



ELEVATING STUDENT VOICE

Student Educational Equity Development (SEED) Survey

Student Educational Equity Development (SEED) Survey

Domain Score Technical Report

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Contents

Executive Summary..... 2

Introduction 3

Method 3

Results..... 5

 Access to Learning Resources 5

 Sense of Belonging 9

 Representation..... 9

 General Belonging..... 12

 Opportunity to Learn 15

 English Language Arts 15

 Mathematics 25

 Science 36

 Self-Efficacy 47

 English Language Arts 47

 Mathematics 55

 Science 64

 Career Connected Learning 73

 Well-Rounded Education 76

Discussion 79

Glossary 81

Executive Summary

In September 2025, the Oregon Department of Education (ODE) created and published a collection of domain score data files for the 2024-2025 Student Educational Equity Development (SEED) Survey. This report provides detailed information about how ODE created and validated the SEED Survey domain scores. Key takeaways include:

- ODE analyzed the following domains: Access to Learning Resources, Sense of Belonging (Representation, General Belonging), Opportunity to Learn (English Language Arts, Mathematics, Science), Self-Efficacy (English Language Arts, Mathematics, Science), Career Connected Learning, and Well-Rounded Education.
- Results indicated that it was reasonable to create domain scores for all domains that were analyzed, except for Opportunity to Learn ELA (3rd grade only) due to low marginal reliability.
- ODE created domain scores for all domains except for Opportunity to Learn ELA (3rd grade only). Domain scores were calculated by assigning a set of 'response points' to each item on the survey. Response points for all items included in the score were summed together, divided by the total possible points, and multiplied by 100. In other words: **Domain score = [sum of response points ÷ total points] × 100.**
- SEED Survey Domain Scores Data files can be found on the [SEED webpage](#). ODE plans to release these files as a part of our regular annual reporting.

A [glossary](#) that defines analytic terms, along with relevant citations, is included at the end of this report.

Introduction

The [Student Educational Equity Development \(SEED\) Survey](#) is administered annually to students in grades 3-11 across Oregon. It asks about schooling experiences and is meant to be used to identify systemic strengths and areas for growth – from the perspective of students who are served by Oregon’s K-12 public education system. The SEED Survey includes items about the following domains: Access to Learning Resources, Sense of Belonging (Representation, General Belonging), Opportunity to Learn (English Language Arts, Mathematics, Science, Tribal History/Shared History), Self-Efficacy (English Language Arts, Mathematics, Science), Post-Graduation Planning, Extracurricular Engagement, Career Connected Learning, and Well-Rounded Education¹. In September 2025, the Oregon Department of Education (ODE) created and published a collection of SEED Survey Domain Score Data files at the state, ESD boundary, and district level. Each file was parsed by grade and student group.

Domain scores were created in direct response to feedback ODE heard from schools, districts, our Technical Advisory Committee, and other community partners regarding how to more effectively share data. Our goal was to develop a measure that was simple enough to be interpretable and actionable for districts, while remaining statistically sound. In this report, ODE researchers and psychometricians provide detailed information about how we created and validated the domain scores.

Method

ODE analyzed data from the 2024-2025 SEED Survey to develop the domain scores. A total of 180,076 students took the SEED Survey, representing 47% of all eligible students. More information about the survey and student sample can be found in the [2024-2025 SEED Survey State Report](#).

The evaluation team selected the following domains to analyze: Access to Learning Resources, Sense of Belonging (Representation, General Belonging), Opportunity to Learn (English Language Arts, Mathematics, Science), Self-Efficacy (English Language Arts, Mathematics, Science), Career Connected Learning, and Well-Rounded Education. More information about which items we analyzed is provided in the [results](#) section of this report.²

We took the following steps when analyzing the data:

1. **Descriptive Statistics.** We first examined the distributions of each item. Some items on the SEED Survey are the same across each grade, while other items are different from one grade to the next. We created histograms across grades for items that were the

¹ For more information, refer to [SEED Survey Domains and Sample Items](#).

² ODE prioritized analyzing the core SEED domains. Additional domains were then analyzed as time permitted based on input from other ODE offices and from schools and district partners who attended SEED office hours. Domain scores for two of remaining domains (Opportunity to Learn Tribal History/Shared History, Extracurricular Engagement) may be created in the future. A domain score for Post-Graduation Planning will not be created as the associated items are better suited to item-level analysis than aggregation.

Student Educational Equity Development (SEED) Survey

same in each grade. We created histograms within each grade for items that varied from one grade to the next.

2. **Dimensionality.** We then conducted a [principal components analysis \(PCA\)](#) and examined [scree plots](#) for each domain to identify how many components (i.e., underlying concepts) were present. We conducted PCAs across grades for domains that included items that were the exact same in each grade. We conducted PCAs within each grade for domains that included items that varied from one grade to the next.
3. **Rasch Modeling.** Next, we specified [Rasch models](#) for each domain to identify which items to retain and to assess if the retained items could estimate the domain with sufficient precision and accuracy. When doing so, we examined [residual correlations](#), [infit](#), and [marginal reliability](#). We used [Expected a Posteriori \(EAP\)](#) to provide reasonable estimates in the case of missingness.
4. **Validation.** Lastly, we calculated domain scores and assessed the comparability of the scores to the Rasch models via correlations. We considered a correlation of $\geq .95$ to indicate that the domain score was sufficiently analogous to the Rasch model. Domain scores were calculated by assigning a set of 'response points' to each item on the survey. For example, if an item had four response options, the lowest option was assigned zero response points and the highest was assigned three (e.g., Strongly Disagree = 0, Disagree = 1, Agree = 2, Strongly Agree = 3). Response points for all items included in the score were summed together, divided by the total possible points, and multiplied by 100. In other words: **Domain score = [sum of response points ÷ total points] × 100**. Students were included in the calculation if they answered at least one item for that contributed to the given score. Skipped items were not included and were treated as missing.

Student	Item	Response	Response Points	Possible Points
Barbara	1	Strongly Agree	3	3
Barbara	2	Disagree	1	3
Barbara	3	Strongly Disagree	0	3
Barbara	4	Skip	Null	Null
Barbara	5	Agree	2	3
Barbara	6	Strongly Agree	3	3
Total			9	15

Example Domain Score Calculation³:

$$\text{Domain score} = [9 \div 15] \times 100 = 60$$

³ Because Barbara skipped Item 4, that response was not included in the domain score calculation. Additionally - For validation purposes, scores were calculated at the student level. However, in reporting scores are calculated at the level they are aggregated at.

Results

Access to Learning Resources

We included all **Access to Learning Resources** items in our analysis:

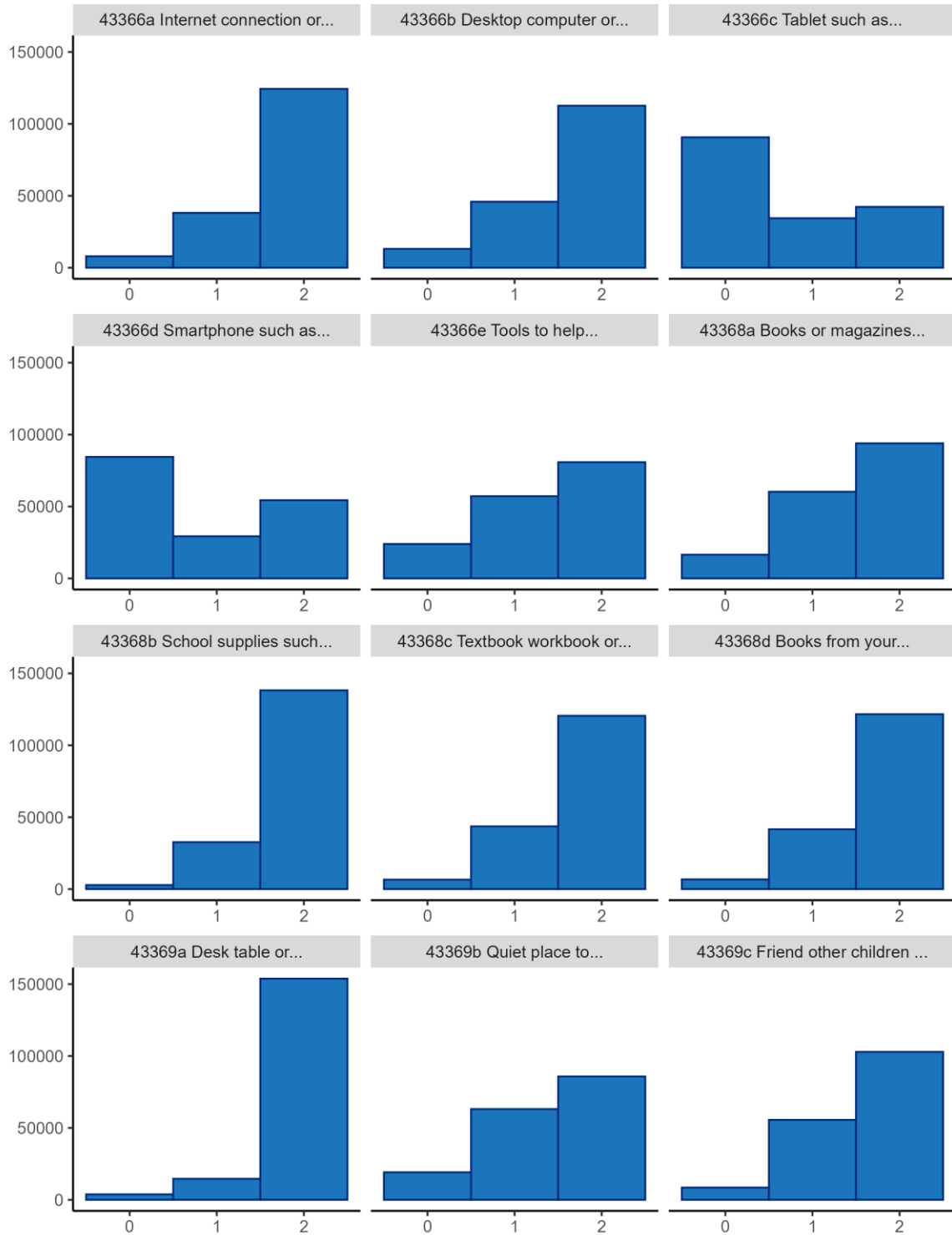
3 rd to 11 th Grade
43366a: Are these things available to help you with your school work? Internet connection or Wi-Fi
43366b: Are these things available to help you with your school work? Desktop computer or laptop (such as Chromebook or similar)
43366c: Are these things available to help you with your school work? Tablet (such as iPad or similar)
43366d: Are these things available to help you with your school work? Smartphone (such as iPhone or similar)
43366e: Are these things available to help you with your school work? Tools to help you talk with your teacher and other students (such as headphones, microphones or similar)
43368a: Are these things available to help you with your school work? Books or magazines to read for fun
43368b: Are these things available to help you with your school work? School supplies (such as paper, pencil, etc.)
43368c: Are these things available to help you with your school work? Textbook, workbook, or other things provided by your school
43368d: Are these things available to help you with your school work? Books from your class library, school library, or public library
43369a: Are these things available to help you with your school work? Desk, table, or flat writing surface
43369b: Are these things available to help you with your school work? Quiet place to do school work (such as an office or bedroom)
43369c: Are these things available to help you with your school work? Friend, other children, or adults (not including your teachers)
43369d: Are these things available to help you with your school work? Quiet time to do school work with few distractions
43369e: Are these things available to help you with your school work? Tutoring or extra help not provided by your school

Note. *Response Options:* No, Not Available (0), Yes, Sometimes Available (1), Yes, Always Available (2)

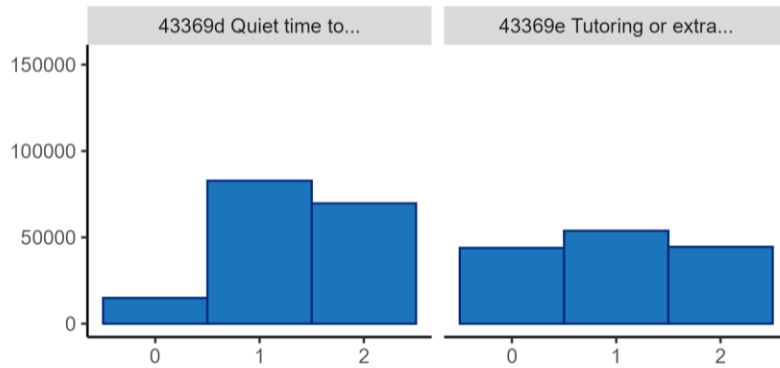
Descriptive Statistics

Item histograms are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).

Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Dimensionality

We selected a one component solution based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figure below (plot #1). The one, two, and three component solutions explained a meaningful amount of variance.

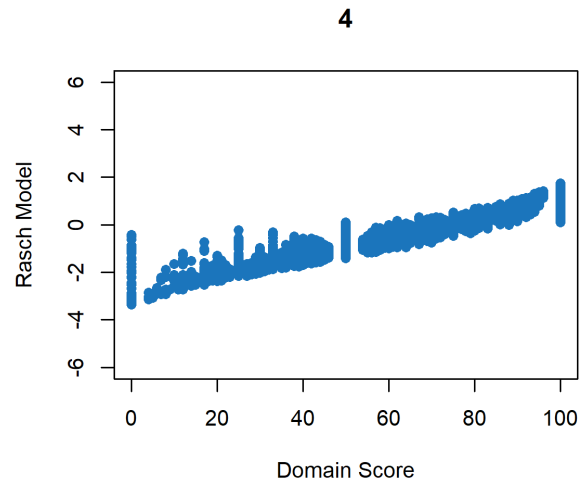
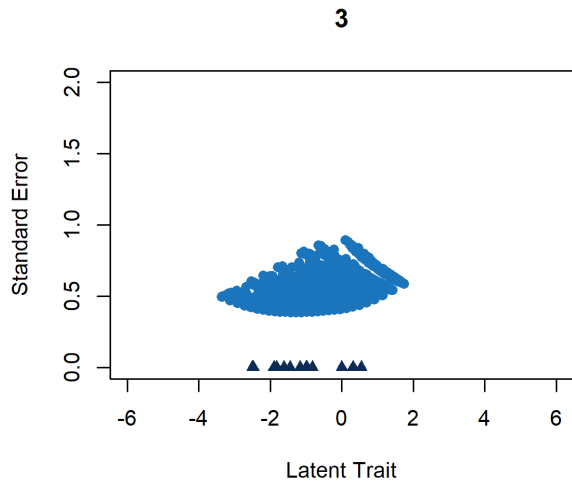
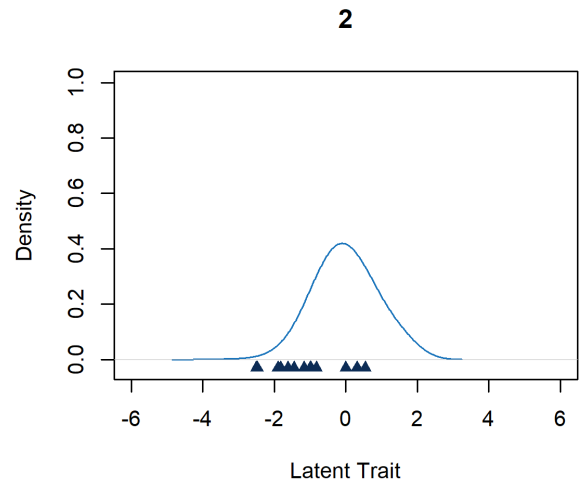
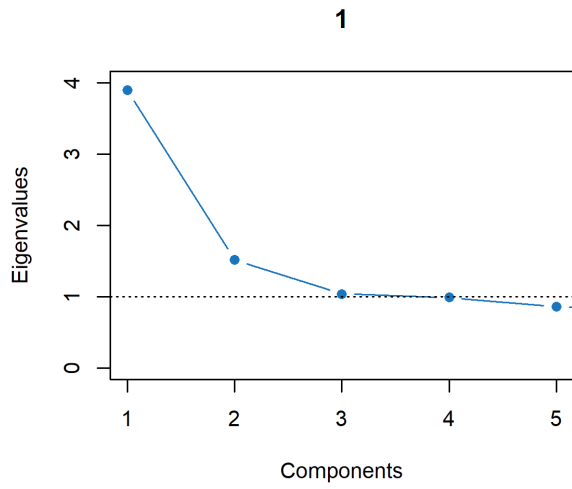
Rasch Modeling

We retained all items based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (-.30 to .19) and [infit](#) (.85 to 1.0). The figure (plot #2) shows each [item's location](#) across the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -3 and 1. The figure (plot #3) maps the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) was .77 and therefore acceptable.

Validation

The figure (plot #4) displays the correlation between the Rasch model (y-axis) and the domain score (x-axis). The correlation was .98, suggesting that the domain score is an acceptable representation of the Rasch model.

Student Educational Equity Development (SEED) Survey



Sense of Belonging

Sense of Belonging is parsed into two areas: Representation and General Belonging.

Representation

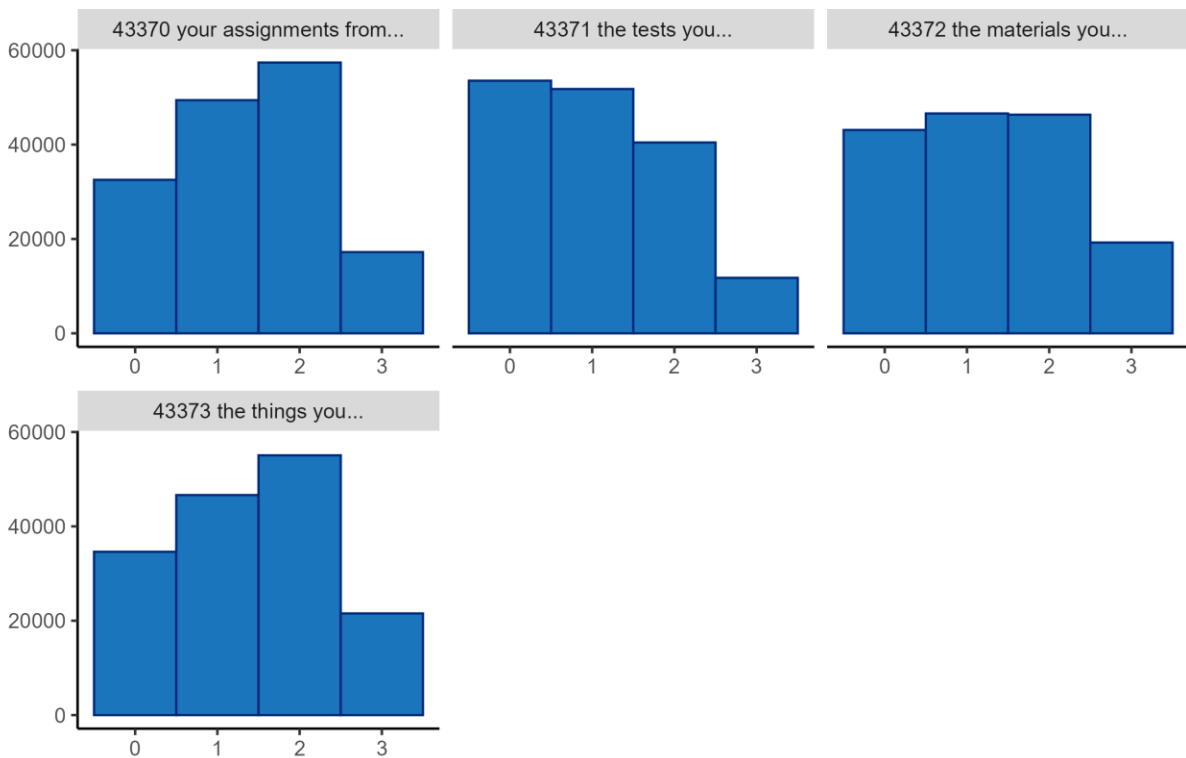
We included all **Representation** items in our analysis:

3 rd to 11 th Grade
43370: Think about your assignments from this school year. How often did they have pictures or stories of people who are like you and your family?
43371: Think about the tests you took this school year. How often did they have pictures or stories of people who are like you and your family?
43372: Think about the materials you used in class this school year. These could be textbooks, workbooks, or online materials. How often did they have pictures or stories of people who are like you and your family?
43373: Think about the things you read in class this school year. These things could be articles, stories, or books. How often did they show people who are like you and your family?

Note. *Response Options*: Never (0), Rarely (1), Sometimes (2), Often (3)

Descriptive Statistics

Item histograms are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).



Dimensionality

We selected a one component solution based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figure below (plot #1). The one component solution was the only solution that explained a meaningful amount of variance.

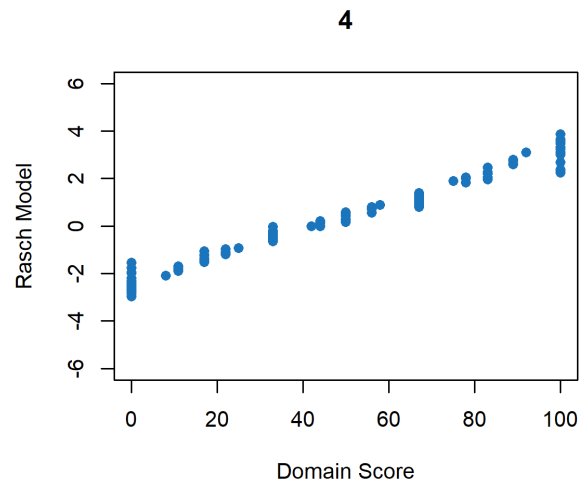
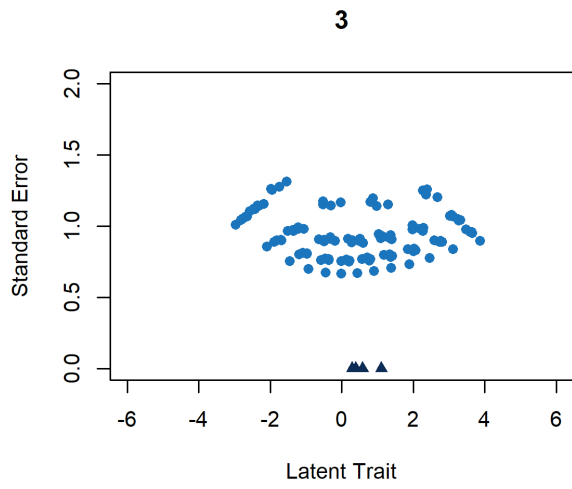
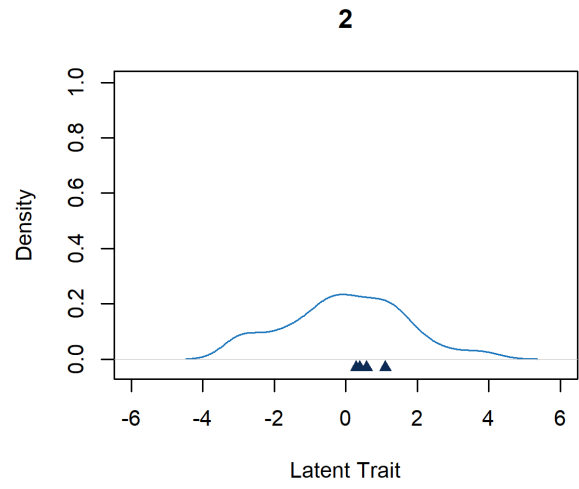
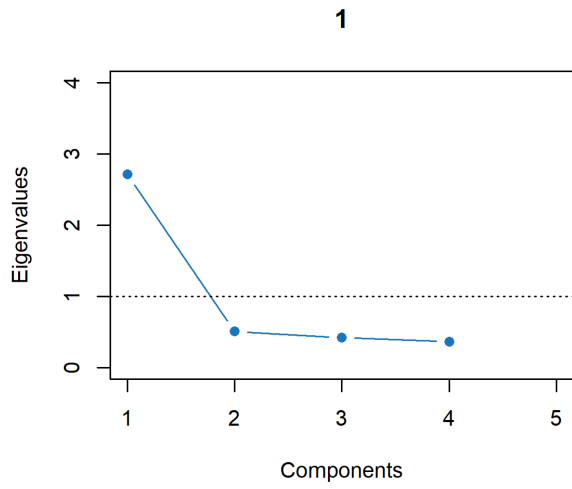
Rasch Modeling

We retained all items based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (-.14 to .16) and [infit](#) (.71 to .80). The figure (#2) plots each [item's location](#) onto the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between 0 and 2. The figure (#3) maps the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) was .81 and therefore acceptable.

Validation

The figure (#4) displays the correlation between the Rasch model (y-axis) and the domain score (x-axis). The correlation was .99, suggesting that the domain score is an acceptable representation of the Rasch model.

