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A comprehensive description and critical analysis of portfolio assessment

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A Comprehensive Description and Critical Analysis of Portfolio Assessment

By
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Abstract

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The purpose of this study is to provide a comprehensive description of portfolio assessment and analyze critically the use of portfolios for student assessment at the high school level with specific application to the mathematics content area.

A portfolio is a purposeful collection of student work that demonstrates their learning experiences, knowledge, applications and development over time. There are many variations of portfolio assessment depending upon the specific purpose of compiling the portfolio.

Portfolio assessment is a new trend in the area of student assessment that will address the need for an alternative to traditional pencil and paper testing procedures. The use of portfolios allows for the creativity of each individual student, maintains their diversity, allows them to take control of their learning and encourages students to become self-directed learners. Student narratives should also be included in each portfolio describing how they produced the contents and what they learned about themselves in the process .

New mathematics curriculum standards as established by the National Council of Teachers of Mathematics (NCTM) can not be assessed through traditional testing procedures. Experts conclude portfolios are a favorable method to assess these standards.

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CHAPTER 1

Introduction to the Study

Introduction

The word "portfolio" may summon the idea of a large black leather case containing an artists' collection of work. The word "portfolio" has been slightly adapted to meet the needs of educators. Student portfolios contain a variety of items that demonstrate what students can do rather than focus on mistakes (Hamm & Adams, 1991).

Using portfolios to assess and evaluate students has been a recent trend in education. This study provides the reader with ample discussion of portfolio assessment, theories, practices as well as different types of portfolios to meet various purposes.

Statement of the Problem

The purpose of this study is to provide a comprehensive description of portfolio assessment and analyze critically the use of portfolios for student assessment at the high school level with specific application to the mathematics content area.

Significance of the Problem

Educators have been dissatisfied with the multiple choice standardized tests because they do not provide a true picture of the students' ability and knowledge (Black, 1993). There has been a shift away from relying on a single test toward evidences gathered from

many sources including a teacher's professional judgement (NCTM, 1995). Portfolio assessment is a new trend in the area of student assessment that will address the need for an alternative to traditional pencil and paper testing procedures.

Although individual teachers have been using portfolio assessment in their own classrooms, there have been few districts and states that have implemented portfolio assessment on a large scale basis, thus there is a limited amount of research and literature. There are very few comprehensive descriptions of the theory, purposes, methods and applications of portfolio assessment. Schools who are planning to implement portfolio assessment need guidance for it to be successful and effective.

The new curriculum standards for the various content areas can not be assessed through traditional pencil and paper testing procedures. Traditional teaching and testing focuses on the verbal/ liguistic and logical/mathematical intelligences as described by Gardner's Seven Intelligences Scale (Burke et al., 1994). Students whose learning is dominant in any of the five other areas don't get an equitable chance to demonstrate mastry. Portfolios have been an increasingly popular alternative that take multiple intelligences into consideration. Portfolio assessment has been used by a few schools as an alternative that would address new curriculum standards and multiple intelligences.

Limitations

This study is limited to the information available in the Southern New Jersey area through the Savitz Library of Rowan College, Glassboro, New Jersey and the ERIC Document Reproduction Service. There have been few districts or states that have implemented portfolio assessment on a large scale basis, thus there is a limited amout of research and literature.

Definitions of Terms

Assessment refers to the process of gathering evidence about a student's knowledge, the ability to apply their knowledge to real situations focusing on what a student can do rather than what they can not do (NCTM, 1995).

Evaluation is the process of decision making and providing feedback to the learners to help them grow (Wasserman, 1991). Evaluations are based on the careful review of assessment information.

A portfolio is "a systematic and organized collection of evidence used by the teacher and student to monitor growth of the student's knowledge, skills, and attitudes in a specific subject area" (Vavrus, 1990). Contents may include but not limited to the following: tests, simulations, interviews, cooperative works, projects, videos and photographs, performances, observation checklists, logs and journals, student self-assessments, computer programs, peer evaluations, musical pieces, graphic organizers and art work (Burke et

al., 1994). The process by which these items are physically organized or contained may vary. Some educators have chosen to assemble items in a box while others find that a binder style notebook more effectively meets their needs; however, each student has their own portfolio.

Portfolio assessment describes the use of portfolios to contain the items collected for the purpose of assessment. There are many variations of portfolio assessment. The portfolio may be used to represent the progress made by an individual student during a specific length of time, such as one week, month or year. It could also be limited to a single content area such as mathematics achievement. Portfolios may even be used to assess student achievement for a particular unit such as percents. Student narratives should also be included in each portfolio describing how they produced the contents and what they learned about themselves in the process (Paulson & Paulson, 1991).

Authentic assessment describes real tasks that require students to perform and/or produce knowledge rather than reproduce information others have discovered (Newman cited in Stefonek, 1991). Characteristics of these tasks include the following: transfer into life applications, higher-order thinking, multiple means rather than solely pencil and paper tasks, and integration of knowledge across multiple content areas.

Multiple Intelligences theory developed by Howard Gardner maintains that intelligence can be measured in any of seven various

areas. These include the following: Logical/Mathematical; Visual/Spatial; Verbal/Linguistic; Interpersonal; Musical/Rhythmic; Intrapersonal; and Bodily/Kinesthetic (Burke et al., 1994).

Procedures

This study will include a comprehensive description of portfolio assessment. Included will be a description of portfolios, reasons to use them for assessment, various types and purposes of portfolios, artifacts included in a portfolio, management, and scoring.

Steps to implementing a portfolio assessment system in the classroom will be described focusing on the many different areas and concerns that may be overlooked by those not familiar with this assessment technique.

Conclusions will be based on the related research and scholarly literature. Recommendations for specific application to the mathematics content area will be made. An outline for the use of portfolios to document individual student mastry of specific skills and curriculum standards will also be included.

CHAPTER 2

Review of Related Literature

Introduction

Educators have been dissatisfied with the multiple choice standardized tests because they do not provide a true picture of the students' ability and knowledge (Black, 1993). There has been a shift away from relying on a single test toward evidences gathered from many sources including a teacher's professional judgement (NCTM, 1995). Portfolio assessment is a new trend in the area of student assessment that will address the need for an alternative to traditional pencil and paper testing procedures. Portfolio assessment has been used in schools as an alternative that would address new curriculum standards. In this chapter, literature in the field of student assessment is reviewed. A comprehensive description of the theory, benefits, and applications of portfolio assessment will be provided.

Review of Related Literature

A portfolio is "a systematic and organized collection of evidence used by the teacher and student to monitor growth of the student's knowledge, skills, and attitudes in a specific subject area" (Vavrus, 1990, p. 48). Contents may include but not limited to the following: tests, simulations, interviews, cooperative works, projects, videos and photographs, performances, observation checklists, logs and journals, student self-assessments, computer

programs, peer evaluations, musical pieces, graphic organizers and artwork (Burke et al., 1994, p. viii). The process by which these items are physically organized or contained may vary. Some educators have chosen to assemble items in a box while others find that a binder style notebook more effectively meets their needs; however, each student must have their own portfolio.

