

Portfolios

A portfolio is a purposeful collection of a student's work that provides evidence of the student's skills, understandings, or attitudes. If the portfolio includes work collected over time, then it may also reflect the student's growth.

This tutor outlines reasons portfolios may be useful and provides some guidance for getting started and going further. A bibliography includes suggestions for additional reading.

Why Portfolios?

Portfolios can help teachers:

- better assess student learning;
- foster student autonomy;
- communicate the goals of instruction to students and parents; and
- improve their own teaching.

Student Assessment

Since a portfolio contains direct samples of student work, it may, for certain purposes, be superior to indirect indicators like grades. For example, an actual graph shows a student's skill at graphing better than a grade; and the juxtaposition of two graphs, one from September and the other from January, documents learning over time much more accurately than two grades could ever do.

Many outcomes that are hard to assess by more conventional methods—communication, reasoning, problem solving, confidence, perseverance, flexibility, and so on—can be assessed using portfolios. Portfolios can help teachers learn more about how students think and track the development of that thinking.

Student Autonomy

Portfolios can encourage students to assess their own learning. Students become more self-directed and motivated by examining and reflecting on their own work and the work of their peers.



Many outcomes that are hard to assess by more conventional methods . . . can be assessed using portfolios. Portfolios can help teachers learn more about how students think and track the development of that thinking.

Communication

Concrete examples of student work reveal much that cannot be easily conveyed in grades or comments. Parents and others can see for themselves progress and achievement.

The examples of student work in a portfolio also convey the content and goals of the curriculum in a specific way that complements the generalities of curriculum philosophies and scope and sequence charts. Portfolios focus on the work students actually do, not on ideology or wishful thinking. Communication between students and their parents, teachers, and peers can be enhanced by having particular examples to discuss.

Portfolios can help establish public norms for mathematics achievement. When assessment focuses on tests and grades, then a narrow conception of what is valuable in mathematics is communicated. When assessment is more broadly based, then a broader vision of mathematics is promoted.

Improvement of Instruction

Student portfolios can be useful both for making instructional decisions and for evaluating and improving instruction.

Certainly, better understanding of how students think and feel can help teachers make better decisions about directions for future instruction. But portfolios can also help teachers improve their teaching more generally. Portfolios can facilitate discussions with professional colleagues about different approaches to the same topic; they can reflect the range of instructional opportunities being offered; and they can indicate the use of manipulatives, group work, and technology in an implemented curriculum.

Student portfolios might be included in a Teaching Portfolio that a teacher can use for self-evaluation. One's own teaching can be refined by collecting and examining several years of student portfolios. Some of the benefits that portfolios promise for students—collegiality, establishment of public norms, improvement of higher-level skills—may thus become available to teachers.

Getting Started

The beginnings of all things are small.

—CICERO

There is no single right way to do portfolios. The suggestions offered below have worked for others and may work for you, but you should expect to learn by trial and error and to have to rely on your own judgment. If you have used portfolios for writing or some other subject, then your experience will be invaluable. If you possibly can, work with a colleague as you implement portfolios for the first time.

Starting small, with modest goals, is a good idea. For example, you may organize your portfolio program around one well-defined area that is hard to assess by more traditional methods. For instance, choose one of the following areas as a theme for the portfolios:

- measurement,
- graphing,



*There is no single right way
to do portfolios.*

- drawing pictures and diagrams, or
- communication of solution methods.

Besides starting small, start early so that you have a baseline of student attitudes and achievement. Before and after comparisons are useful, but are impossible without early samples. All materials in a portfolio must be dated.

A box with a file folder for each child’s work is a simple way to get started. If the box is easily accessible, then the portfolios are more likely to fit into classroom routines. Anticipate the need for more room as items are added to the portfolios.

What goes in the portfolios is a key question. Figure 1 shows some kinds of materials that might be included in a portfolio, although clearly no real portfolio will have such a wild collection. Figure 2 is a table of contents for a possible third-grade portfolio.