Student Educational Equity Development (SEED) Survey



General Belonging

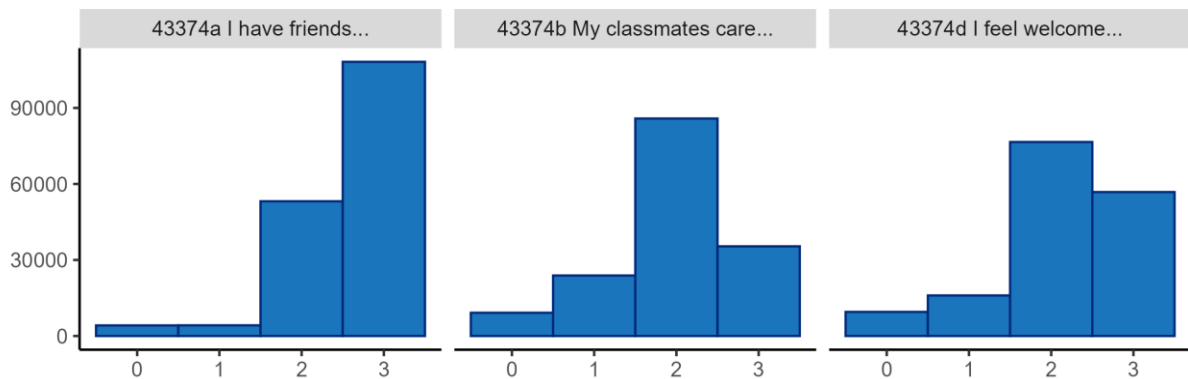
We included the following **General Belonging** items in our analysis⁴:

3 rd to 11 th Grade
43374a: Think about this school year and the people at your school. How much do you agree with each statement? I have friends at school.
43374b: Think about this school year and the people at your school. How much do you agree with each statement? My classmates care about me.
43374d: Think about this school year and the people at your school. How much do you agree with each statement? I feel welcome at my school.
43375a: Think about this school year and the people at your school. How much do you agree with each statement? There are adults at my school who care about me.
43375b: Think about this school year and the people at your school. How much do you agree with each statement? I feel safe talking with adults at my school
43375c: Think about this school year and the people at your school. How much do you agree with each statement? I feel safe talking with students at my school.
43375d: Think about this school year and the people at your school. How much do you agree with each statement? I like going to school.

Note. *Response Options*: Strongly Disagree (0), Disagree (1), Agree (2), Strongly Agree (3)

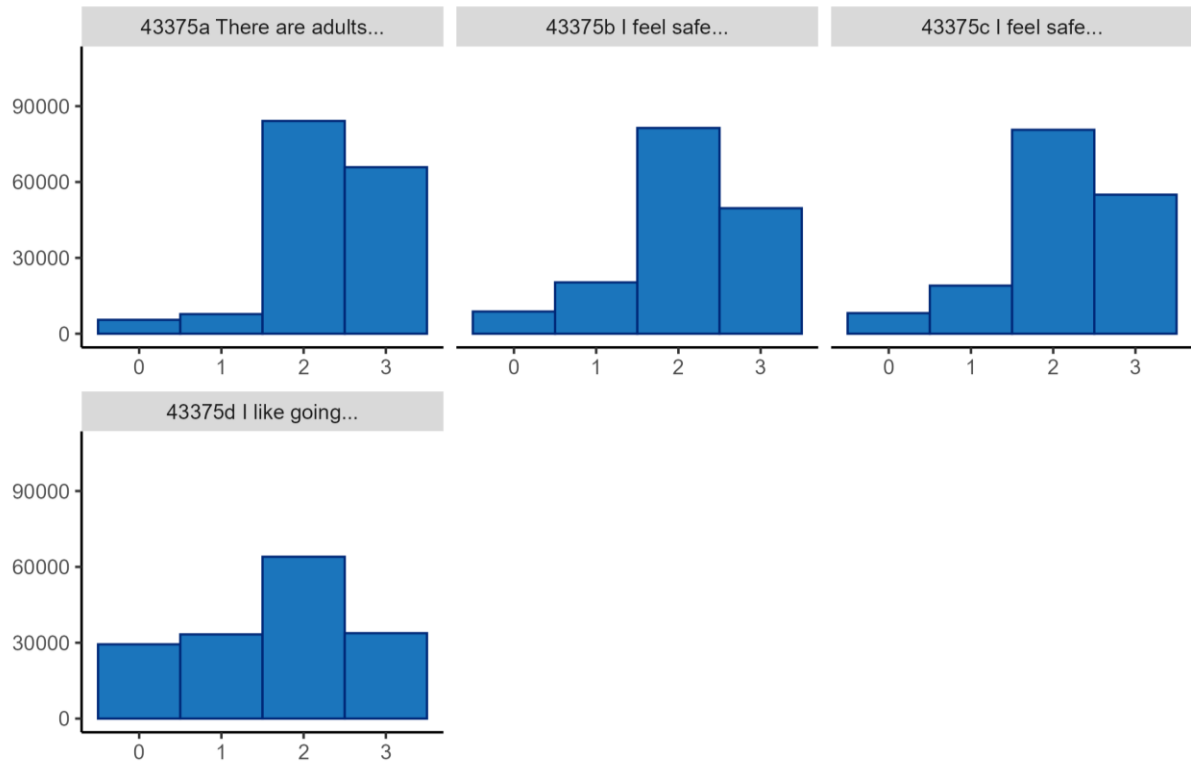
Descriptive Statistics

Item histograms are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).



⁴ We excluded two General Belonging items from our analysis (“There are adults at my school who are like me and my family” and “I have classmates who are like me and my family”).

Student Educational Equity Development (SEED) Survey



Dimensionality

We selected a one component solution based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figure below (#1). The one component solution was the only solution that explained a meaningful amount of variance.

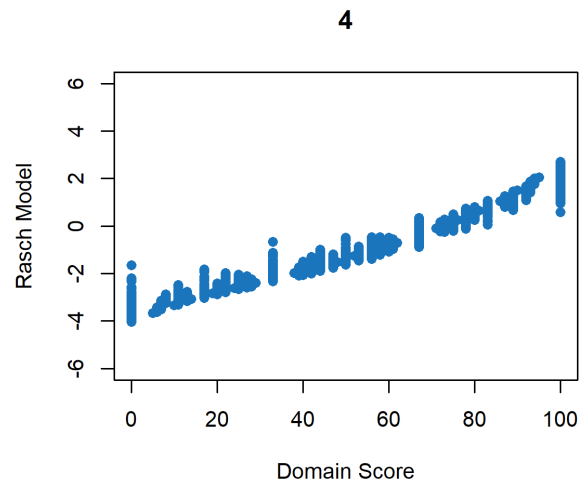
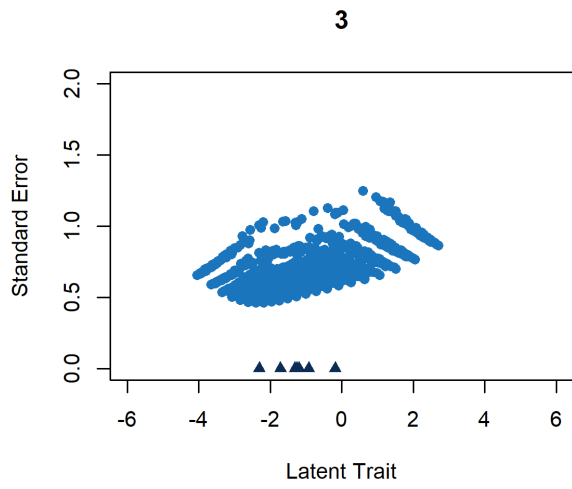
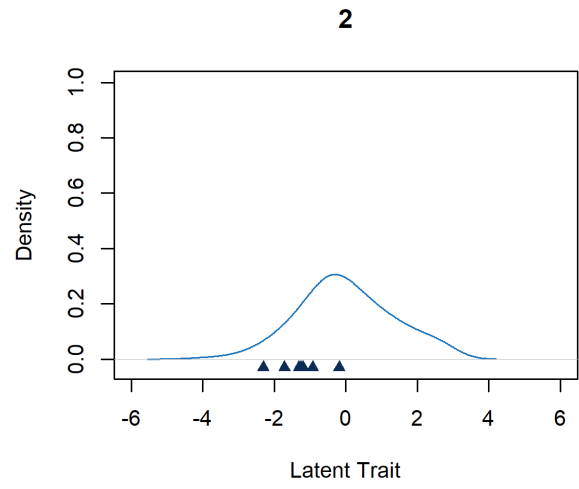
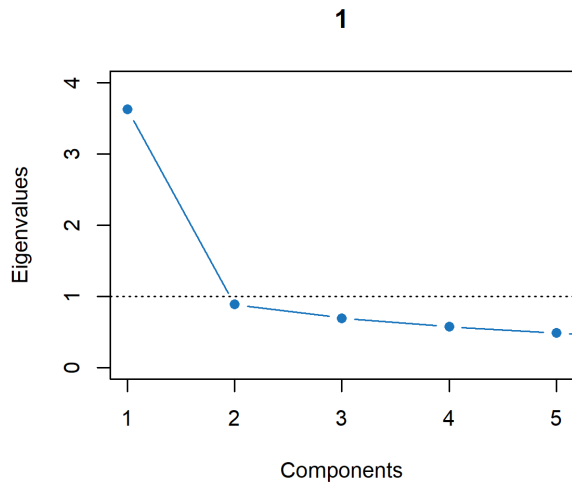
Rasch Modeling

We retained all items based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (-.29 to .16) and [infit](#) (.71 to 1.06). The figure (#2) plots each [item's location](#) onto the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -3 and 0. The figure (#3) maps the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) was .81 and therefore acceptable.

Validation

The figure (#4) displays the correlation between the Rasch model (y-axis) and the domain score (x-axis). The correlation was .98, suggesting that the domain score is an acceptable representation of the Rasch model.

Student Educational Equity Development (SEED) Survey



Opportunity to Learn

Opportunity to Learn is parsed into three areas: English Language Arts (ELA), Mathematics, and Science.⁵

English Language Arts

Opportunity to Learn ELA is only included on the SEED Survey in grades 3, 6, and 9. We included the following **Opportunity to Learn ELA** items in our analysis:⁶

3 rd Grade	6 th Grade	9 th Grade
43376a: Think about what you did for reading time this year. How often did you do the following? Talk about new or difficult vocabulary words with your teacher or classmates.	43408a: Think about what you did in your language arts class this year. How often did you do the following? Have a class discussion about something that the whole class has read.	43437a: Think about what you did in your high school language arts classes. How often did you do the following? Make a presentation to the class about something that you have read.
43376b: Think about what you did for reading time this year. How often did you do the following? Talk with the whole class about something the class has read.	43408b: Think about what you did in your language arts class this year. How often did you do the following? Work in pairs or small groups to talk about something that you have read.	43437b: Think about what you did in your high school language arts classes. How often did you do the following? Do a project about something that you have read (such as create a video or website).
43376c: Think about what you did for reading time this year. How often did you do the following? Work in pairs or small groups to talk about something that you have read.	43409a: Think about what you did in your language arts class this year. How often did you do the following? Evaluate the main evidence in a persuasive/argumentative text.	43437c: Think about what you did in your high school language arts classes. How often did you do the following? Have a class discussion about something that the whole class has read.
43377a: Think about what you did for reading time this year. How often did your teacher ask you to write about what you read?	43409b: Think about what you did in your language arts class this year. How often did you do the following? Analyze the author’s organization of information in the text.	43437d: Think about what you did in your high school language arts classes. How often did you do the following? Discuss different interpretations of what you have read.
43390: Think about what you did for reading time this year. How often did you borrow books or magazines from your classroom library, school library, or media center?	43409c: Think about what you did in your language arts class this year. How often did you do the following? Summarize the text.	43437e: Think about what you did in your high school language arts classes. How often did you do the following? Work in pairs or small groups to talk about something that you have read.

⁵ The SEED Survey also includes a fourth Opportunity to Learn area (Tribal History/Shared History), which was not included in this analysis.

⁶ We excluded one Opportunity to Learn ELA item from our analysis (“Besides doing homework, how much time do you spend reading outside of school?”). This item was excluded due to the differing response format and context.