Portfolio entries should demonstrate the use of a variety of assessment tools. The National Council of Teachers of Mathematics (NCTM) maintains that student achievement should be assessed through multiple means. "A shift toward using multiple and complex assessment tools such as performance tasks, projects, writing assignments, oral demonstrations, and portfolios, and away from sole reliance on answers to brief questions on quizzes and chapter tests" (NCTM ,1995, p 29).

A realistic simulation of using mathematics in real life situations provides a good entry in a portfolio. To document this simulation, the teacher could use a video tape or anecdotal report describing in detail the student simulation. Consider a lesson taught at the elementary school level on money and making change. A simulation to assess mastry of these skills could be to set up a pretend grocery store. The teacher could set up empty boxes of popular foods labeled with the cost of the item. Students, supplied with pretend money, could enter the "store" and make choices on what they would like to purchase. The student "cashier" totals the purchases and makes change. The simulation provides decision making

opportunities for both the student consumer and the student cashier.

On the secondary level, a simulated investment account can be maintained. Students could select companies from the financial section of the newspaper and make imaginary investments. Students follow the company and make decisions based on the rise and fall of the stock market. Such an experience provides the student with real life experiences and provides the teacher feedback on the mastry of skills.

Interviewing may be used by the teacher and student in a variety of ways. The teacher can interview a student to determine areas in which he or she is having difficulty with the intention of providing remediation. The teacher can gain insight to the student's mathematical disposition, communication skills, reflections on different approaches and solutions to problems and mathematical connections to other subject areas. Written notes or a cassette recording of an teacher-student interview may be included in a portfolio (Lamme & Hysmith, 1991).

Cooperative learning activities may be documented through teacher checklists, student checklists or an anecdotal writing. Group projects or performances can be included in a student portfolio.

Projects of various types may be included in a portfolio. If the project is not in written form and is too cumbersome to save, it may be documented through photographs (Kentucky Teacher's Guide, 1994).

Both videos and photographs depicting the student actively engaged in the learning process may be included in a portfolio. Videos

or photographs may be used to document projects that are too large to be stored. Videos of cooperative learning activities, simulations, performances and interviews are some examples that would enhance student portfolios.

Portfolios may also include performances by the student. Examples of such would include plays, recitations, teaching a lesson to their peers or to another age group. Such performances may be recorded on video, audio cassette or through an anecdotal report by the teacher or student.

Checklists provide for rating of specific indicators. These are either in the form of numeric rating or descriptions such as frequently, sometimes, or seldom. Students or teachers can rate specific criteria by checking the appropriate response (Lamme & Hysmith, 1991; Burke et al., 1994). For one example of an observation checklist, please refer to appendix A.

Journals are versatile writing assignments that reveal student thinking and reasoning (Gordon & MacInnis, 1993). The personal nature of a journal allows the student to write to the teacher without the fear of criticism from others. Journal writings may also indicate if students are having difficulty mastering a specific skill. Teachers provide a written response to the writing; however, it is not evaluated as a finished product. Some teachers use the journal writing as a dialouge between themselves and each student (Gordon & MacInnis, 1993).

"An important goal of the evaluative process is to shift the locus

of evaluation from teachers to learners, so that learners become more informed self-evaluators. Teachers who consistently work to shift the locus of evaluation from teacher to student enable learners to become their own diagnosticians" (Wasserman, 1991, p. 93). Students who learn to be self evaluators will become autonomous learners (Lamme & Hysmith, 1991).

The use of various commercial software packages in the classroom provide the student opportunity to experience mathematics in different ways. Some software packages provide the student with motivational drill and practice while others offer dynamic decision making opportunities that could not be carried out in a book or with pencil and paper. Teachers who are proficient in computer programming can write their own programs for their students to use. Computer programs can be given to the students to input into the computer and then altered to meet the needs of various situations (Hamm & Adams, 1991).

Creative musical pieces, written or performed, give portfolios a broader dimension. The teacher should encourage students to demonstrate learning through a variety of mediums including the musical intelligence as described by Howard Gardner (Burke et al., 1994).

Graphic organizers can show connections to learning and the relationships between various components of the facts and skills. It is good to include such items in a portfolio. Students who are dominant in the visual/spatial intelligence will be able to excell when

given the opportunity to express themselves visually (Burke et al., 1994).

Art work or photographs that document student works can demonstrate learning and should be included in the portfolio (Hamm & Adams, 1991).

Many experts maintain that traditional pencil and paper tests and essays should not be eliminated from the assessment process. These items do serve a valuable purpose, and samples of such should be included in the student portfolio (Hamm & Adams, 1991; Burke et al., 1994). However, others in the field have differing opinions. Morton (1991) states that tests, workbook pages and other graded daily assignments should not be included in a portfolio (p. 3).

Those who are considering the use of portfolios in the classroom are sometimes apprehensive because of the logistical problems. One must consider storage of the portfolios and the time needed to assemble and evaluate the portfolios. However, the educational benefits of using portfolios far outweigh the logistical problems (Burke et al., 1994).

By performing the task of assembling a portfolio, representing their efforts over a length of time, students will be encouraged to take charge of their own learning (Paulson et al., 1991).

There are many benefits to implementing a portfolio system of assessment. The valuable feedback from student writing in the portfolio will give teachers insight into their students' growth (Paulson et al., 1991). Additionally, a portfolio compiled over the

course of one school year will show change and growth providing continuity from one year to the next (Vavrus, 1990). Another benefit is student writing and artifacts in the portfolio will give teachers powerful insight into student achievement, knowledge, and understanding (Hamm & Adams, 1991). Maintaining a portfolio will help students become aware of their own learning history (Hamm & Adams, 1991). Maintaining student portfolios will help teachers assemble works that reflect student achievement on district goals (Frazier & Paulson, 1992). Lastly, the use of portfolios will give students opportunities to demonstrate their knowledge and understanding in a variety of ways (NCTM, 1995).

Students will benefit from the proper implementation of portfolios for assessment. A single test or quiz indicates only what the student can communicate at the given moment it is being administered. Portfolios, on the other hand, show the learning process over time. Evaluators can see in a variety of ways a more accurate understanding of a student's abilities and development (Black, 1993).

By implementing a portfolio system the teacher, or reviewer of the portfolio, can see how the student has progressed over time. Consider a student who begins the school year not knowing how to accurately calculate percentages. The early entries in the portfolio show no knowledge of the concept by largely incorrect responses. Entries found in the middle of the portfolio show a better understanding of the concept, but the student is still making errors on some of the problems. The end of the portfolio indicates mastery of

the concept with accurate calculation of the problems.

The student reflections and journal writings are also a valuable window into the self-esteem of the student. Frequently, a student's sucess or failure in the classroom will positively or negatively effect the way they feel about themselves. By focusing on the written emotions, the teacher will be able to accurately determine if the student needs extra encouragement or support. It can be determined if the student's self-esteem has improved over the time the particular portfolio was maintained. The teacher can get feedback on a regular basis by reading the subsequent journal and reflection writings to determine if the encouragement is working to help the student.

