrate dependability (Lincoln & Guba, 1985). It is used to allow an external reviewer to make judgments about the products of the study. An organized accumulation of interview guides, notes, documents, note cards, peer debriefing notes and a reflexive journal can provide these evidences. In this study all sources of data were organized and dated, as well as cross referenced where appropriate to

assist an external reviewer in the event of an audit.

Reflexive Journal

The reflexive journal is a detailed description of all decisions made by the researcher concerning the study. This journal may be kept daily or weekly. In the beginning of the study I maintained a separate fieldnote journal and reflexive study journal. What I soon began to realize was that some contents belonged in both sources. I made the decision to keep one journal. My reflexive journal was kept in the same location as my fieldnotes and encompassed all decisions concerning the study.

I was fortunate enough to live approximately one hour from the research site. This hour of driving time provided me with time to re-listen to all interviews on my cassette player in my car. After listening to the interview for the second time, I often had questions or ideas that surfaced as I listened. I would write in my journal immediately after I got home addressing any ideas or concerns that I identified while re-listening to the interviews.

Any decision I made about the study and all details of events surrounding the study were recorded in my journal. The withdrawal of the student, the student and teacher review of transcripts, the collection of PMI charts and other relevant events were all noted in my journal. When I began to see patterns or themes in the data these were discussed and recorded in the journal. Each of the final themes are identified in Table 4 with their corresponding research question.

Table 4
Data Themes with Their Corresponding Research Questions

Data Theme	Corresponding Research Question(s)
Definition	1 & 4
Implementation	2
Reflection	6 & 7
Change	3 & 5
Value	6 & 7
History	2

Thick Description

Thick descriptions help provide the reader with information that assists in transferability (Lincoln & Guba, 1985). Transferability refers to the extent to which a study's findings can be applied to other contexts or with other respondents (Erlandson, Harris, Skipper, & Allen, 1993). All data should include thick descriptions that bring the reader into the context of the study and provide the reader with sufficient detail for understanding the context of the data. Fieldnotes were collected with special attention to detail. All reports written contained this rich information.

My Stance on Portfolio Assessment

I have always struggled with the issue of assessment. As a classroom teacher who taught high school biology for seven years, I constantly grappled with the issue of assessment. I graduated from a teacher education program that was grounded in behavioral psychology and my teacher education studies were deeply rooted in this theory. I was taught to write Mager-style measurable, instructional objectives and plan Madeline Hunter-style lessons. I was taught to create traditional style multiple choice, true/false, fill-in-the-blank and short answer tests. Upon entering my first classroom after graduation, I quickly realized how absurd it was to make statements like "The student will be able to . . ." on a lesson plan. My first teaching job was in an inner city high school and I realized that the best I could hope for on any given day was that the students "might" accomplish my objective for the day.

I wrote extensive lesson plans with measurable objectives. I taught these magnificently constructed plans and then gave my students traditional tests that were supposed to measure the knowledge they learned. I started to realize that many of my students did not perform well on these traditionally structured tests, although informal assessments suggested they understood what was being taught my class. Some of my students scored very well on these tests consistently while other students I taught showed no positive achievement on my tests.

To address my concern, I began to use more practical measures of assessment in an effort to have the students demonstrate what they had learned. For example, I would have the students demonstrate that they could successfully take another student's blood pressure or construct a wet mount of a specimen for viewing under a microscope.

I also had my students keep science notebooks which displayed all their work. I used these notebooks for assessment purposes by having my students compile a collection of everything we had accomplished during the given time period.

During my last year of public school teaching, I was a member of an interdisciplinary team on which I, along with a world history teacher and a world literature teacher, worked with the same one hundred students. This program allowed me the opportunity to talk to an English teacher about assessment during our common team planning period and she provided me with my first insight into portfolio assessment. Portfolios were becoming a part of the assessment of students in writing in this school during this time. I started to realize that maybe portfolios could be useful in science as well.

I was not aware of the literature written on portfolios. As a classroom teacher, I did not have the time to research the topic. I simply let my students select work from their notebooks and write me a letter or paper about what they learned each quarter. I did not call these notebooks and letters or papers portfolios. Portfolios during this time, to me, were only used by English teachers. Now, however, I believe that what my students created were the beginnings of portfolios. I quickly realized the benefit of having my students revisit their work. They were able to make statements like "I got a good grade on this" or "maybe I should have spent more time doing this." My students were beginning to look at their work in a different way. They were beginning to construct their ideas about what they had accomplished in high school biology. The next year I left the classroom and began graduate school.