Student Educational Equity Development (SEED) Survey

3 rd Grade	6 th Grade	9 th Grade
	43409d: Think about what you did in your language arts class this year. How often did you do the following? Interpret the meaning of the text.	43438a: Think about what you did in your high school language arts classes. How often did you do the following? Evaluate the main evidence in an argumentative text.
	43410a: Think about what you did in your language arts class this year. How often did you do the following? Question the motives or feelings of the characters.	43438b: Think about what you did in your high school language arts classes. How often did you do the following? Analyze the author’s organization of information in the text.
	43410b: Think about what you did in your language arts class this year. How often did you do the following? Identify the main ideas of the text.	43438c: Think about what you did in your high school language arts classes. How often did you do the following? Analyze the author’s point of view or purpose within a text.
	43410c: Think about what you did in your language arts class this year. How often did you do the following? Identify the themes of the text.	43438d: Think about what you did in your high school language arts classes. How often did you do the following? Summarize the text.
	43411a: Think about your language arts class this year. How often did your assignments ask you to write several sentences?	43438e: Think about what you did in your high school language arts classes. How often did you do the following? Interpret the meaning of the text.
	43412a: Think about your language arts class this year. How often did you borrow books or magazines from your school library or media center?	43439a: Think about what you did in your high school language arts classes. How often did you do the following? Question the motives or feelings of the characters.
		43439b: Think about what you did in your high school language arts classes. How often did you do the following? Identify the main ideas of the text.
		43439c: Think about what you did in your high school language arts classes. How often did you

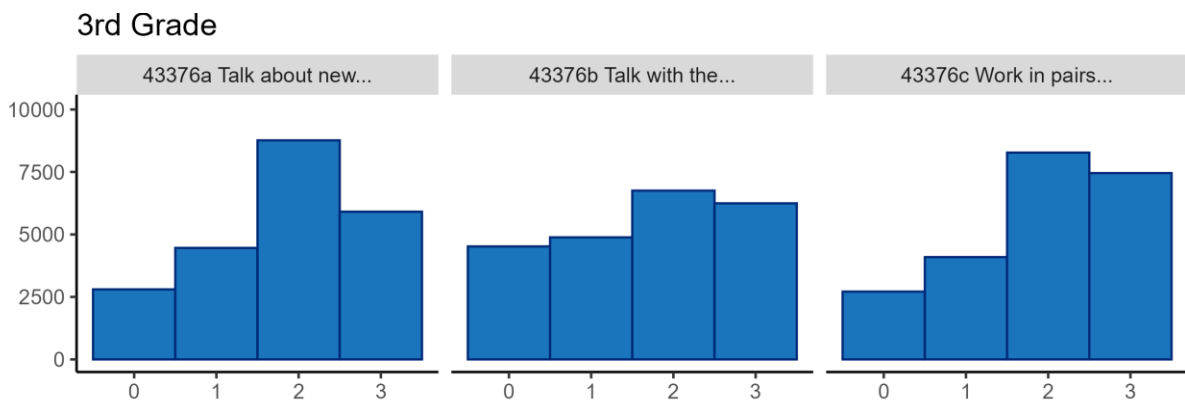
Student Educational Equity Development (SEED) Survey

3 rd Grade	6 th Grade	9 th Grade
		do the following? Identify the themes of the text.
		43439d: Think about what you did in your high school language arts classes. How often did you do the following? Analyze two or more texts on the same topic.
		43440a: Think about what you did in your high school language arts classes. How often did your assignments ask you to write several sentences or paragraphs?
		43441a: Think about what you did in your high school language arts classes. How often did you use books, magazines, or digital resources from your school library or media center?

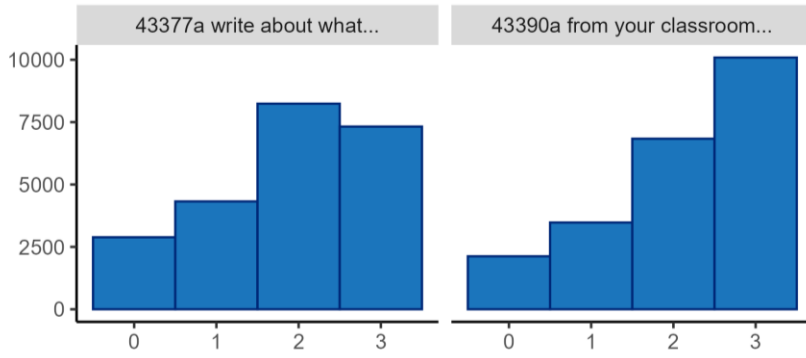
Note. *Response Options:* Never (0), Rarely (1), Sometimes (2), Often (3)

Descriptive Statistics

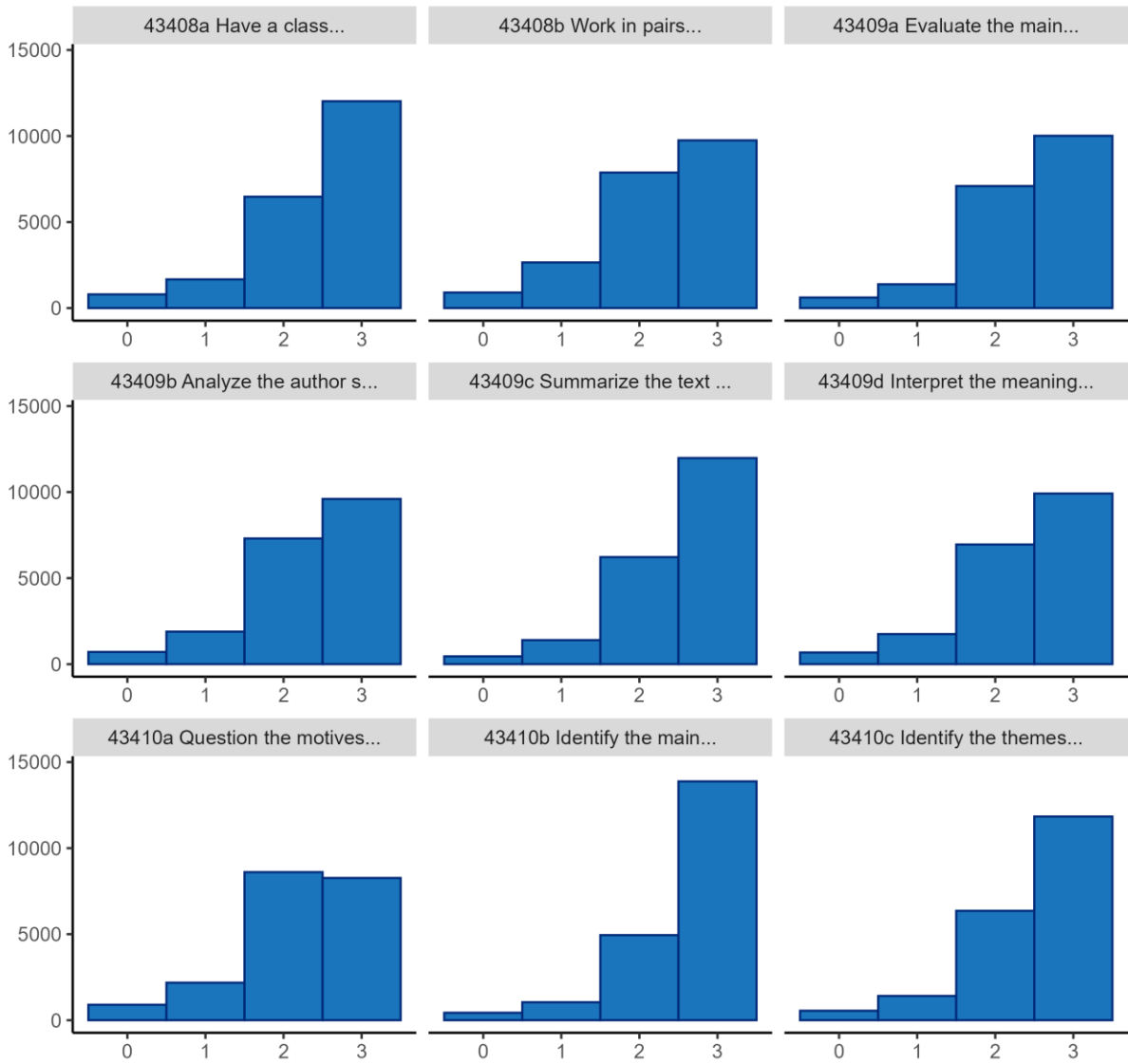
Item histograms for **Opportunity to Learn ELA** are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).



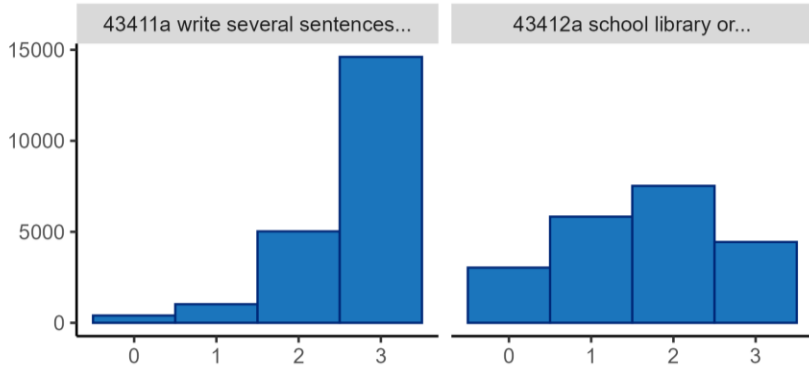
Student Educational Equity Development (SEED) Survey