The National Council of Teachers of Mathematics (NCTM) Content Standards include demonstrating a positive mathematical disposition indicated by the following: motivation, curiosity, perseverence, risk taking, flexibility, self-responsibility, and self-confidence (NCTM, 1991). To document the mastry of a positive mathematical disposition, teachers cannot turn to a test item response (NCTM, 1991).

The student journal writings and reflections on individual artifacts in the portfolio are extremely valuable because they are a window to the attitudes and appreciation a student maintains (Black, 1993). The student's disposition can be determined by their expressed feelings in the form of a written reflection or journal entry. Mathematical disposition may also be measured through teacher observation checklists, another item that may be part of a portfolio

(NCTM, 1991). Consider a student who entered high school believing strongly that mathematics is useless and has no application to everyday life. Such an attitude can be measured from early entries in the portfolio. As the year progresses, artifacts in the portfolio illustrate the student participating in a variety of activities or situations where mathematics has direct application to the lives of real people. Gradually the change in the student's attitude is observed through their written reflections, journal entries or other items found in their portfolio (NCTM, 1994).

Demonstrating that learning has taken place cannot be limited to paper and pencil tests. The portfolio should contain a variety of items, thus widening the scope of its documentation of the whole student providing for a more accurate assessment (NCTM, 1995).

It is reasonable to believe that a student may not be able to write about the classifications of quadrilaterals on a test, yet be able to illustrate the differences and similarities in the form of a poster or graphic organizer. The portfolio allows for creativity in student learning and expression of ideas (Hamm & Adams, 1991).

The National Council of Teachers of Mathematics (NCTM) has established goals and standards as a guideline for teachers. In addition to developiong a positive mathematics disposition, the goals include the following: growth in mathematical understanding, mathematical reasoning in a variety of mathematical topics, connecting mathematical ideas to other subjects and real-world situations, group problem solving, and the use of technology (NCTM,

1991). "The (portfolio) exemplifies the goals of the NCTM Evaluation Standards and shows much more than will a single test" (NCTM, 1991). Also provided are examples of artifacts for the portfolio that give evidence of meeting the goals. For a comprehensive list of activities or assignments that will evidence these goals, please refer to appendix B.

A common purpose of the student portfolio is to assemble and organize student work for the purpose of assessment and evaluation (NCTM, 1991). The portfolio can easily be adapted to meet the specific needs of the teacher. Using a portfolio allows for much more than justs tests and quizzes. The contents of a portfolio vary from projects, performances, cooperative activities to journals and checklists.

Portfolios can also be used to improve the curriculum and teaching methods (Black, 1993) and for the purpose of evaluating teaching style or teaching methods (Wolf, 1991). Teachers see on a regular basis the effects of their teaching on the students. Through student feedback, the teacher can adapt what is being taught or how it is being taught (Lamme & Hysmith, 1991). Through the reflections and journals, teachers can determine what methods of instruction the students prefer and what skills they have not mastered. Monitoring of student portfolios will encourage the teacher to continually use a variety of teaching methods and provide diverse opportunities for the students to demonstrate learning (NCTM, 1995). By observing student sucess and reading enthusiastic reflections, journals, and student

self-evaluations, teachers will become empowered to continue using the teaching styles that maximize student learning (Black, 1990).

Another benefit of using portfolio assessment is students will learn organizational skills. They will learn to systematically place entries in the proper portfolio format. Teachers need to teach a method of organization, because some students will never pick it up on their own (Sanborn & Sanborn, 1994). By learning organization skills, students will earn better grades in other classes. Students also develop a personal satisfaction from their efforts that will extend throughout the entire school year (Sanborn & Sanborn, 1994).

There are many different types of portfolios that may be implemented. These may be divided into the following three categories: personal, professional or academic.

In addition to student assessment portfolios a personal portfolio may be constucted of artifacts relating to the student's hobbies, activities, talents, friends and other personal achievements and goals (Burke et al., 1994). The personal portfolio may be in written form and contain photographs, newspaper clippings, cards or memorabilia.

Individuals may also compile professional portfolios. These will serve to document academic and vocational training and experience. The focus can be in various areas including: college admissions portfolios, college scholarship portfolios, employability, and performance review portfolios (Burke et al., 1994).

The academic portfolio illustrates what the student has accomplished relating to learning. The teacher can implement the

portfolio in many different ways. In the "Graded Portfolio", contents may be graded, ungraded or a combination of graded and ungraded. Items collectively may receive a single portfolio score determined by predetermined criteria and a scoring rubric (Burke et al., 1994). The "Integrated Portfolio" illustrates the connections between various content area (Burke et al., 1994). "Cooperative Group Portfolios" demonstrate the power of a cooperative group focusing on the various strengths, abilities and development of interpersonal skills (Burke et al., 1994). A portfolio that focuses on growth over a few consecutive years is a "Multi-Year Portfolio" (Burke et al., 1994). Work from several school years arranged chronologically demonstrates the growth taken place over a few years. A "Multiple Intelligences Portfolio" develops a specific topic using activities or assessments from each of Gardner's seven intelligences (Burke et al., 1994). See appendix C for examples of multiple intelligence activities and assessments. Portfolios can be assembled to represent a class as a whole. Items that may be part of the "Class Portfolio" include the following: class picture, motto, and song; class predictions; photographs and videos of activities, trips, assemblies, guest speakers and performances; class poems, stories and profiles (Burke et al., 1994). Such a portfolio may be helpful to a new student entering the class by documenting what has been done earlier in the year. A portfolio may be specifically designated to document intelligent behavior (Burke et al., 1994). "Teachers who seek to promote intelligent and socially responsible behaviors use portfolios to focus

on evidence of persistence, empathetic listening, flexibility in thinking, metacognitive awareness, problem posing, and problem solving" (Burke et al., 1994, p. 73).

Some teachers have chosen to implement a two portfolio system of academic assessment (NCTM, 1991). One portfolio is the "work" portfolio containing all of the student's work for a period of time, usually two to three weeks. At the end of the prescribed time period, the work is reviewed and some pieces are revised. Selected items are then placed into the assessment portfolio. Those chosen for the assessment portfolio have met certain criteria set by the teacher. As pieces are selected for the assessment portfolio, reflections are written about each piece indicating answers to a writing prompt such as why they chose it, how their thinking has developed or what they learned from the assignment (NCTM, 1991). Many teachers have used Post-It Notes for students to write reflection so as to not permanently adhere to the artifact (Burke et al., 1994).

Storing the portfolios is a common concern for those who are considering implementing portfolio assessment (Burke et al., 1994). Frequent concerns include containing the portfolio entries and storing the portfolios. Items for the portfolio may be collected in a box, plastic crate, accordian file, hanging file folder, notebook or whatever is convenient for the specific teacher's needs (Burke et al., 1994). A stand up cereal box may also be used to hold student work before it is reviewed and pieces are selected for the assessment portfolio (Burke et al., 1994). Portfolios can be stored in the classroom or media

center. Older students may transport the portfolios to and from school rather than storing them in the classroom.