During my first year of graduate school, I was presented with a theory about teaching and learning that helped me begin to make sense of my classroom practices and experiences. Reflections on my own teaching and the exploration of new ideas led me to constructivism. Fosnot (1996)

offers a good introduction of constructivism, as I interpret it: Constructivism is a theory about knowledge and learning; it describes both what “knowing” is and how one “comes to know.” Based on work in psychology, philosophy, and anthropology, the theory describes knowledge as temporary, developmental, nonobjective, internally constructed, and socially and culturally mediated.” (p. ix).

As I still struggle to make personal meaning of constructivism, I have begun to realize that it is a way of knowing. It is not simply one theory but contains a broad range of ideas and I believe that many of the ideas associated with constructivism have implications for both instruction and assessment.

As to how constructivism connects with learning, Driver and Leach (1993) state that learners are actively involved in the process of building their own knowledge about the world around them through physical experiences and social interactions. Thus, I believe that we as teachers must provide our students with opportunities to experience science and engage in social interactions that allow them to interpret their experiences. Using such teaching practices will help our learners to internalize and reshape or transform new information (Brooks and Brooks, 1993), thus allowing learning to occur. The challenge to us as educators then becomes how to assess this type of learning.

The National Commission on Testing and Public Policy (1990) and The National Research Council (1996) recommend that assessment be an ongoing process that helps emphasize what students know, rather than a series of tests that we give to help identify what our students do not know (Powell, 1993). Portfolios offer a means of alternative assessment that can provide continuous and dynamic processing, multi-dimensional measures, collaboration between the student and the teacher, and authenticity as it relates to the daily life of the student (Lines, 1994).

Assessment has traditionally been characterized by the types of instruments used for standardized testing. These tests, often multiple-choice, true/false and fill-in-the-blank in nature, are used to evaluate students and often, curriculum. This form of assessment also serves to determine the individual academic fate of students, as well as to compare

individual students. Standardized tests are not structured to provide comprehensive, in-depth assessment of students' construction of meaning (Templin, 1995). The content validity of these tests indicates whether the tests accurately reflect the knowledge, skills, and abilities they are intended to measure. Knowing something is more than just receiving the material; a knower must interpret the new material and relate it to other knowledge she already has (Herman, 1992).

The current reform of science education involves the implementation of varied forms of instruction. With these modifications in instructional practice, different measures of assessment will evolve with the curriculum (Baxter, Shavelson, Goldman & Pine, 1992). Presently, many cognitive psychologists are advocating the use of assessment practices that are reflective, constructive, and self-regulated (Herman, 1992). Portfolios offer an alternative form of assessment that addresses these criteria.

Portfolios are designed to provide students with opportunities to reflect, thus relating to one tenet of constructivism. Graham (1993) states that this reflection provides opportunities for students to critically examine the experiences and products of the portfolio.

I believe that portfolios are also constructive and self-regulated in nature. Students select pieces which they feel represent the criteria outlined by the teacher. The student is often given control over items to be included in the portfolio. Thus the portfolio is regulated, in some sense, by the student.

Portfolio implementation is often accompanied by student/teacher portfolio conferences. Graves (1976) defines the purpose of such a conference by stating that during this time the teacher should solicit information from the students rather than issue directives about errors on work included in the portfolio. Many researchers (i.e., Calkins, 1983, 1986, 1991; Graves, 1983; Milliken, 1992; Russell, 1983; Smith, 1992; Walker & Elias, 1987) suggest that conferences encourage and teach students to reflect critically on their written work. Researchers that have taken into account the constructivist roles of teachers and students reveal the importance of conversation in the conferencing process. Such researchers suggest that both teachers and students are learners during the process (Graves, 1979, 1983; Sperling, 1990; Tobin, 1990; Walker & Elias, 1987).

Thus conferences allow students the opportunity to be actively participate in their own learning and gives me as a teacher an insight into the child as a learner.

I believe portfolios offer an assessment tool which allows educators to evaluate students in a manner that is consistent with the underlying principles of constructivism. These principles include: reflection, self-regulation, and dynamism. Portfolios satisfy the criteria of being reflective with the use of student/teacher conferences. Self-regulation is achieved when students are given latitude in what is included in the portfolio. Portfolios are also dynamic in nature, as the students' knowledge changes so does the content of the portfolio.