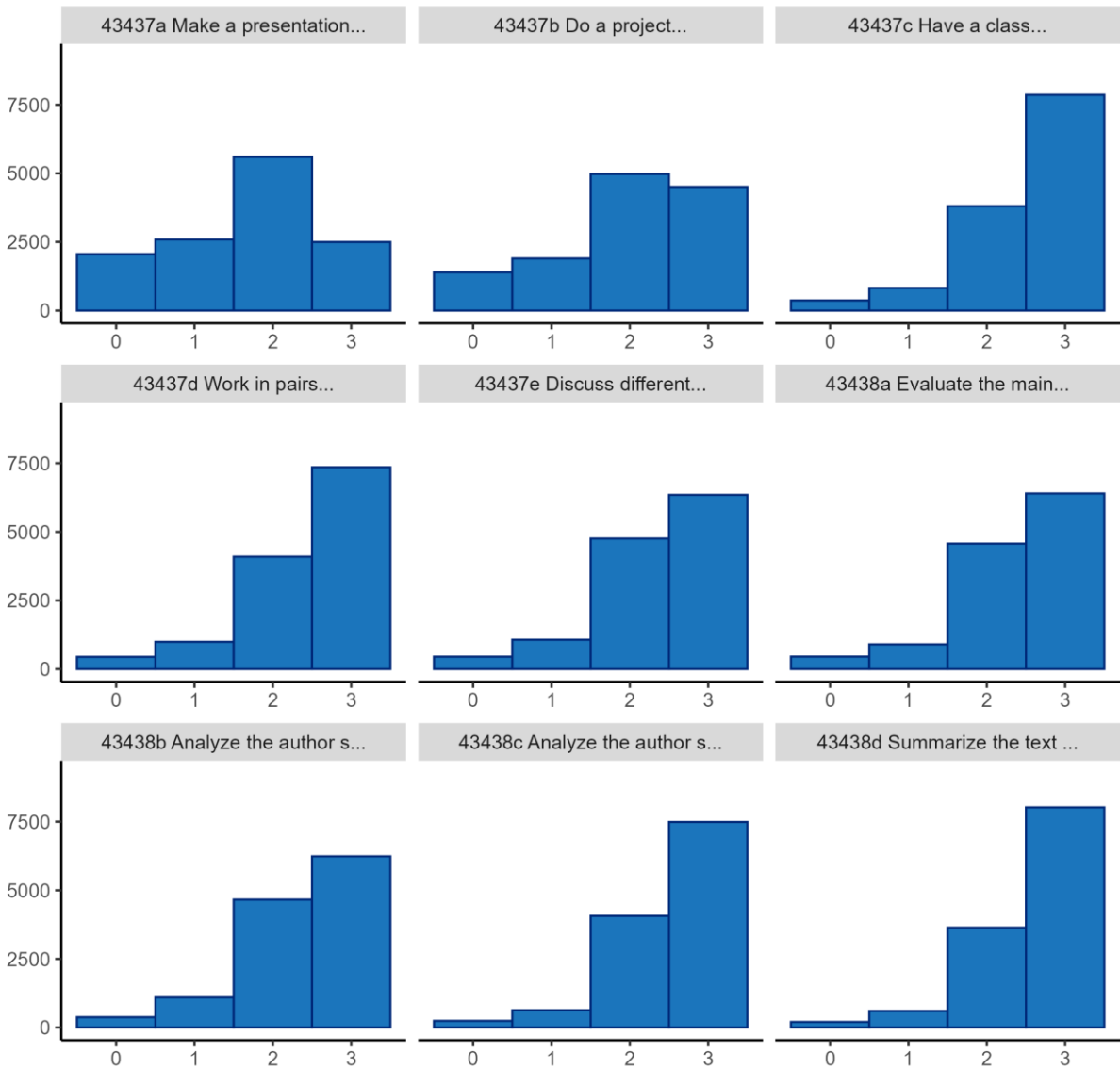
6th Grade



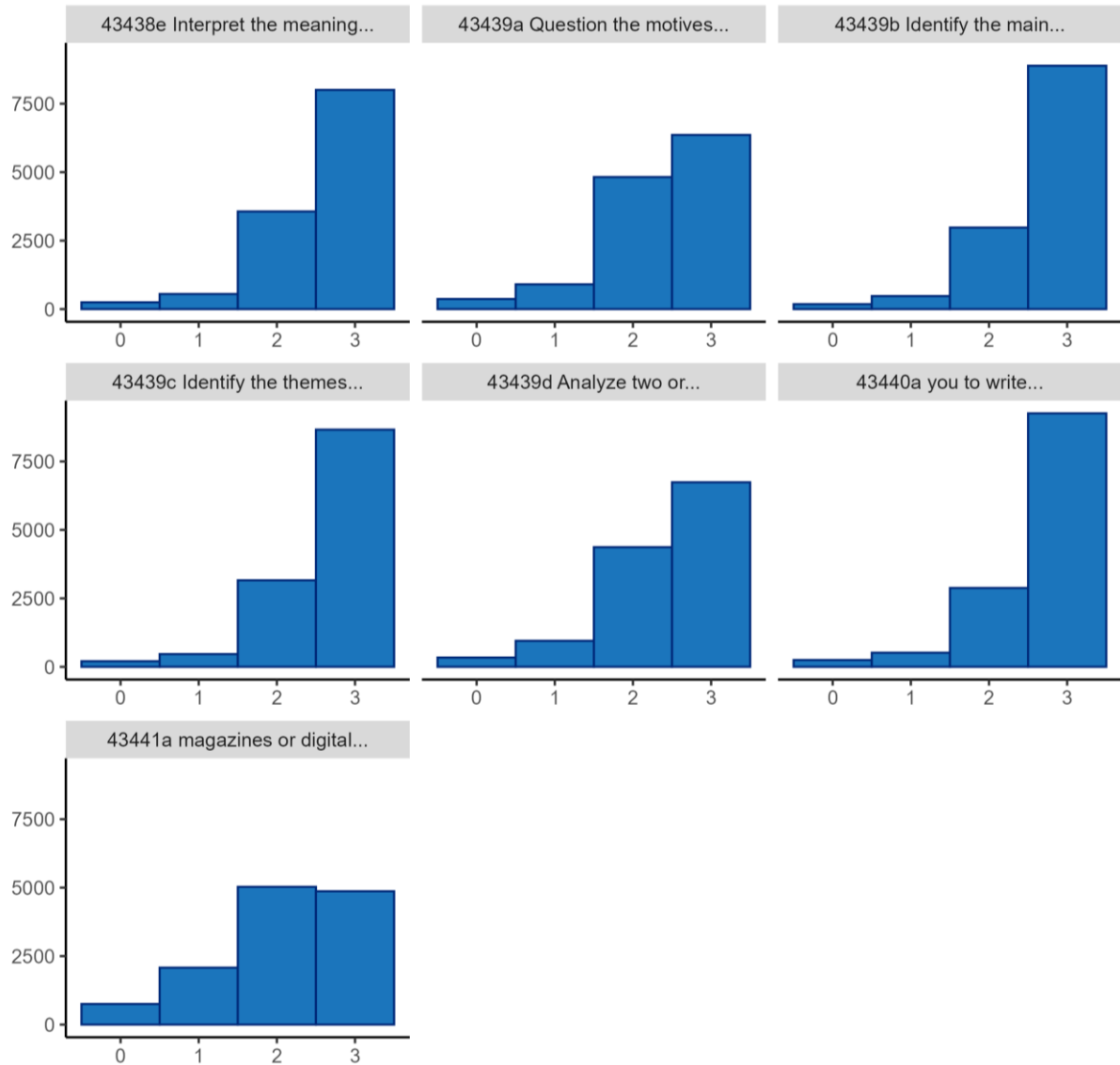
Student Educational Equity Development (SEED) Survey



9th Grade



Student Educational Equity Development (SEED) Survey



Dimensionality

3rd, 6th, and 9th Grade: We selected a one component solution for 3rd, 6th, and 9th grade based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figures (#1). A one component solution was the only solution that explained a meaningful amount of variance for 3rd and 6th grade. The one and two component solutions explained a meaningful amount of variance for 9th grade.

Rasch Modeling

3rd Grade: No items were retained for 3rd grade Opportunity to Learn ELA. While items showed acceptable [residual correlations](#) (-.05 to .10) and [infit](#) (.75 to .98), the [marginal reliability](#) was unacceptably low (.55 or 55 percent) because close to half of the total variation in the latent trait (approximately 45 percent) was due to measurement error. The removal of potentially misfitting items did not increase the marginal reliability to an acceptable range; thus, the

Student Educational Equity Development (SEED) Survey

decision was made to not calculate a domain score for these items. The figure (#2) plots each onto the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -1 and 0. The figure (#3) maps the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis).

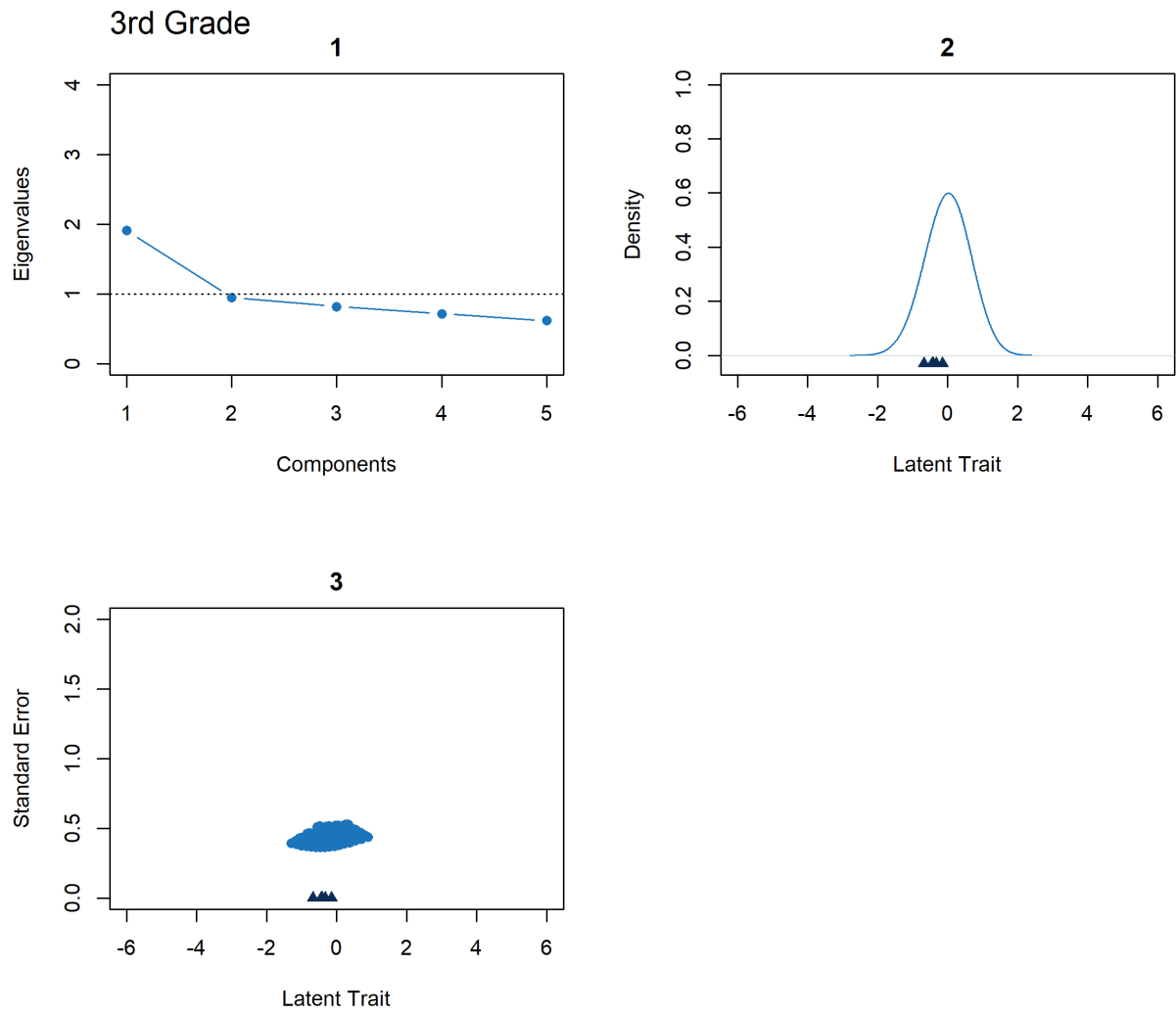
6th and 9th Grade: We retained all items for 6th and 9th grade based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (6th grade: .05 to .20; 9th grade: -.20 to .30) and [infit](#) (6th grade: .77 to 1.3; 9th grade: .73 to 1.3). The figures (#2) plot each [item's location](#) onto the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -2 and 0 for 6th grade and -3 and 0 for 9th grade. The figures (#3) map the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) (6th grade: .77; 9th grade: .85) was acceptable.

Validation

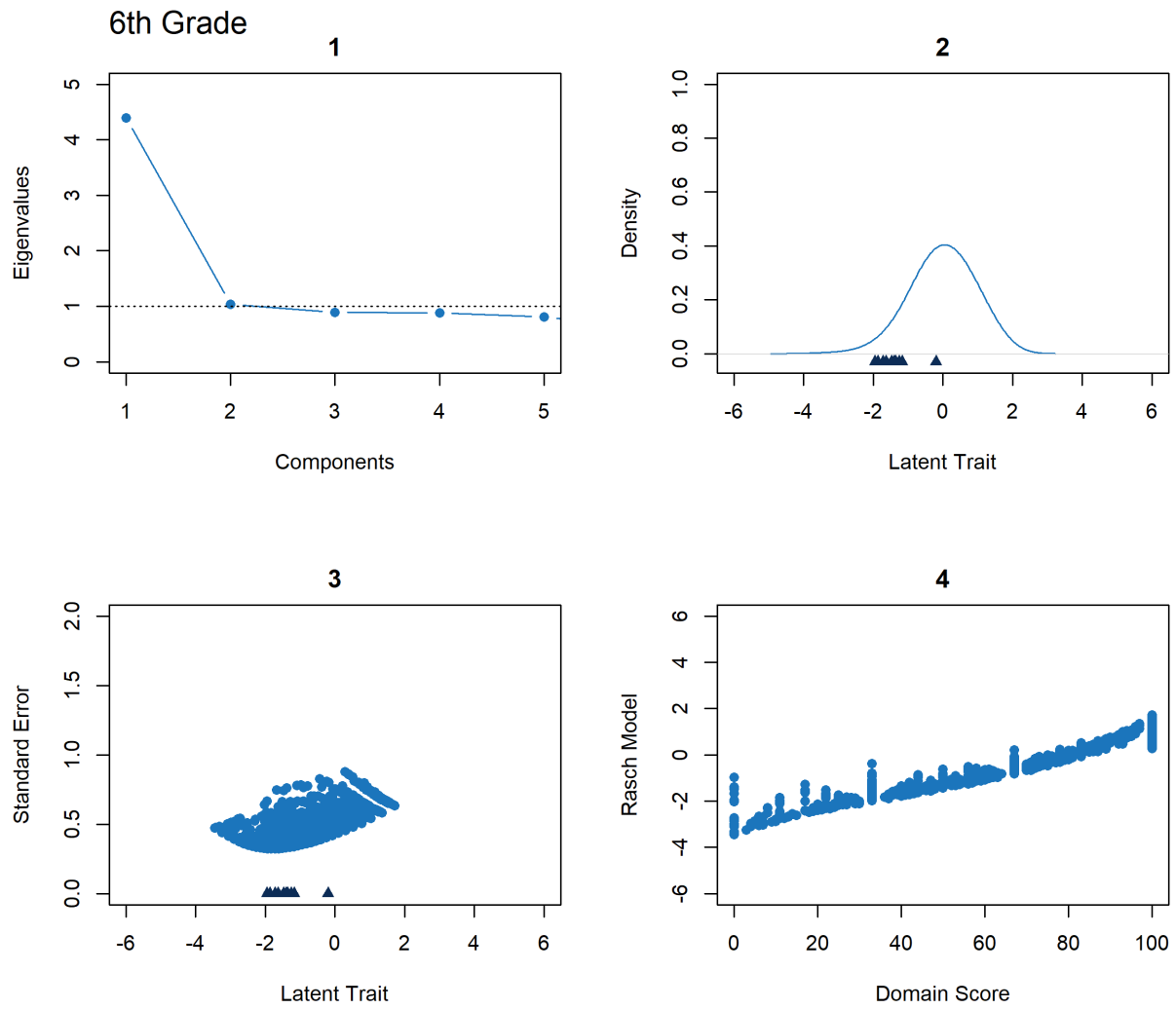
3rd Grade: Because we chose to not calculate a 3rd grade domain score, we did not generate a plot of the correlation between the Rasch model and domain score.