Prior to implementation, the teacher must clearly establish the purpose of the portfolio and the type of portfolio to be maintained. Once determined, the teacher must decide what items should be selected for the assessment portfolio, how many items should be selected, and who should select the items from the numerous artifacts in the working portfolio. The selection process should be driven by specific criteria and standards (Burke et al., 1994).

Selection from the various artifacts in the working portfolio should be based on the following: content area learning, the learning experience or process, multiple assessment means and multiple intelligences of the student (Burke et al., 1994).

Items that demonstrate mastry of specific content area skills should be included in the assessment portfolio. The format of the artifacts can be projects, performances, formal testing or any of the various means of assessment previously described (Burke et al., 1994).

Items that represent the learning process skills, such as communication with others, writing, problem solving, decision making, and higher order thinking skills, should be included. In such artifacts, the content is secondary because the focus is on the process rather than the product (Burke et al., 1994).

The multiple intelligence theory developed by Gardner maintains that student intelligence can be measured in seven different areas. These include the following: Logical/Mathematical; Visual/Spatial;

Verbal/Linguistic; Interpersonal; Musical/Rhythmic; Intrapersonal; and Bodily/Kinesthetic (Burke et al., 1994). A portfolio should contain artifacts that demonstrate the student's abilities in various ways. Traditional testing concentrates on the logical/mathematical and the verbal/linguistic abilities of the student. A student that is dominant in any of the other areas would not have a chance to excell if the teacher did not provide diverse ways of learning and expressing what has been mastered. For this reason, portfolio artifact selections should not be excessively dominated by any area. For example, the assessment portfolio should not be made solely from written pieces. Similarly it should not be overloaded with artwork or musical pieces. It is good to provide for a variety of assessment means (NCTM, 1991). The portfolio may also contain rough drafts of an essay as well as the final product. By including both of these papers, it can be determined how well the student edits their work and checks for accuracy.

Depending on the purpose of the portfolio, items in the assessment portfolio may be selected by different people. The teacher must decide in advance who is to make the selections and what criteria are to be followed. Options include the following: student-selected artifacts, teacher-selected artifacts, teacher and student selected artifacts, peer-selected artifacts, and artifacts selected by parents or significant others. The teacher should determine how many of the artifacts will be selected by each of the persons described.

Burke, Fogarty, and Belgrad (1994, p. xi) have summarized the portfolio process:

1. Project the purposes and types of portfolios.
2. Collect and organize artifacts over time.
3. Select key artifacts based on criteria.
4. Interject personality through signature pieces.
5. Reflect metacognitively on each item.
6. Inspect to self-assess and align to goals.
7. Perfect and evaluate... and grade if you must.
8. Connect and conference with others.
9. Inject and eject artifacts continually to update.
10. Respect accomplishments and show with pride.

These steps provide a guideline for those who are planning to implement portfolio assessment; steps may be omitted and need not follow the order as listed (Burke et al., 1994).

Before a portfolio system of assessment is implemented the teacher must make clear decisions about the purpose of the portfolio and how it is to be carried out (Burke et al., 1994). There must be adequate communication between parents and school regarding the portfolio and its grading system (Black, 1993).

Before begining the selection process the teacher must consider the following questions: "What should be included?; How will the items be selected?; Who will select the items?; and When will these items be selected?" (Burke et al., 1994, p. 33). Although selection can take place any time the teacher chooses, the process usually occurs at the end of a unit, end of a marking period, end of the year or prior to parent conferences (Burke et al., 1994).

Depending on the age level, purpose and availability of supplies,

student portfolios can be designed and decorated. Giving students the opportunity to use artistic creativity allows their personality, enthusiasm, and pride show through their work (Burke et al., 1994). Covers, page layout, overall theme are some of the components of a well designed portfolio (Burke et al., 1994).

"The reflection phase requires the student to thoughtfully examine each piece selected for inclusion in the portfolio" (Burke et al., 1994, p. xiii) By reflecting on the artifacts in the portfolio, design , and organization the students are given the opportunity to make decisions and evaluate their own work. By assessing their own work, students will become autonomous learners (Lamme & Hysmith, 1991).

The "Inspect" stage of the portfolio process requires students to self-assess their progress (Burke et al., 1994). They should check to see if their work follows teacher guidelines and goals (Burke et al., 1994).

In the "Perfect and Evaluate" stage, students must tie up loose ends and put the finishing touches on their portfolio (Burke et al., 1994).

Conferencing upon completion of the portfolio, provides the student with the opportunity to demonstrate to the teacher or reviewer that they have become self-governing learners (Burke et al., 1994). The student should be asked questions that probe into deep levels of thinking and achievement. The teacher may decide how complex or informal to establish the conference guidelines through various options (Burke et al., 1994).

Artifacts in the portfolio are regularly updated; some items are added while others are removed (Burke et al., 1994). The "Inject/Eject" phase of the portfolio process requires students to continually make judgements on the artifacts in the portfolio based on the criteria of its evaluation (Burke et al., 1994).

Formal exhibition of portfolios give students the opportunity to communicate their accomplishments to others (Burke et al., 1994). There are various ways that portfolios can be presented: before an audience, placed in the media center, or displayed at a schoolwide achievement night.

Grading of the portfolio is a major concern for those who are using portfolio assessment and those considering its use. Individual teachers will need to make their owns decisions based on a number of options. Parents must be made aware and educated on the grading system of the student portfolios (Black, 1993). Teachers must decide whether to grade the portfolio as a whole, grade individual entries prior to being placed in the portfolio and also grading the complete portfolio, or not to grade the portfolio at all (Burke et al., 1994).

Some concerns have been expressed regarding the grading of portfolios. "It's much harder to ensure portfolios accurately record and measure student performance" (Black, 1993, p. 28). "Any program of portfolio assessment must address the possibility that assessments might be biased on the basis of race, sex, or cultural orientation or overly generous so as to bolster student's self-esteem" (Black, 1993, p. 31). Scoring a portfolio and conferencing with each

student individually takes a substantial amount of time (Merina, 1993).

The NCTM suggests using a holistic scoring method (1991). Portfolios are sorted into four levels according to the predetermined criteria. Portfolios are given a score ranging from 4, representing the highest, down to level 1 (NCTM, 1991). Each teacher needs to develop their own rubric; however, the NCTM (1991) has provided some starting guidelines. Level 4 portfolios indicate a wide variety of types of artifacts presented in a creative format (NCTM, 1991). There is evidence that students have engaged in thinking for themselves and have utilized a variety of resources (NCTM, 1991). Communication is clear in a level 4 portfolio and improves from early artifacts to those at the end of the portfolio (NCTM, 1991). Through the papers, organization, decorative display, and the reflective writings enthusiasm for mathematics is demonstrated (NCTM, 1991).

Level 3 portfolios are similar to level 4 with respect to a variety of types of artifacts. Communication is fair rather than clear (NCTM, 1991). The use of resources is limited; there is indication of proficiency of basic math concepts (NCTM, 1991). The major difference between the levels 4 and 3 portfolio is the demonstration of enthusiasm, self-assessment, and extensive investigations (NCTM, 1991).

