# Evaluating Student Performance Using a Trend Line Analysis: The Tukey Method

During the progress monitoring process, educators analyze students' data to evaluate their performance and adjust instruction as needed. One way they can do this is by using a trend line analysis. When using this method, educators compare the following for an individual student:

**Goal line**—the straight line representing a student's expected rate of improvement needed to meet a predetermined goal

**Trend line**—the straight line representing the general direction of the student's scores

Though most software programs will graph a trend line, educators can use the *Tukey method* to graph a trend line by finding the line of best fit for a student's data across a given period. While it may appear complicated at first glance, the Tukey method is quite simple, requiring only graph paper and a pencil.
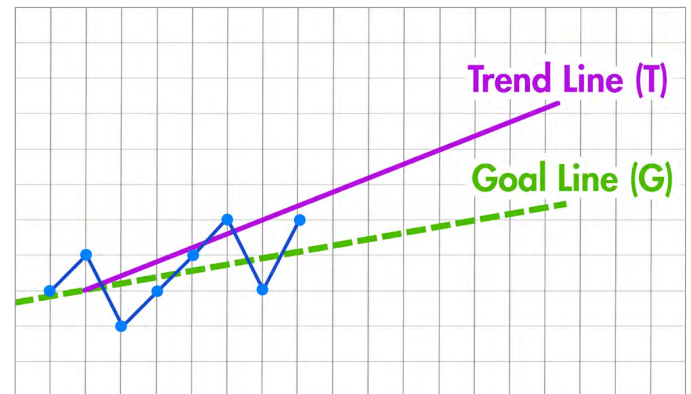


## Step-by-Step Instructions

Following are step-by-step instructions for using the Tukey method to create a trend line. Although the Tukey method can be used in all subject areas, for illustrative purposes, these instructions incorporate a student's reading scores. The table below contains the student's scores for eight weeks of instruction (plotted each Tuesday), and the graph visually represents the student's performance across the eight weeks in relation to the goal line.

**For Your Information**

A minimum of eight data points is needed to conduct a trend line analysis. For example, to gather this data, educators can collect data:

- Once per week across eight weeks of instruction
- Twice per week across four weeks of instruction

| Weeks of Instruction | Words Correct |
|:---:|:---:|
| 1 | 9 |
| 2 | 12 |
| 3 | 14 |
| 4 | 11 |
| 5 | 15 |
| 6 | 14 |
| 7 | 12 |
| 8 | 15 |
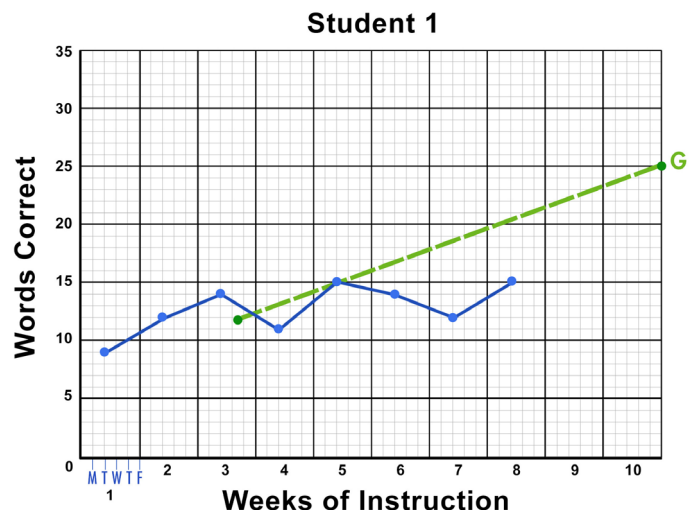
## Step 1

### Divide scores into three relatively equal groups.

If possible, divide the scores into three equal groups. If the scores cannot be divided equally, divide them into approximate thirds.

In this example, there are eight scores (or data points), so they cannot be divided equally. To divide these scores into approximate thirds, draw two vertical lines—denoted in pink—that place three scores in the first group (9, 12, and 14), two in the second group (11 and 15), and three in the third group (14, 12, and 15).
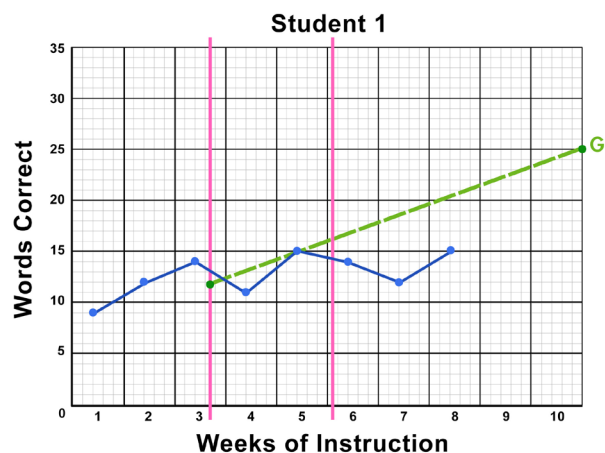