You might aim for balance in the selection of materials: group vs. individual assignments; short problems vs. longer projects; real life vs. purely mathematical problems; on-demand vs. no-deadline tasks; attitude vs. skill vs. concept-oriented work; and so on. The number of pieces should not be so few that there is not enough evidence about important outcomes, nor so many that there is no judgment about what is important or worthwhile. About eight to ten pieces might be enough for a semester.

How to pick what to put in the portfolios must also be decided. We suggest that the selection of items be made by the students subject to constraints imposed by the teacher. These constraints might range from compelling that particular items be included, to requiring that items be chosen to meet certain criteria, to allowing complete freedom of choice by students. The amount of latitude allowed by the teacher will depend on his or her class and goals. Younger children, for example, usually need more direction. Putting fewer constraints on what goes in the portfolios may foster student autonomy, but may result in portfolios with few overlapping items so that comparisons between students are difficult, or may even yield useless collections of random scraps.

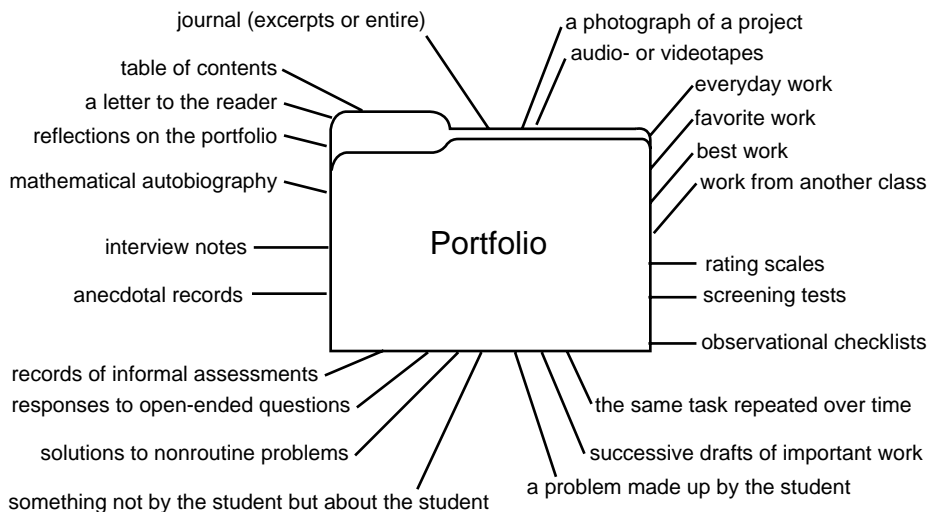


Figure 1: Possible items for mathematics portfolios



The number of pieces should not be so few that there is not enough evidence about important outcomes, nor so many that there is no judgment about what is important or worthwhile. About eight to ten pieces might be enough for a semester.

One way to organize the selection process is to have two folders for each child—a collection folder and the portfolio proper. Then, from time to time (once every several weeks or so), the collection folder can be harvested and a few select items added to the portfolio. At the same time, the portfolio can also be weeded so that the total number of items does not become too large. This selection can be done by students in small groups or pairs subject to teacher constraints as described above. The items remaining in the collection folder can be kept there or sent home.

Eight to ten well-chosen and chronologically arranged pieces of work can be most useful. You will have specific examples that communicate at parent conference time what your curriculum is and how your students are progressing; you will have a sampling of the products of your instruction so that you can critically examine your teaching; and your students will be confronted with a cross section of their own work so that they can attain greater self-awareness and autonomy. You have accomplished much even if your portfolios are no more than this.

Going Further

There are, however, other things that you might want to try as you gain experience with portfolios, especially if you are working with older students. Periodic reviews of the portfolios, writing about the portfolios, and assessing the portfolios are worth considering.