Level 2 portfolios lack in evidence of student original thinking (NCTM, 1991). These portfolios have less variety in types of artifacts and frequently focus on arithmetic and less complex problems (NCTM,

1991). Artifacts also have minimal student explanations of process thinking and solutions to problems (NCTM, 1991).

The level 1 portfolio has minimal creativity or evidence of student thinking (NCTM, 1991). Artifacts are mostly worksheets or textbook problems; no explanation of solutions are included (NCTM, 1991). For a more comprehensive holistic scoring guide, refer to appendix D.

Some teachers may choose to develop a list of criteria and a corresponding scoring rubric (Burke et al., 1994). Sample criteria for grading student portfolios include:

> "accuracy of information, completeness, connections to other subjects, creativity, development of process, diversity of selections, evidence of understanding, following directions, form (mechanics), growth and development, insightfulness, knowledge of content, multiple intelligences, originality, persistence, quality of product, reflectiveness, self-assessment, timelines, transfer of ideas, variety of entries and visual appeal" (Burke et al., 1994, p. 94).

For each of the evaluative criteria chosen, teachers determine the elements and indicators for each (Burke et al., 1994). The indicators may range from a score of 0 to 5, 1 to 3, or any numeric range the teacher prefers. Burke, Fogarty, and Belgrad (1994) provide an example to illustrate criteria elements and indicators: "Color: (1) no color, (2) some color, (3) very colorful; and Design: (1) no graphics, (2) some graphics, (3) creative graphics" (p. 91).

If other teachers in the school use portfolio assessment, the student portfolios should be passed along to the next teacher. The

student's development would be documented over a longer period of time thus illustrating a wider scope of development. Teachers receiving portfolios of students that will be entering their classes the following year would be able to preview the portfolios to gain an understanding of their learning experience. Knowing about the student's learning style, strengths and weaknesses in advance would allow the teacher to pick up where the last teacher left off (NCTM, 1994).

CHAPTER 3

Procedures

Introduction

This is a nonexperimental descriptive research study. Information was gathered through extensive library research utilizing the various sources available through the Savitz Library of Rowan College, Glassboro, New Jersey.

Procedures

The first phase in preparing this study was the collection of related literature. The topics of student assessment and portfolios were researched extensively and compliled for reference throughout the course of the study. The ERIC Document Resource was the primary source of locating related literature. Another resource was the Dissertation Abstracts International. The Learning Resource Center-South of Sewell, New Jersey was another valuable source of gathering information regarding portfolio assessment.

The researcher read the literature and assembled notes on the various aspects of portfolios assessment. An outline was compiled consisting of the major topics of portfolio assessment. This was done by using the information found in the journal articles and information the researcher learned at a mini-graduate course, "Portfolio Assessment" through the Regional Training Center of Morristown, New Jersey. A comprehensive outline was developed for the purpose of

describing the use of portfolios for student assessment. Topics chosen for the outline were those the researcher felt were important aspects of portfolio assessment and areas that would be most beneficial to readers who have a limited knowledge of portfolio assessment. Discussion of topics in the following outline were augmented with information found in the research journals.

Portfolio Assessment

I. What is a portfolio?

II. What is included in a portfolio?

III. Why use portfolios for assessment?

  A. What are the benefits of using portfolios for assessment?

  B. What can portfolios do that tests can not?

IV. Purposes and Types

  A. Assessment of student work

  B. Improving curriculum / teaching methods

  C. Various types of portfolios

V. Management of portfolios

  A. Organization

  B. Storage

VI. Who decides what is included?

  Teacher, Student, Parent, Peer

VII. Steps to implementing a portfolio assessment system in the classroom

  A. Define specific purposes of using the portfolio

  B. Collect and organize items for the working portfolio

C. Select what will go into the graded portfolio

D. Personality of the student goes into the portfolio; Decorate

E. Student metacognitive reflections about individual pieces

F. Students inspect their portfolio; Self-evaluation

G. Perfect the final product and submit for evaluation

H. Conference; Teacher discusses the portfolio with student

I. Update contents continually

J. Display accomplishments

VIII. Scoring the portfolio

IX. What is done with the portfolio at the end of the year?

The second phase of the study was the analysis in Chapter 4. The opinions of experts in the field of student assessment were correlated to form an indepth analysis of portfolio assessment.

The final phase of the study are the conclusions and specific application to the mathematics content area in Chapter 5. The researcher provides additional recommendations based on the synthesis of the related literature.

CHAPTER 4

Analysis of data

Introduction

As previously stated, the purpose of this study is to provide a comprehensive description of portfolio assessment and analyze critically the use of portfolios for student assessment at the high school level with specific application to the mathematics content area. Chapter 2 of this study contains a description of portfolio assessment. This chapter contains a critical analysis of the use of portfolios for assessment. Thorough research has uncovered many similarities and differences among expert opinions in the area of student assessment regarding portfolios.

Analysis

Individuals and groups such as the NCTM have agreed that standardized tests alone do not accurately reflect student's knowledge and have limitations (NCTM, 1991; Wasserman, 1991; Black, 1993; Glazer, 1994; NCTM, 1995). King provides a narrative description of the limitations of standardized tests in a piece that originally appeared in the Winter 1990 issue of the Kentucky English Bulletin. This anecdote centers on a principal of a school for Navajo children who are bilingual. The results of the standardized achievement tests report a particular group of students to be "low-functioning". The administrator visits the classroom and finds evidence that these

children were not as the tests indicate. The administrator leaves the classroom of students involved in active learning and decides to take another look at the test.

The NCTM (1995) describes major shifts in assessment practice stating that students must be assessed with multiple means rather than "basing inferences on restricted or single sources of evidence" (p. 83). In another publication, the NCTM suggests that portfolios may be used to assess student achievement and progress (NCTM, 1991). "The (portfolio) exemplifies the goals of the NCTM Evaluation Standards and shows much more than will a single test" (NCTM, 1991, p. 35). "This assessment medium enables students to demonstrate learning and understanding of ideas beyond facts and knowledge . . . Work in the portfolio can show the ability to reason and to communicate mathematically, to make conjectures, gather evidence, look for patterns, analyze, build logical arguements and solve problems" (NCTM, 1991, p. 36). Some NCTM Evaluation Standards are difficult to assess with traditional measures (NCTM, 1991). However with portfolios and the evidence collected over time, favorable results and documentation may be yielded. Some of these NCTM standards are as follows: positive mathematical disposition, growth in mathematical understanding, mathematical reasoning in a variety of mathematical topics, mathematical connections to other subjects and to real world situations, group problem solving, use of tools, teacher and parent involvement (NCTM, 1991).