## Step 2

### Find the intersection of the midrate and middate for the first group of scores.
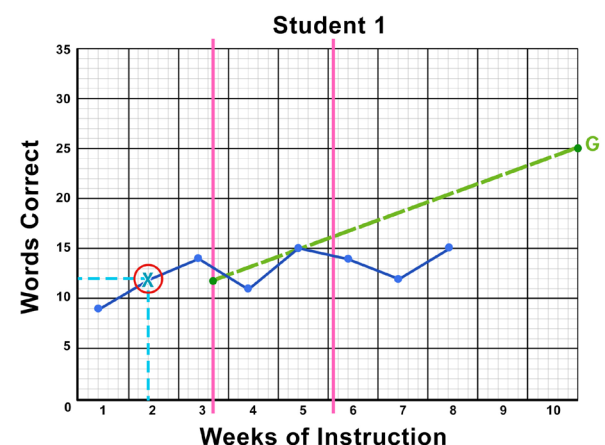
For the first group of scores, determine the *midrate* or *median* score—the score that falls in the middle when scores are arranged from lowest to highest. Next, identify the *middate* or the middle week of instruction. Then, place an X at the intersection of the midrate and the middate.

In this example, there are three scores across the first three weeks of instruction. The scores are already arranged from lowest to highest, so the median score (midrate) and the middle week of instruction (middate) are easily identified.

Median score (midrate): 9, 12, 14,

Middle week of instruction (middate): Week 1, Week 2, Week 3

Now, place an **X** at the intersection of the midrate (12) and the middate (Week 2).



## Step 3

### Find the intersection of the midrate and middate for the third group of scores.

For the third group of scores, determine the *midrate* and *middate*. Then, place an X at the intersection of the midrate and the middate.
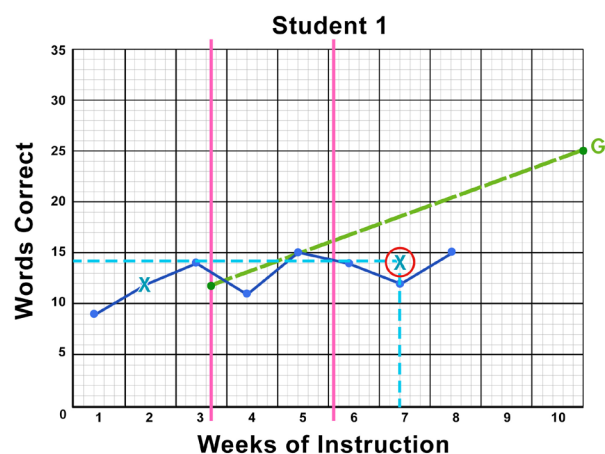
In this example, there are three scores across the final three weeks of instruction. Once these scores are arranged from lowest to highest, the midrate and middate can be easily identified.

Median score (midrate): 12, 14, 15

Middle week of instruction (middate):

Week 6, Week 7, Week 8

Now, place an **X** at the intersection of the midrate (14) and the middate (Week 7).

## Step 4

### Draw the trend line.

Draw a line beginning at the X in the first group and continuing through the X in the third group.

In this example, a line is drawn from the first point (the intersection of 12 and Week 2) to the second point (the intersection of 14 and Week 7) to create the trend line.

