

# thinkpoint

## What does it mean to use matrix sampling in student assessment?

### INTRODUCTION

In most state- or district-level student assessments, all students are assessed on the same content using the same set of test items. Doing so helps to assure that content considered important is used in the assessments given to all students. The advantage of this approach is that the results can readily be compared across students, classrooms, schools, and districts, since all students have responded to the same items. Because the number of students who took these common tests can range from a few students to many, it may also be possible for educators to examine the performance of students on each test item or set of test items to make comparisons across items or content standards (such as, “on which item or set of items did students score the highest or the lowest?”).

There are times, however, when testing all students on the same set of items may not be a priority or even necessary. These include

times when new items are being field tested, or times when only group-level performance is desired. In these instances, every-pupil testing on a common set of items can be viewed as an inefficient and unnecessary use of testing time.

Recent concerns about students spending too much time in testing have led some to ask the question: “Do we need to administer all of the test items to all of the students?” The answer to that question is: “It depends.”

The most positive impact of matrix sampling is the reduction in the total amount of time needed for testing while still obtaining group-level estimates of student performance. This can save assessment administration time and scoring time, and reduce the costs of assessment without adding much to the data analysis and reporting tasks.

## What is matrix sampling?

Sampling described here is the purposeful selection of a subset of test items or persons. To be truly useful when a sample is selected, each test item or person needs to have an equal chance of being selected. When this occurs, we call it random sampling. Here, the word “random” means “equal chance,” not “haphazard” or “uncontrolled.” The key is to draw representative samples—of items or of students.

**Matrix sampling** is the selection of both things (i.e. test items) and people (i.e., students). The first step is to construct a matrix containing all test items and all students can be constructed. Step two is to choose from among two basic models of matrix sampling:

### Matrix sampling model 1

In this matrix-sampling model, the overall assessment is divided up

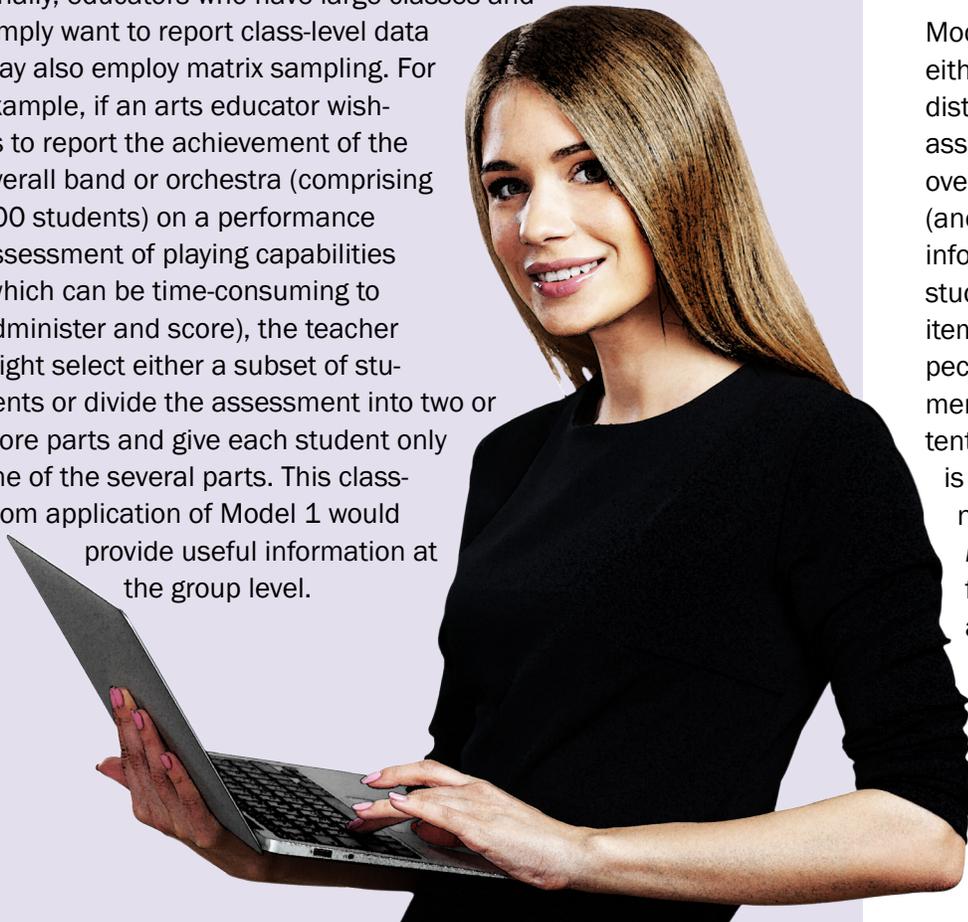


## How and when might matrix sampling be used?

Matrix sampling is used in several ways in large-scale assessment programs, especially when individual student reporting either is unnecessary or of much less importance. Many assessment programs use matrix sampling for embedded field testing of new test items within their operational tests. The advantage of embedded field testing is that each student only has to take a few of the field test items, the items are included within the actual test students are taking so that student motivation is the same (since they don't know which items are actual or field test ones). Also, the time necessary to obtain student test performance can be minimized, especially when many students take the operational test, since samples of 500-1000 can be sufficient for field testing purposes.

Matrix sampling is also used when only an overall estimate of student performance is necessary or desired. Since detailed information on student skills is not desired, it is possible to use either Model 1 or Model 2 to obtain overall test performance. An illustration of this is national tests such as the National Assessment of Educational Progress (NAEP) that report test performance only at the state and national levels, not that of individual students, schools, or districts.

Finally, educators who have large classes and simply want to report class-level data may also employ matrix sampling. For example, if an arts educator wishes to report the achievement of the overall band or orchestra (comprising 100 students) on a performance assessment of playing capabilities (which can be time-consuming to administer and score), the teacher might select either a subset of students or divide the assessment into two or more parts and give each student only one of the several parts. This classroom application of Model 1 would provide useful information at the group level.



## When might matrix sampling not be good to use?

It is not wise to use matrix sampling when an educator needs a detailed profile of the performance of a student. Even when only class-level performance is desired, educators must ask: "Are there enough students on which to divide up the test and still have adequate numbers of students in each group on which to report group results?" since using Model 1, each student will be assessed on only one portion of the standards. In a large school or district, with many students, it may be possible to use matrix sampling, so long as it is not necessary to show such information for each student.

Model 2 may not work well at either the student or the school/district level, since students are assessed only on a portion of the overall set of content standards (and accompanying test items). No information would be available on student performance on the test items not used, which could especially be an issue if the assessment has multiple strands of content and representing each strand is desired. Thus, this model may not be suitable for *those desiring detailed item information* from all students on all strands and content standards.

# What are the impacts of using matrix sampling?

The most positive impact of matrix sampling is the reduction in the total amount of time needed for testing while still obtaining group-level estimates of student performance. This can save assessment administration time and scoring time, and reduce the costs of assessment without adding much to the data analysis and reporting tasks. If group-level data is all that is needed, then matrix sampling could be an attractive option for an assessment program.

Matrix sampling, if not carefully considered and implemented, may not yield the desired type or quality of assessment information. If group sizes are too small, or the pool of items is divided into too many sub-tests, the group results

may not provide a good estimate of the performance of all students. Assessments based on only a portion of the content standards may not yield the desired comprehensive assessment information.

These pros and cons need to be thoughtfully reviewed before a decision to use matrix sampling is made. Carefully implemented, this strategy can help to make assessment more useful and less burdensome. It can help achieve overall state goals for assessment and accountability without sacrificing quality assessment, thus permitting other types of assessment—those used to actually help students learn—to be used without increasing the overall burden of assessment on students.

# Author

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## To learn more

### Further reading about models of public assurance that seek to rely less on large scale standardized measures:

Childs, Ruth. (2003). Matrix Sampling of Items in Large-Scale Assessments. Toronto, ON: Ontario Institute for Studies in Education of the University of Toronto.

[pareonline.net/getvn.asp?v=8&n=16](http://pareonline.net/getvn.asp?v=8&n=16)

### Information on how the National Assessment of Educational Progress (NAEP) uses sampling

[nces.ed.gov/nationsreportcard/about/samplesfaq.aspx](http://nces.ed.gov/nationsreportcard/about/samplesfaq.aspx)

[nces.ed.gov/nationsreportcard/tdw/sample\\_design](http://nces.ed.gov/nationsreportcard/tdw/sample_design)

[nces.ed.gov/nationsreportcard/about/nathow.asp](http://nces.ed.gov/nationsreportcard/about/nathow.asp)

[www.nagb.org/content/nagb/assets/documents/naep/kolstad-sampling.ppt](http://www.nagb.org/content/nagb/assets/documents/naep/kolstad-sampling.ppt)