6th and 9th Grade: The figures (#4) display the correlation between the Rasch model (y-axis) and the domain score (x-axis) for 6th and 9th grade. The correlation for 6th grade was .96 and for 9th grade was .95, suggesting that the domain scores are acceptable representations of the Rasch models.

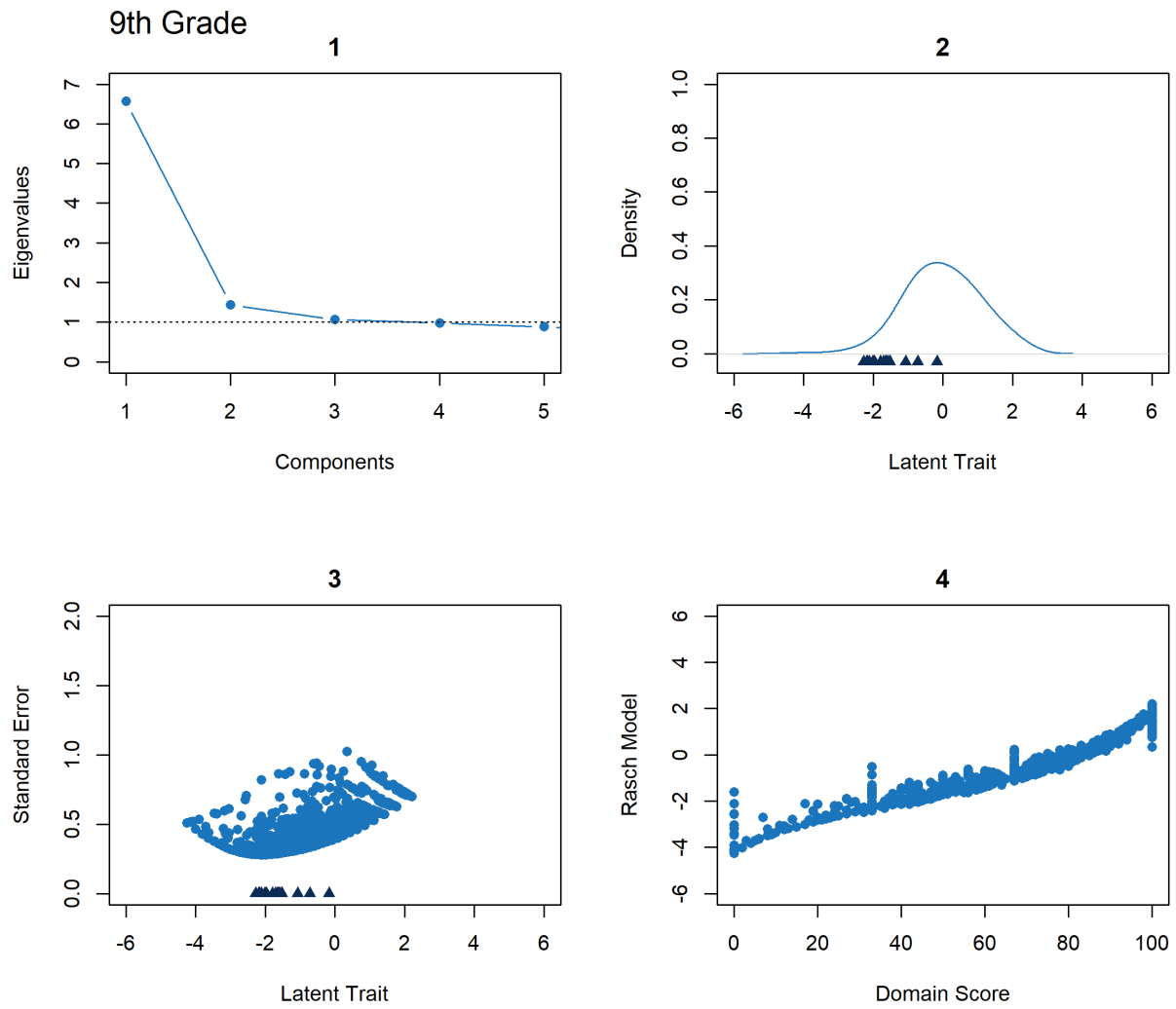
Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Mathematics

Opportunity to Learn Mathematics is only included on the SEED Survey in grades 4, 7, and 10. We included all **Opportunity to Learn Mathematics** items in our analysis:

4 th Grade	7 th Grade	10 th Grade
43378a: Think about what you did in your math class this year. How often did you use a computer or other digital device to solve math problems?	43378a: Think about what you did in your math class this year. How often did you use a computer or other digital device to solve math problems?	43444a: Think about what you did in your high school math classes. How often did you do the following? Discuss new or difficult math vocabulary with your teacher or classmates.
43379a: Think about what you did in your math class this year. How often did you do the following? Link what you are learning in math to things you already learned.	43397a: Think about what you did in your math class this year. How often did you do the following? Talk about new or difficult math vocabulary with your teacher or classmates.	43444b: Think about what you did in your high school math classes. How often did you do the following? Work in pairs or small groups to talk about a math problem.
43379b: Think about what you did in your math class this year. How often did you do the following? Show multiplication in more than one way. (For example, array, repeated addition, skip-counting, etc., to multiply multi-digit numbers like 23 X 17.)	43397b: Think about what you did in your math class this year. How often did you do the following? Work in pairs or small groups to talk about a math problem.	43444c: Think about what you did in your high school math classes. How often did you do the following? Have a class discussion about a math problem your class is working on.
43379c: Think about what you did in your math class this year. How often did you do the following? Use a number line or visual model when solving a problem about fractions. (For example, which is larger, 1/5 or 1/4?)	43397c: Think about what you did in your math class this year. How often did you do the following? Talk with the whole class about a math problem the class was working on.	43445a: Think about what you did in your high school math classes. How often did you do the following? Your teacher gave you feedback on a math test or assignment. (Feedback is something helpful your teacher tells you or writes on your assignment.)
43397a: Think about what you did in your math class this year. How often did you do the following? Talk about new or difficult math	43398a: Think about what you did in your math class this year. How often did you do the following? You got	43445b: Think about what you did in your high school math classes. How often did you do the following? Your classmates gave you

Student Educational Equity Development (SEED) Survey

4 th Grade	7 th Grade	10 th Grade
vocabulary with your teacher or classmates.	help with math when you needed it.	feedback on a math test or assignment. (Feedback is something helpful your classmates tell you or write on your assignment.)
43397b: Think about what you did in your math class this year. How often did you do the following? Work in pairs or small groups to talk about a math problem.	43398a: Think about what you did in your math class this year. How often did you do the following? Your teacher gave you helpful comments on a math test or assignment.	43445c: Think about what you did in your high school math classes. How often did you do the following? You got help with math when you needed it.
43397c: Think about what you did in your math class this year. How often did you do the following? Talk with the whole class about a math problem the class was working on.	43398c: Think about what you did in your math class this year. How often did you do the following? Your classmates gave you helpful comments on a math test or assignment.	43446a: Think about what you did in your high school math classes. How often did you use different ways to show your thinking on a math problem (such as draw a picture, tell a story, or write an equation)?
43398a: Think about what you did in your math class this year. How often did you do the following? You got help with math when you needed it.	43399a: Think about what you did in your math class this year. How often did you use different ways to show your thinking on a math problem (such as draw a picture, tell a story, or write an equation)?	43447a: Think about what you did in your high school math classes. How often did you do the following? Connect what you are learning in your math class to math concepts you already learned.
43398a: Think about what you did in your math class this year. How often did you do the following? Your teacher gave you helpful comments on a math test or assignment.	43400: Think about what you did in your math class this year. How often did your math assignments ask you to write several sentences?	43447b: Think about what you did in your high school math classes. How often did you do the following? Use Desmos, Geogebra, or other online math tools.
43398c: Think about what you did in your math class this year. How often did you do the following? Your classmates gave you helpful comments on a math test or assignment.	43421a: Think about what you did in your math class this year. How often did you do the following? Connect what you are learning in your math class to math concepts you already learned.	43447c: Think about what you did in your high school math classes. How often did you do the following? Solve a system of linear equations both algebraically and graphically. (For example, you buy three markers and

Student Educational Equity Development (SEED) Survey

4 th Grade	7 th Grade	10 th Grade
		three notebooks for \$11.25. Your friend buys four markers and two notebooks for \$10.00. How much do markers cost? How much do notebooks cost?)
43399a: Think about what you did in your math class this year. How often did you use different ways to show your thinking on a math problem (such as draw a picture, tell a story, or write an equation)?	43421b: Think about what you did in your math class this year. How often did you do the following? Calculate and use a unit rate to solve math problems. (For example, which is the better deal, a 10-ounce drink for \$1.99 or a 12-ounce drink for \$2.29?)	43447d: Think about what you did in your high school math classes. How often did you do the following? Solve real-world problems using trigonometric ratios and properties of similar triangles. (For example, a tower casts a shadow that is 60 feet long when the angle of elevation of the sun is 65. How tall is the tower?)
43400: Think about what you did in your math class this year. How often did your math assignments ask you to write several sentences?	43421c: Think about what you did in your math class this year. How often did you do the following? Use a number line or visual model when solving a problem involving negative rational numbers. (For example, find the difference in altitude between a 1,493-foot mountain and a valley that is 38 feet below sea level.)	43447e: Think about what you did in your high school math classes. How often did you do the following? Analyze and interpret a set of data to make inferences and draw conclusions. (For example, a student is trying to determine whether to use the interquartile ranges or the standard deviations to compare the spread of two data sets. What additional information might the student need to determine how to compare the sets?)
	43421d: Think about what you did in your math class this year. How often did you do the following? Solve multi-step real-world problems by creating and solving simple equations using variables. (For example, the perimeter of a rectangle	43500a: Think about what you did in your high school math classes. How often did your math assignments ask you to write several sentences?

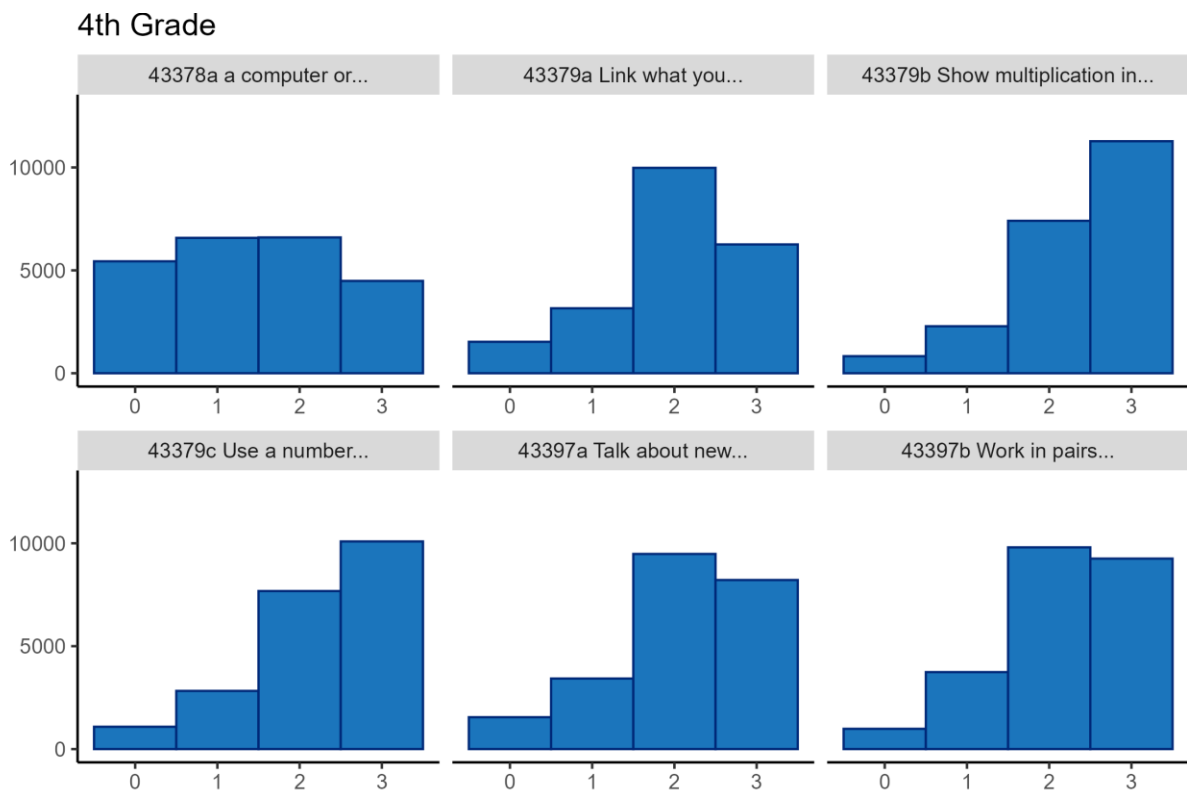
Student Educational Equity Development (SEED) Survey

4 th Grade	7 th Grade	10 th Grade
	is 54 cm. Its length is 6 cm. What is its width?)	
		43501a: Think about what you did in your high school math classes. How often did you use a computer or other digital device to solve math problems?