*Note: Because the Tukey method only uses the median scores of the first and third groups, it does not take into account all the data points, and is, therefore, an estimation of the trend line.*
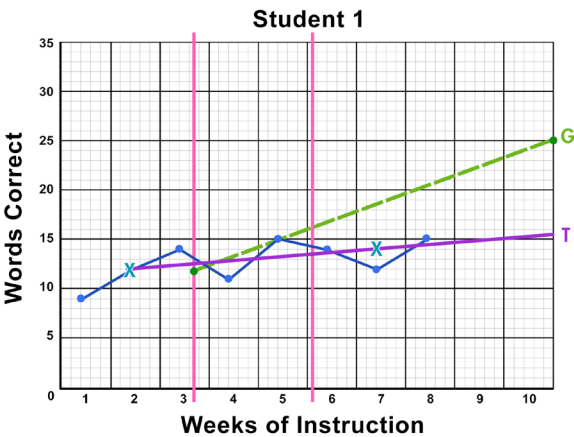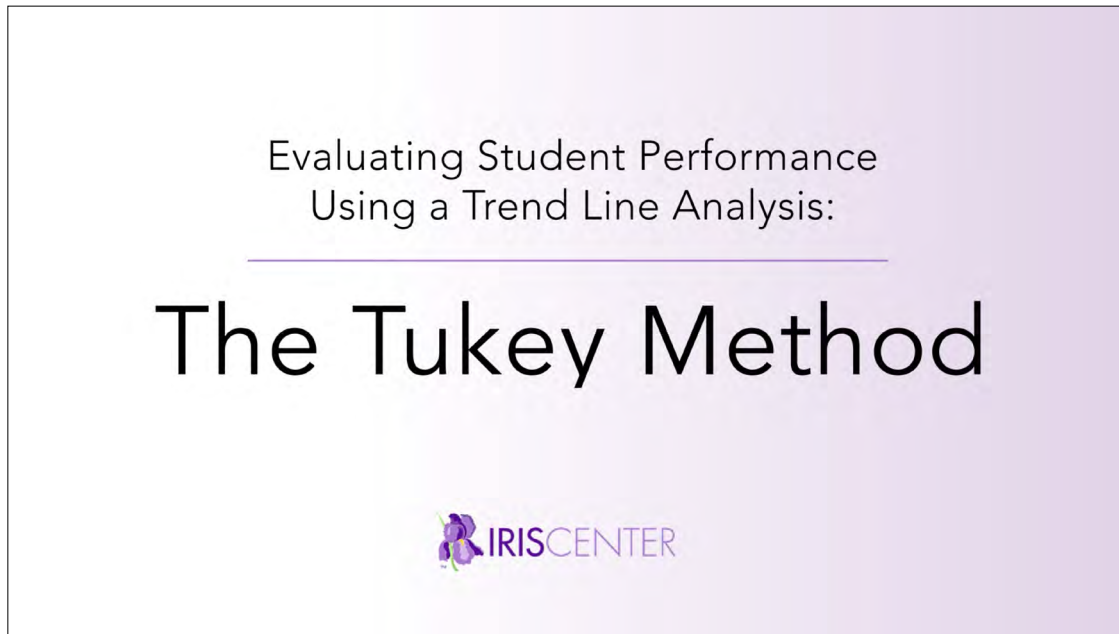


Student 1

# Making Data-Based Instructional Decisions

After using the Tukey method to graph a trend line, the educator can use a trend line analysis to evaluate student performance. Determining whether the student's trend line is steeper, flatter, or around the goal line enables an educator to make a data-based instructional decision, sometimes referred to as *data-driven instruction* (DDI). The table below illustrates how to use a trend line analysis to interpret student data and, in turn, make an informed instructional response.

| Position of the Trend Line | Instructional Response |
| --- | --- |
| **Steeper than the goal line…**  | **Increase the goal**—If the student's trend line is steeper than the goal line, the student's performance is exceeding expectations and a more ambitious goal is needed. |
| **Flatter than the goal line…**  | **Revise instruction**—If the student's trend line is flatter than the goal line, the student is not making adequate progress. The educator should implement a different instructional approach and continue to monitor the student's progress to determine if the approach is effective. |
| **Around the goal line…**  | **Make no changes**—If the student's trend line and goal line are about the same, the student is on target to meet the goal. No changes to instruction are necessary at this time, but the educator should continue collecting data. |

## Video Example

In the video below, the educator follows the step-by-step instructions described above to accurately and efficiently draw a trend line. After doing so, the educator compares the trend line and goal line to evaluate the student's performance.



Evaluating Student Performance
Using a Trend Line Analysis:

# The Tukey Method

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## References

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National Center on Response to Intervention. (2013). *Brief #3: Common progress monitoring graph omissions: Making instructional decisions.* Progress monitoring brief series. https://files. eric.ed.gov/fulltext/ED578046.pdf

Parker, R., Tindal, G., & Stein, S. (1992). Estimating trend in progress monitoring data: A comparison of simple line-fitting methods. *School Psychology Review, 21*(2), 300–312. https:// doi.org/10.1080/02796015.1992.12085616