Jarrett's Portfolio • Table of Contents		
Item	Description	Date
Letter to Reader	My letter tells what my portfolio shows about my math work this semester.	9/22
Journal	A few times a week we write about math in our journals. Mine has 35 pages so far!	
Spinning Differences	I used a spinner to make subtraction problems and then graphed how many times I got each difference.	9/27
The Better "Picker Upper"	I used water to make spots on different kinds of paper towels. Then I counted square cm to find the areas of the spots.	10/25
Joe the Goldfish	Joe needed a raincoat and I figured out how much cloth he would need to make it.	11/1
Palindromes	A palindrome is a number that is the same frontwards and backwards. I used addition to make numbers into palindromes.	11/10
Lemonade Stand	This was the first line graph I ever made.	11/15
Mass vs. Number	I measured the mass of different numbers of marbles. Then I made a line graph and used it to make some predictions.	12/5
Stencilrama	This was my favorite. We made stencils out of index cards and then used the stencils to make designs. We had to figure out how many times we would have to move the stencil to make a border around the bulletin board.	1/15

Figure 2: Sample third-grade portfolio with an emphasis on graphing

Portfolio Review

Most teachers will be hard-pressed to find time to meet with individual students to review portfolios. Whole-class discussion and peer consultations, however, can accomplish many of the same goals.

For example, ask students to look through their collection folders for their best graphs to be added to their portfolios. First, through whole-class discussion, help students identify characteristics of a good graph. Then in small groups or pairs, students can examine their collections to pick out the best graphs. This opportunity for students to examine one another's work can help establish public norms for excellence.

Portfolio Writing

Asking students to write about the contents of their portfolios encourages reflection and self-assessment. This writing can take a variety of forms.

The most basic writing is a table of contents with the name of each piece, a brief description, and the date it was completed. Students can also include who chose the piece and why, who worked on the piece, and what was learned or liked or hard about the piece.

You might ask students to write a letter to the reader of the portfolio. The letter can identify favorite pieces and explain why they are favorites, or best work, or work that shows the most progress. The letter might point out what the portfolio reveals about the student as a learner of mathematics.

Assessing the Portfolios

You should not feel that you must assess the portfolios. The work included in them, after all, has most likely been graded already, and the collection is itself a direct indicator of achievement and attitude, a direct indicator that may be sufficient for your purposes.

Assessing the portfolios, however, can have advantages, especially if you are working with older students. For one, it shows that you care about the portfolios and so communicates to the students that they should take them seriously. It can also model processes you want students to apply in peer- and self-assessment of the portfolios.

If you do intend to grade the portfolios, make your expectations known to the students in advance. The establishment of such public criteria for excellence, like the TIMS Student Rubrics, will help students know what they should aim for so that their work can be better focused. You might concentrate on how well the portfolios are organized—table of contents, correct chronological order, completeness, etc.—or on the quality of the reflective writing about the portfolio. You may encourage a balanced selection of items, documentation of improvement over time, clarity of communication, accuracy of self-assessment, neatness, or something else. As long as your criteria are known to the students and so long as you have the time to do it, such grading can be useful.

Conclusion

Portfolios will not solve all the problems of mathematics education. And there are some costs for using them. Using portfolios as part of an assessment program will certainly take extra time and can be difficult, especially at first. Getting students to reflect on their own learning is particularly hard. But despite such pitfalls, portfolios offer great promise for improving your teaching and your students' learning. The basic idea is simple: collect, select, reflect.

References

- Crowley, Mary L. "Student Mathematics Portfolio: More Than a Display Case." *Mathematics Teacher*, 86(7), pp. 544–547, 1993.
- Kuhs, Therese. "Portfolio Assessment: Making It Work for the First Time." *Mathematics Teacher*, 87(5), pp. 332–335, 1994.
- Lambdin, Diana V., and Vicki L. Walker. "Planning for Classroom Portfolio Assessment." *Arithmetic Teacher*, 41(6), pp. 318–324, 1994.
- Mumme, Judith. *Portfolio Assessment in Mathematics*. A publication of the California Mathematics Project. University of California, Santa Barbara, CA, 1990.
- Stenmark, Jean Kerr, ed. *Mathematics Assessment: Myths, Models, Good Questions, and Practical Suggestions*. National Council of Teachers of Mathematics, Reston, VA, 1991.