Research yields many definitions for the word portfolio. It has

been described as a "container of evidence of a person's skills" (Hamm & Adams, 1991, p. 18). Sanborn and Sanborn define it as a "purposefully organized collection of student work" (1994, p. 26). While others in the field of education maintain another emphasis for the term. Paulson and Paulson state that a portfolio is "a carefully crafted portrait of what a student knows or can do" (1991b, p. 1). A good working definition developed at the Northwest Regional Educational Laboratory is as follows: "A portfolio is a purposeful collection of student work that exhibits to the student (and/or others) the student's efforts, progress or achievement in (a) given area(s). This collection must include: student participation on selection of portfolio content; the criteria for selection; the criteria for judging merit; and evidence of student self-reflection" (Arter, 1990, p. 2). Although the individual definitions differ, there is common ground shared, namely that it is a collection of student work.

Research suggests that the portfolio must contain student reflections (Lamme & Hysmith, 1991; Hamm & Adams, 1991; Wasserman, 1991; Gordon & MacInnis, 1993; Black, 1993). These reflections may be in the form of written narratives in which the students describe their thoughts and feelings behind the learning process (Paulson & Paulson, 1991b). Writing and communicaton of mathematical ideas is an educational goal of the NCTM Standards (NCTM, 1991). Students can reveal thinking and reasoning through the writing process and demonstrate what they know and do not know (Gordon & MacInnis, 1993). Teachers may supply writing prompts to

provide the students with a spring board (NCTM, 1991): Write about your favorite topic in math.; What do you like the most or least about geometry?; What are you still confused about?; In what way do you feel you learn best? and Write a note to a friend who was absent explaining today's lesson.

Experts in the field of assessment have differing opinions regarding a few topics of portfolio assessment. Debate exists on whether to use portfolios as a substitute for standardized state evaluations or to use portfolios as a supplement to standardized state evaluations. Some states and districts have required portfolio assessment. In states and districts where portfolios have not been required, individual teachers use portfolio assessment to address their own assessment needs.

Hamm and Adams (1991) estimate that many schools view portfolio assessment as "an exciting possibility that my be used in combination with other formal and informal assessments for plotting the growth of our students during their school years" (p. 21).

Currently, Kentucky requires a mathematics portfolio as part of each student's instructional program. The portfolio is scored for accountability in the fourth, eighth and twelfth grades. Kentucky Department of Education has determined that the portfolio will be in addition to multiple-choice items and open-response questions (Kentucky Mathematics Teacher's Guide, 1994).

In 1990, Vermont became the first state to implement portfolio assessment on a large scale as an alternative to standardized testing

(Merina, 1993). The program has been the topic of much scrutiny and criticism (Ernst, 1992; Rothman, 1992c; Abruscato, 1993; Merina, 1993). Many revisions have taken place as a result of the initial pilot program in Vermont (Koretz, 1993; Rothman, 1993).

When considering the small scale portfolio implemented by individual teachers, the question of whether or not to grade the student portfolios continues to be a debate among experts in the field of student assessment. Some experts maintain that since portfolios and instruction are so closely related, they should not be a tool for student assessment (Paulson & Paulson, 1991b). Burke, Fogarty and Belgrad (1994) approach this issue by stating "grade if you must" (p. xi) . The options for grading range from not graded to each entry graded plus a grade for the completed portfolio (Burke et al., 1994). Some experts theorize that students, especially at the elementary grade level, will become overly concerned with the grade they received rather than what they learned through the process (Burke et al., 1994). This supports the reason for not grading the portfolios. Effort and development is emphasized over competative comparisons (Burke et al., 1994). Conversely, the teacher may choose to grade each of the items in the portfolio. This may be done either before or after the portfolio has been assembled. The grades may be scored through rubrics, percentage or letter grades. Another option is to grade selected key items instead of every item in the portfolio (Burke et al., 1994). Teachers must decide the purpose for using portfolios and from these decisions determine how to grade the student portfolios if they

are to be graded at all.

Whether portfolios are used as a large scale alternative to standardized state evaluation or in a classroom implemented by the individual teacher, the question of scoring, reliability and validity of the scores exist. Concern has been raised among experts in the field regarding the scores given to portfolios (Rothman, 1992a). In many methods of scoring there are two or more readers who evaluate the portfolios. Although the criteria used to evaluate the portfolios may be the same, two different readers may assign different scores. This may present a problem when trying to assign a grade. Paulson and Paulson (1991b) compare the portfolio scoring to that of movie reviews. Because the portfolio has been prepared by the student it is a product of their individual personality. It is expected that no two portfolios would be identical. "In educational measurement we treat rater disagreement as error, random events with little or no informational value. If raters disagree, we conclude that our observations are unreliable and take steps to make them more 'reliable' through procedures such as training...This suggests that when raters disagree on how to 'score' something found in a student's portfolio, it may be more valuable to provide the student with a discussion of how and why the judges disagreed than to promote the illusion of a 'unified front' represented by a resolved score"(Paulson & Paulson, 1991b, p. 5). Valuable information about the student and their learning experience may be lost when rater disagreement is defined as error (Paulson & Paulson, 1991b).

CHAPTER 5

Summary, conclusion and recommendations

Introduction

Educators are concerned with accurately assessing and evaluating the learning process of students. The purpose of this study is to provide a comprehensive description of portfolio assessment and analyze critically the use of portfolios for student assessment at the high school level with specific application to the mathematics content area. Previous chapters provided the description and analysis of this form of alternative assessment, while this chapter will address the application to the mathematics content area.

Summary

There has been a shift from assessing student knowledge of specific facts and isolated skills toward assessing their full mathematical power (NCTM, 1995). With this shift comes the challenge of developing a technique to assess all students yet maintain the diversity that exists among them. "(Portfolios) represent a major shift in emphasis - from the much criticized true-false, multiple-choice standardized test methods of evaluating students' work, to the gathering of information about how students think and reason, how they apply data in solving problems, how they communicate their ideas, how responsive their subsequent task work is to teacher's evaluative feedback" (Wasserman, 1991, p. 93).

In the past, states have relied upon multiple-choice standardized tests to assess student achievement, evaluate programs and on which to base financial funding. Currently several states (eg. California, Connecticut, Kentucky, Maryland, Vermont, Wisconsin) are in the process of changing their state testing to be more balanced by including performance tasks, projects, or portfolios in their programs (NCTM, 1995).

Teachers have begun the shift by implementing portfolios in their classrooms as part of the assessment process. These portfolios may represent one school year, one content area, one chapter or one particular unit.

Paulson and Paulson (1991b) state that "portfolio assessment is here to stay" (p. 3). However, educators should still approach portfolios with caution. Because the concept is relatively new, there is not much research to guide educators (Black, 1993). The transition to implementing this assessment technique takes time, planning and careful consideration (Burke et al., 1994).

Conclusion

The National Council of Teachers of Mathematics (NCTM) maintains a position on the assessment of mathematics. The Council analyzes the changes in society and how these changes should be reflected in curriculum, methods of instruction, and assessment techniques (NCTM, 1995). Mathematics education is in the process of changing from assessment of isolated skills and facts to higher order

thinking, problem solving and direct application to real life tasks and situations. The NCTM maintains that portfolio assessment is a medium that enables the student to demonstrate learning and understanding beyond facts and knowledge (NCTM, 1991). A variety of techniques can be used for instruction and assessment. These include the following: tests, simulations, interviews, cooperative works, projects, videos and photographs, performances, observation checklists, logs and journals, student self-assessments, computer programs, peer evaluations, musical pieces, graphic organizers and art work (Burke et al., 1994).