It was not until I entered graduate school and began to search for a dissertation topic that I revisited the idea of portfolio assessment. My interest in student assessment and the current revelation in authentic student assessment led me to portfolio assessment as a dissertation topic. I was unsure what to study concerning portfolios but I was sure that I wanted to concentrate on that topic.

As a part of my graduate assistantship, I supervised science student teachers. This job placed me in a position that permitted me to locate a field site for my research. Details of my association with MVGS are described in the last section of this chapter.

Teachers' Prior Experience with Portfolio Assessment

Each of the teacher participants brought different levels of portfolio experience to this research study.

Mr. Barkley offered this summation of his prior experience:

Barkley: Yes, I started these in science last year uh, as kind of an experiment . . . and uh, this is the way I had done it and they liked it so they [the science team] just adopted it.

Weaver: How long have you been using them with math?

Barkley: about 5 years

Weaver: Is that because the Governor's School, in general, has been using them for five years or just you?

Barkley: Well, I think just me for five years. I think the math department actually . . . started doing it as a total

department about two or three years ago.

Weaver: What made you decide to start using portfolios?

Barkley: I attended a workshop, Mountain Valley Council of Math Teachers, and we talked about it.

Mrs. Hansen offered this account of her limited prior experiences:
The one experience I had with portfolios was during student teaching. We had to do a portfolio. That was the only experience I had . . . It was a professional portfolio and also so we could really gain some insight into what we had been doing that semester. So we also kind of used it as a final exam. It was also, you know, an assessment just within the class.

Ms. Martin's experience is summarized in this excerpt:
. . . and I said well, I've used them as a student but in grade school, for perhaps art or maybe an English class but I never used them in college and I never have used them as part of my curriculum as a teacher.

In summary, all three teacher participants had some knowledge of and experience with portfolios. Mr. Barkley had more experience than either Mrs. Hansen or Ms. Martin.

Like the teacher participants all student participants had prior portfolio experiences. One student, who was home schooled, compiled a collection of his work similar to a portfolio, although he did not officially identify this collection as a portfolio. These selected excerpts from student transcripts demonstrate prior portfolio experience:

Student #1 offered:

Um, in my computer class in middle school, I basically had a portfolio but it was just like all of my work . . . like all my computer documents, my spreadsheets . . . Um, yes in um in my English class a few years ago I used a portfolio and . . .

Student #2 stated:

. . . in eighth grade we had writing portfolios where, for our English class all year long we would just have three days a week would be writing and three days a week would be

reading and so we wrote just a bunch of piec[es] . . . stories and papers and what ever and we just keep a writing folder . . . I think in math we did it in eighth grade or so and then in art last year

Student #3 recapped her prior experiences:

Um, just like writing portfolios. I did a little bit of writing for English . . . Well we just put like, like in 7th grade we put like, the concept the whole reading and writing so on certain days we just wrote the whole class and other days we just read and stuff and we chose, like I don't know how many just a few different stories and put them in a portfolio.

All Advance Chemistry Topics students had prior experience with portfolios at MVGS. Their account of prior portfolio usage at MVGS in science is discussed in Chapter Four of this document.

How I Became Associated with MVGS

In the fall trimester of 1994, I supervised a student teacher who was spending half of her field experience at MVGS and the other half at a high school adjacent to the magnet school.

As I visited MVGS, I became acquainted with the faculty and the Director. Casual conversations with both faculty and the director led to a better understanding of MVGS and its purpose. Through my association with the school, I started to become involved in other activities at the school. I was asked to judge a student project forum in January of 1996. When MVGS's Aquatic Ecosystems teacher became ill suddenly, I was asked to supervise an overnight field trip to a marine science museum and lead a boat trip on the ocean and an inlet waterway. This trip allowed me to become familiar with school's curriculum and become better associated with students from the school.

Whenever I supervised student teachers at nearby schools, I stopped in at MVGS. Sometimes I planned my observations of my student teachers to allow me time to eat lunch with members of the faculty. Sometimes I went early and had a cup of coffee with the secretary or the Director. Other times I just stopped in and spoke to several people, just to make my presence known. I also taught in a middle school enrichment program

housed at MVGS, for three consecutive summers. These experiences provided me with opportunities to become a part, however superficial, of this specialty school.