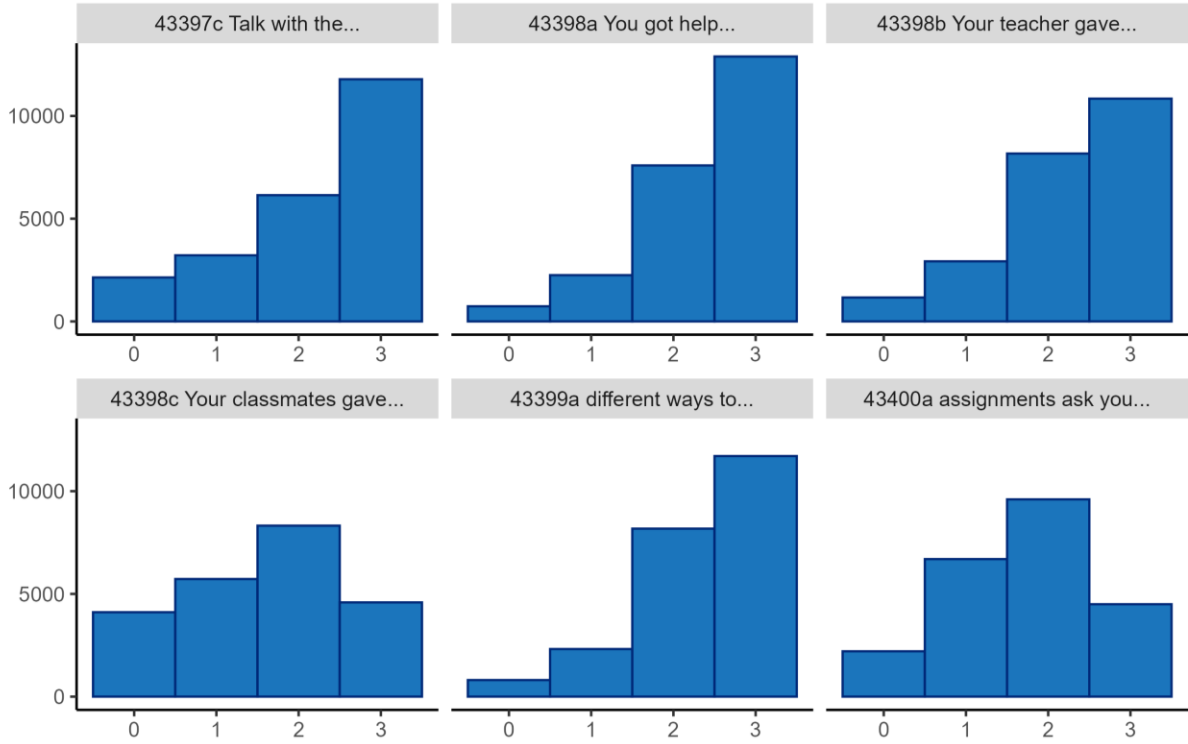
Note. Response Options: Never (0), Rarely (1), Sometimes (2), Often (3)

Descriptive Statistics

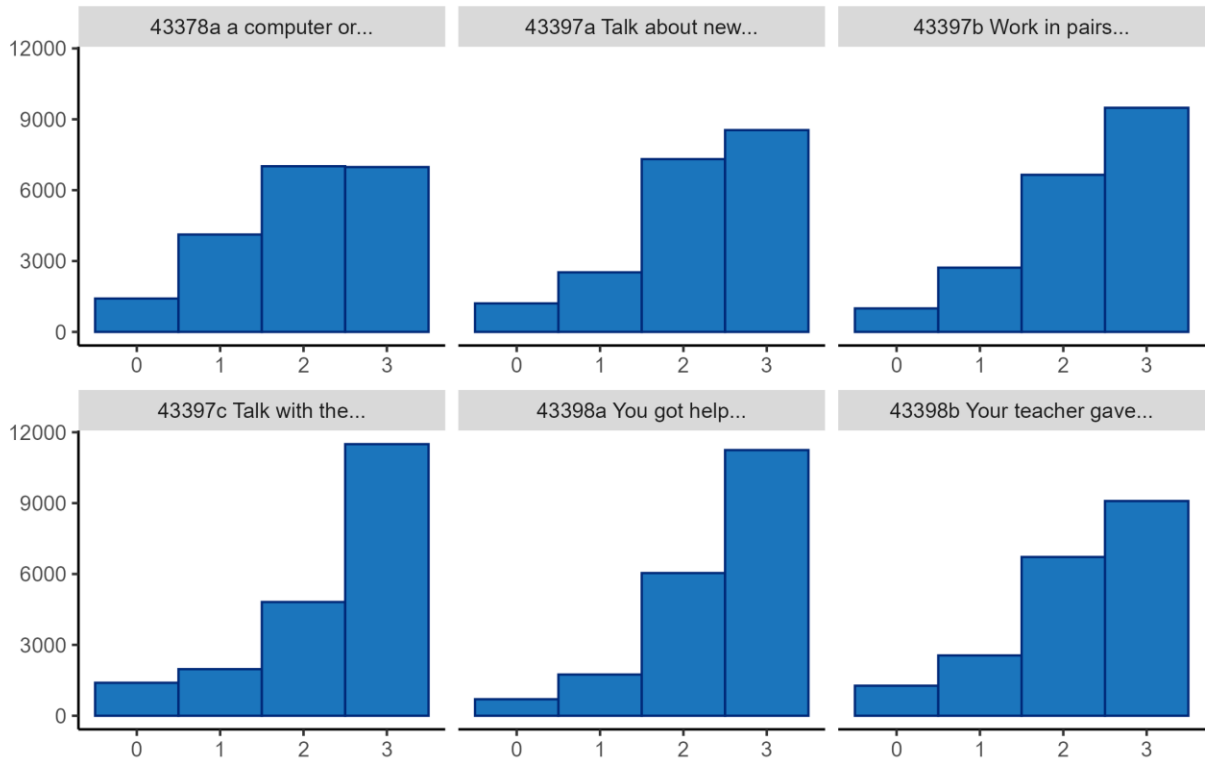
Item histograms for **Opportunity to Learn Mathematics** are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).



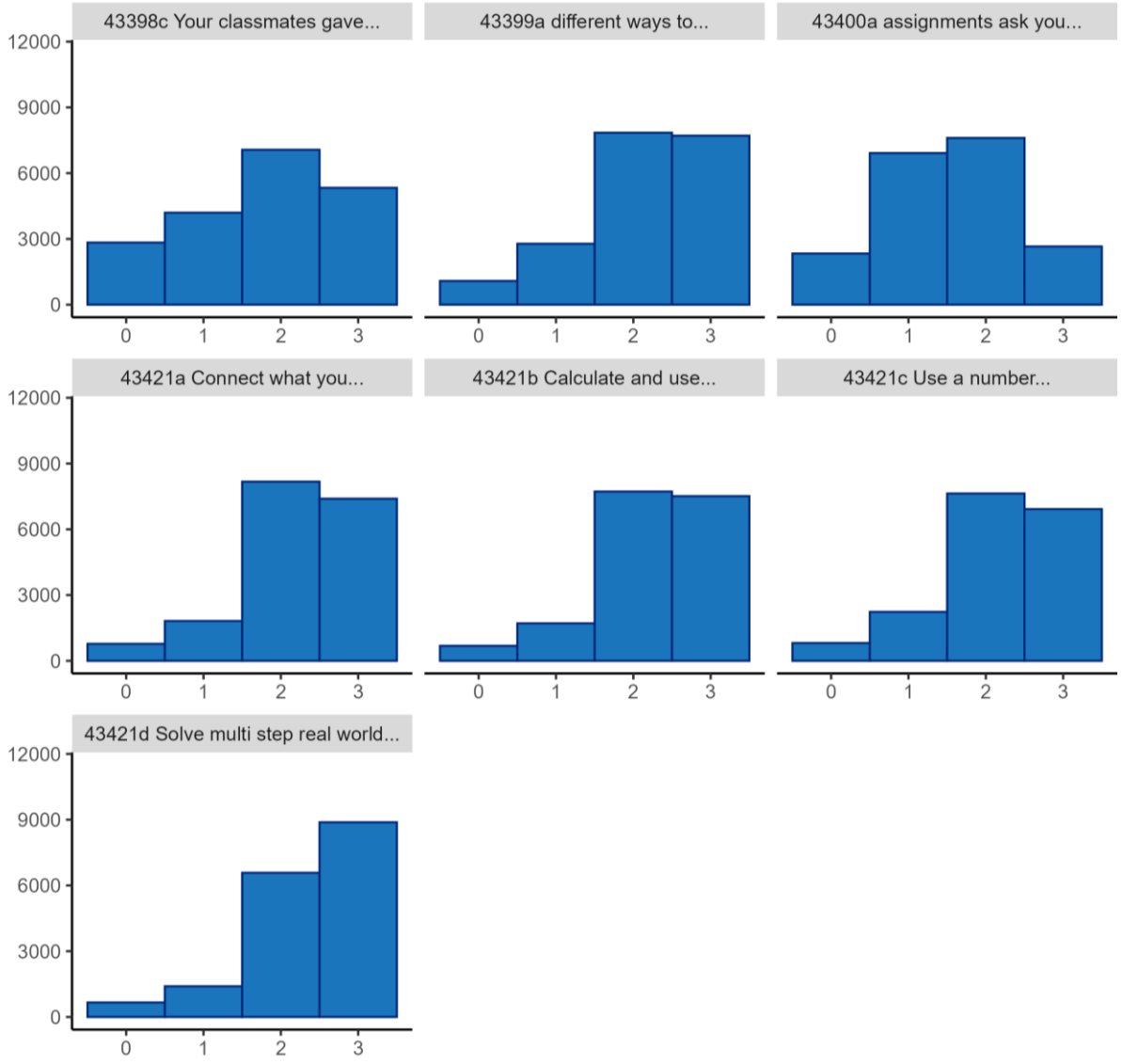
Student Educational Equity Development (SEED) Survey