Experts in the field of student assessment agree that portfolios are a valuable tool and provide for great educational benefits (Hamm & Adams, 1991; Wasserman, 1991; Black, 1993; Burke et al., 1994). The valuable feedback from student writing in the portfolio will give teachers insight into their students' growth (Paulson et al., 1991). Additionally, a portfolio compiled over the course of one school year will show change and growth providing continuity from one year to the next (Vavrus, 1990). Another benefit is student writing and artifacts in the portfolio will give teachers powerful insight into student achievement, knowledge, and understanding (Hamm & Adams, 1991). Maintaining a portfolio will help students become aware of their own learning history (Hamm & Adams, 1991). Maintaining student portfolios will help teachers assemble works that reflect student achievement on district goals (Frazier & Paulson, 1992). Lastly, the use of portfolios will give students opportunities to demonstrate their

knowledge and understanding in a variety of ways (NCTM, 1995). By performing the task of assembling a portfolio, representing their efforts over a length of time, students will be encouraged to take charge of their own learning (Paulson et al., 1991).

Students will benefit from the proper implementation of portfolios for assessment. A single test or quiz indicates only what the student can communicate at the given moment it is being administered. Portfolios, on the other hand, show the learning process over time. Evaluators can see in a variety of ways a more accurate understanding of a student's abilities and development (Black, 1993).

Recommendations

Presently, there is a limited amount of research that statistically analyzes the educational benefits of using portfolios for assessment. The researcher recommends that further studies be conducted to examine the effect that portfolios have on mathematics achievement. Other points to consider for study include the effect of portfolio assessment on student attitude, mathematics anxiety and self-esteem.

The researcher also recommends that longitudinal studies be conducted to examine the effect changing from traditional assessment to portfolio assessment has on the instructional practices of mathematics teachers at the high school level. Hamm and Adams (1991) state: "Portfolio assessment promotes creativity and self-reflection about learning. It allows students to work in

collaboration and independently, and encourages them to analyze, clarify, evaluate, and explore their own thinking. A portfolio invites students to invent, organize, predict, represent, visualize, genuinely reflect on what they are learning, and build self-confidence" (p. 20). The researcher believes that the implementation of portfolio assessment by a teacher previously using traditional assessment measures, will have a significant effect on the instructional strategies used in the classroom. "Teachers are now asking students to clarify assumptions, explore multiple solutions, analyze solution paths to see if they make sense, and verify their solutions by solving problems in different ways. Students are challenged to think beyond getting an answer when teachers ask how the problem can be applied to a real-life situation" (Ernst, 1992, p. 1).

Appendix

Appendix A

CRITERIA: COLLABORATION IN COOPERATIVE GROUP

Elements	Indicators			Score
Interaction	• Little interaction	• Some interaction	• Enthusiastic interaction	2
	1	2	3	
Conversation	• Not always focused on topic	• Usually focused on topic	• Involved conversation on topic	3
	1	2	3	
Involvement	• One student involved	• Several students involved	• Entire group involved	2
	1	2	3	
On-Task Behavior	• Several students off task	• One student off task	• All students on task	3
	1	2	3	

Final Score: 10
Final Grade: A

Scale:
10–12 = A
6–9 = B
4–5 = C

Figure 21

Criteria: Visual Aid for Presentation

Elements	indicators			Score
Size	• Too small to be seen by anyone	• Could be seen by some	• Large enough to be seen by all	2
	1	2	3	
Color	• No color	• Some color	• Very colorful	3
	1	2	3	
Design	• No graphics	• Some graphics	• Creative graphics	2
	1	2	3	
Content	• Did not pertain to speech	• Pertained to speech	• Reinforced main ideas of speech	2
	1	2	3	

Final Score: 9
Final Grade: B

Scale:
10–12 = A
6–9 = B
4–5 = C

Figure 22

Burke, K., Fogarty, R., & Belgrad, S. (1994). The mindful school: The portfolio connection. Palatine, IL: IRI/Skylight Publishing.

Goal	Evidence, examples, and comments
Positive mathematical disposition Motivation Curiosity Perseverance Risk taking Flexibility Self-responsibility Self-confidence ...	• Journal entries depicting enthusiasm for mathematics • Photographs of large, colorful mathematical graphics by students • Problem solution with an added paragraph beginning with "On the other hand..." or "What if..." • Log of a week's or month's work showing a single important problem or investigation worked on over a period of time • Homework paper with a description of several approaches to a problem • Student-written planning calendar outlining work to be done • Mathematics autobiography ...
Growth in mathematical understanding Concept development Problem-solving skills Communication skills Construction of mathematics Reflection on approaches and solutions to problems or tasks ...	• Similar items collected at regular intervals from the beginning of the year • Written explanation of why an algorithm works • Diagram, table, or similar organized representation that clarifies a problem situation • Solution that defines assumptions, includes counter-examples • Photographs of a mathematics project • Journal entries delineating solution justifications and variations in strategies • Student identification of papers that need more work, with reasons • A paper that starts with "Today in math class I learned..." • Inclusion of drafts as well as finished work ...
Mathematical reasoning in a variety of mathematical topics Estimation, number sense, number operations, and computation Measurement, geometry, and spatial sense Statistics and probability Fractions and decimals Patterns and relationships ...	• Report on an investigation (e.g., number patterns in sums of sequential numbers) • Student-planned statistical survey, with accompanying graphic displays • Written report of a probability experiment and accompanying theoretical design • Response to an open-ended question regarding measurement of geometric shapes • Student explanation of what 1/2 minus 1/3 means • Diagram examples of multiplication using a number line, a rectangular array, and repeated groups of physical objects • Annotated drawing illustrating the Pythagorean theorem • Representation of an area model solution for a statistical problem ...

Goal	Evidence, examples, and comments
Mathematical connections Connecting a mathematical idea to other mathematical topics, to other subject areas, and to real-world situations ...	• Papers that show authentic use of mathematics in other curricular areas such as science or social studies • Student reflections on how mathematics is meaningful as it is used in the adult world • Examples from nature of occurrences of Pascal's triangle number patterns • A report on the relationship between arithmetic, algebra, and geometry with demonstrative examples on a coordinate grid • Student-constructed table of equivalent fractions, decimal numbers, and percents, with examples of where each type of number is used • Mathematical art project • Report about a person in history or personally known who contributed to mathematics ...
Group problem solving Development of skills in working with others Communication ...	• A task design or plan • Group paper that includes the names of the members of the group and the tasks each did • Group self-assessment sheet • Videotape or audiotape of group working on problems or making oral reports • Group-work report of trying a second or third strategy applied when the first one didn't work ...
Use of tools Integration of technology—use of calculators and computers and so on Use of manipulatives ...	• Computer-generated statistical analysis of a problem • Frequent notation of use of calculators on open-ended problems • Diagrams representing use of manipulative material ...
Teacher and parent involvement Communication between teacher and parent and between parent and student Parental understanding of educational objectives and values ...	• Consistency of program demonstrated by items from every grading period • Anecdotal reports • Informal assessment sheet • Interview of student • Teacher- or parent-written comments • Assessment by teacher of student work • Student presentation of portfolio to parent during parent-teacher conference ...

National Council of Teachers of Mathematics. (1995). Assessment Standards for School Mathematics. Reston, VA: National Council of Teachers of Mathematics.

Appendix C

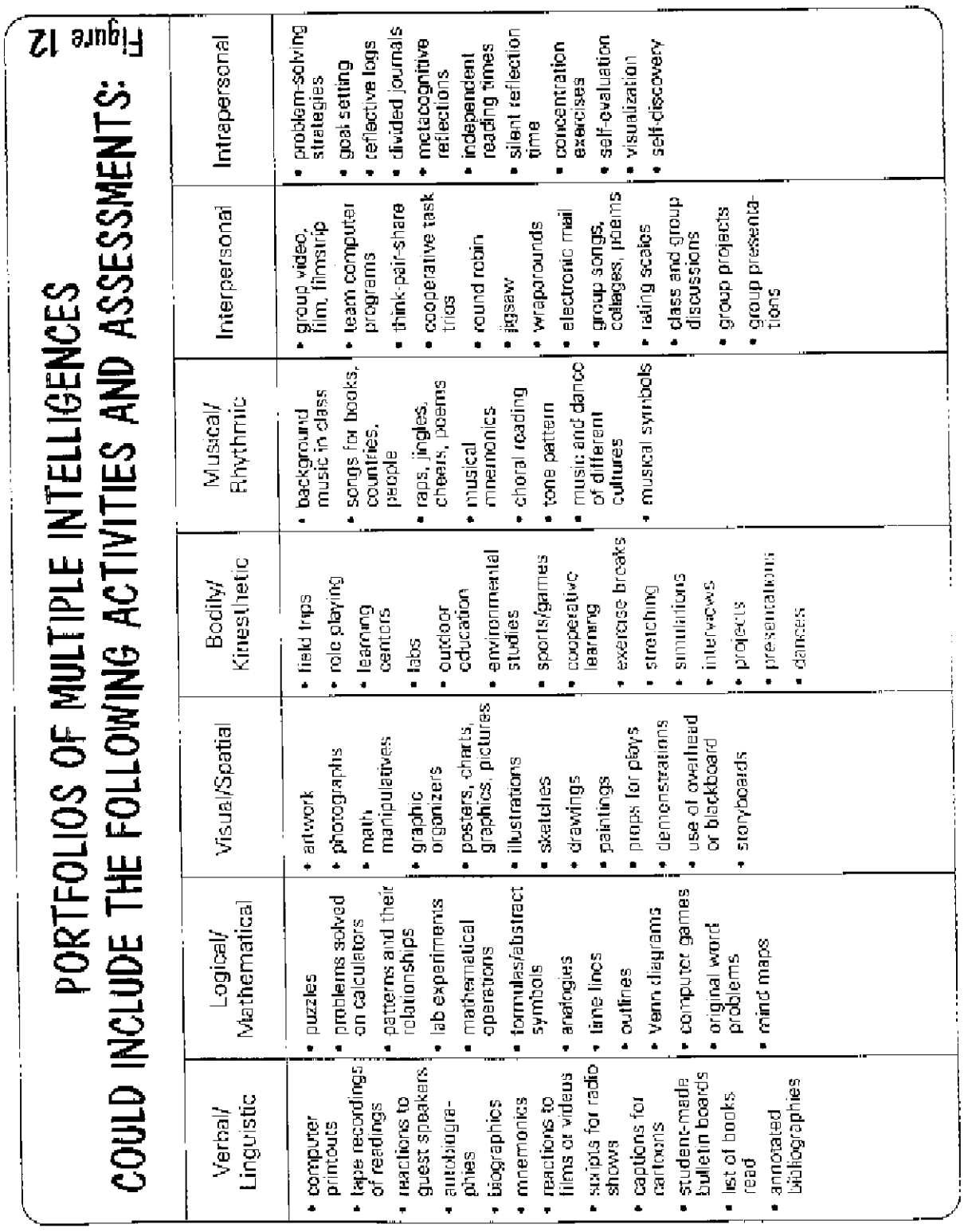

Figure 12

PORTFOLIOS OF MULTIPLE INTELLIGENCES
COULD INCLUDE THE FOLLOWING ACTIVITIES AND ASSESSMENTS:

Verbal/ Linguistic	Logical/ Mathematical	Visual/Spatial	Bodily/ Kinesthetic	Musical/ Rhythmic	Interpersonal	Intrapersonal
• computer printouts • tape recordings of readings • reactions to guest speakers • autobiographies • biographics • mnemonics • reactions to films or videos • scripts for radio shows • captions for cartoons • student-made bulletin boards • list of books read • annotated bibliographies	• puzzles • problems solved on calculators • patterns and their relationships • lab experiments • mathematical operations • formulas/abstract symbols • analogies • time lines • outlines • Venn diagrams • computer games • original word problems • mind maps	• artwork • photographs • math manipulatives • graphic organizers • posters, charts, graphics, pictures • illustrations • sketches • drawings • paintings • props for plays • demonstrations • use of overhead or blackboard • storyboards	• field trips • role playing • learning centers • labs • outdoor education • environmental studies • sports/games • cooperative learning • exercise breaks • stretching • simulations • interviews • projects • presentations • dances	• background music in class • songs for books, countries, people • raps, jingles, cheers, poems • musical mnemonics • choral reading • tone pattern • music and dance of different cultures • musical symbols	• group video, film, filmstrip • team computer programs • think-pair-share • cooperative task trios • round robin • jigsaw • wraparounds • electronic mail • group songs, collages, poems • rating scales • class and group discussions • group projects • group presentations	• problem-solving strategies • goal setting • reflective logs • divided journals • metacognitive reflections • independent reading times • silent reflection time • concentration exercises • self-evaluation • visualization • self-discovery

Burke, K., Fogarty, R., & Belgrad, S. (1994). The mindful school: The portfolio connection. Palatine, IL: IRI/Skylight Publishing.

Appendix D

PORTFOLIO RUBRIC

Name: _____ Subject: _____ Grade: ____

Directions: Develop criteria and indicators for assessing the final portfolio.

Criteria	Does Not Meet Expectations 1	Meets Expectations 2	Exceeds Expectations 3	Total Score
1.				
2.				
3.				
1.				
2.				
3.				
1.				
2.				
3.				
1.				
2.				
3.				

Comments:

Scale:

Total Score: _____ / 36

Final Grade:

IRI SkyLight

Burke, K., Fogarty, R., & Belgrad, S. (1994). The mindful school: The portfolio connection. Palatine, IL: IRI/Skylight Publishing.

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