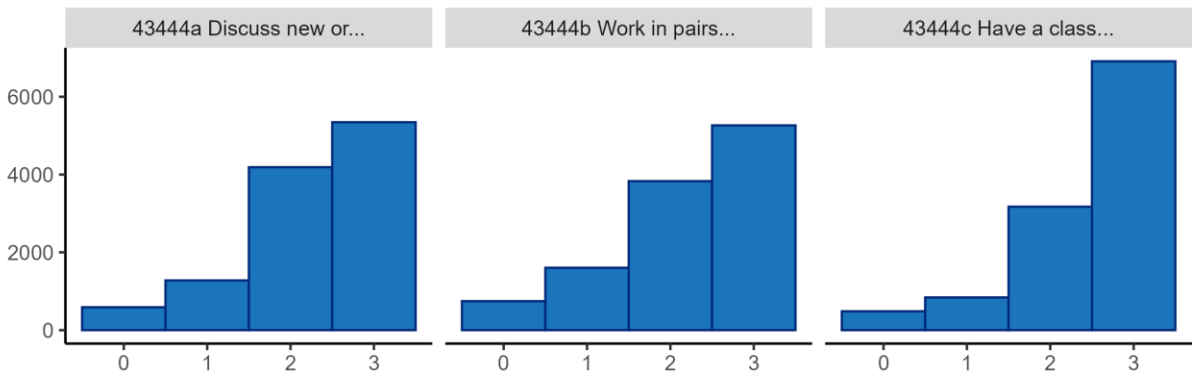
7th Grade



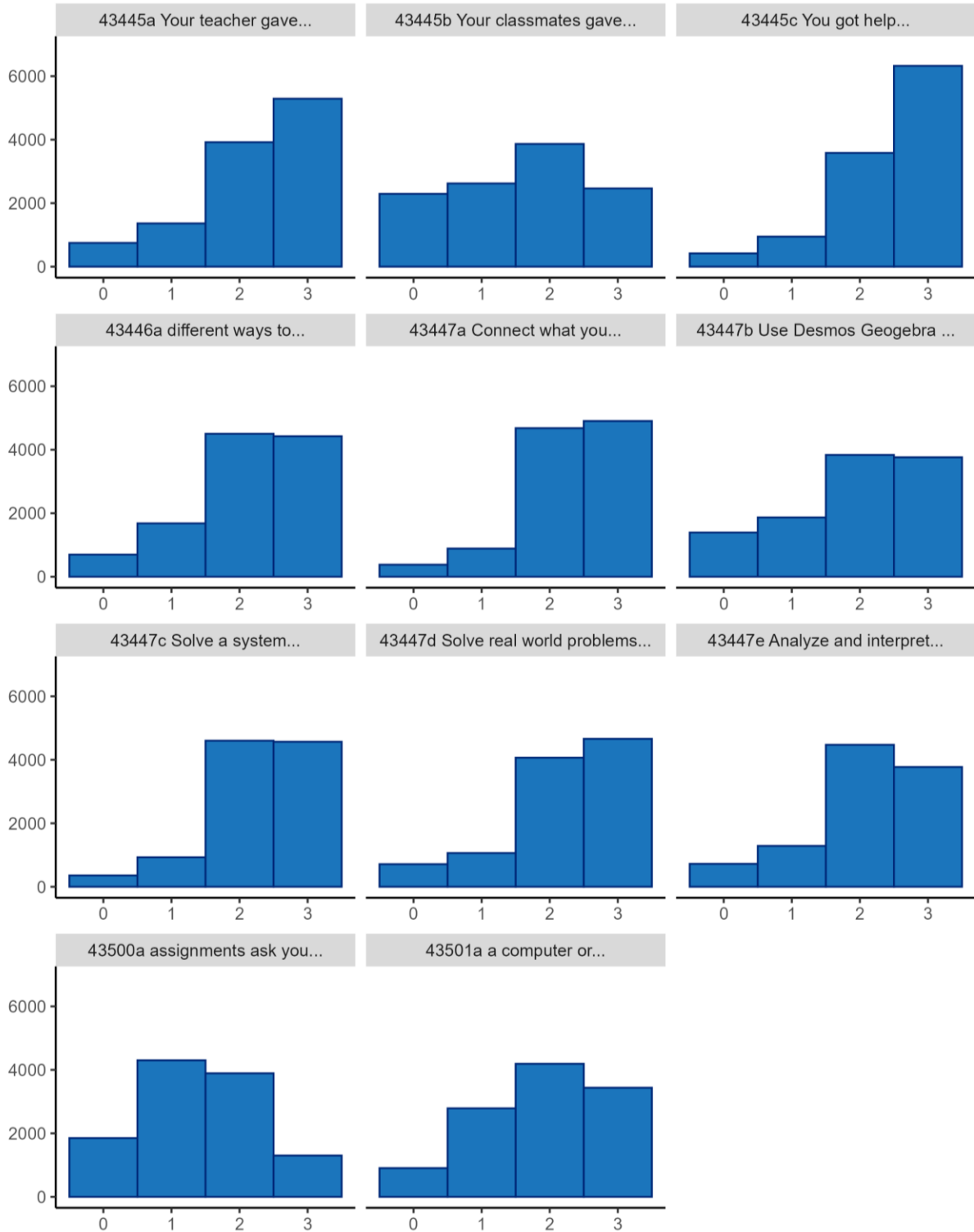
Student Educational Equity Development (SEED) Survey



10th Grade



Student Educational Equity Development (SEED) Survey



Dimensionality

4th, 7th, and 10th Grade: We selected a one component solution for 4th, 7th, and 10th grade based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figures (#1). The one, two, and three component solutions explained a meaningful amount of variance for each grade.

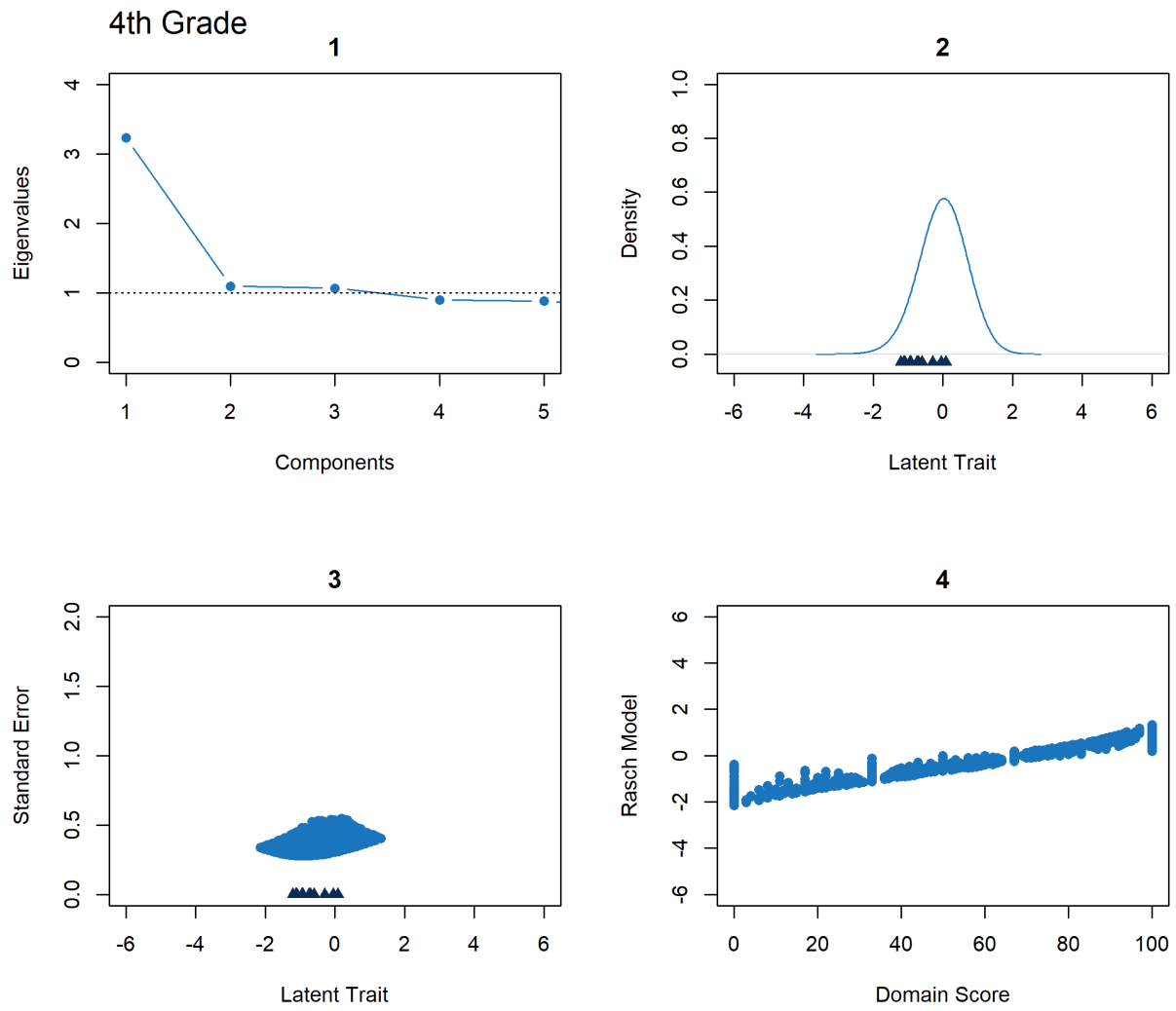
Rasch Modeling

4th, 7th, and 10th Grade: We retained all items for each grade based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (4th grade: -.11 to .17; 7th grade: -.16 to .25; 10th grade: -.16 to .32) and [infit](#) (4th grade: .86 to 1.1; 7th grade: .82 to 1.2; 10th grade: .87 to 1.20). The figures (#2) plot each [item's location](#) onto the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -2 and 0 for each grade. The figures (#3) map the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) (4th grade: .70; 7th grade: .79; 10th grade: .81) was acceptable.

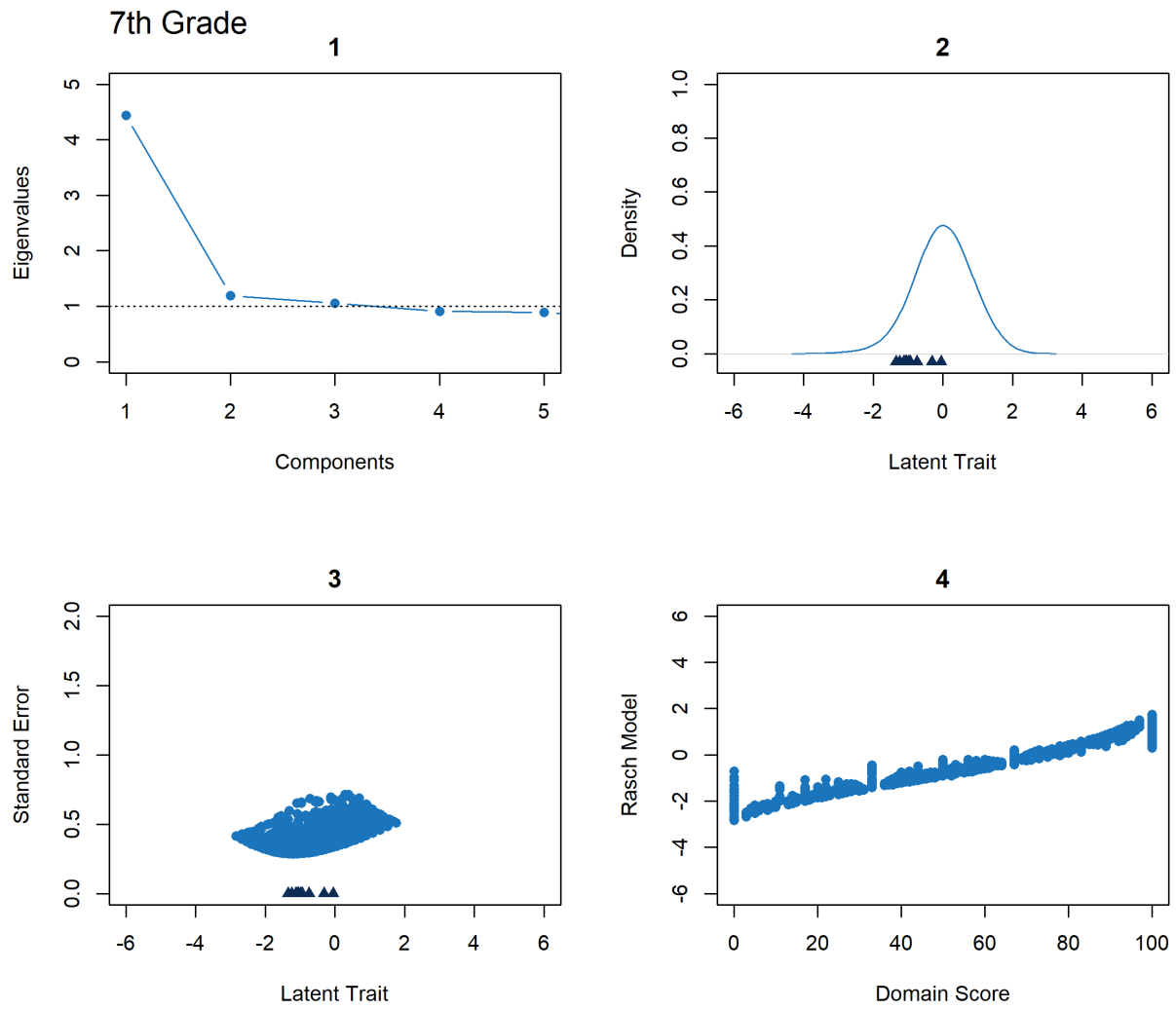
Validation

4th, 7th, and 10th Grade: The figures (#4) display the correlation between the Rasch model (y-axis) and the domain score (x-axis) for each grade. The correlation was .98 for each grade, suggesting that the domain scores are acceptable representations of the Rasch models.

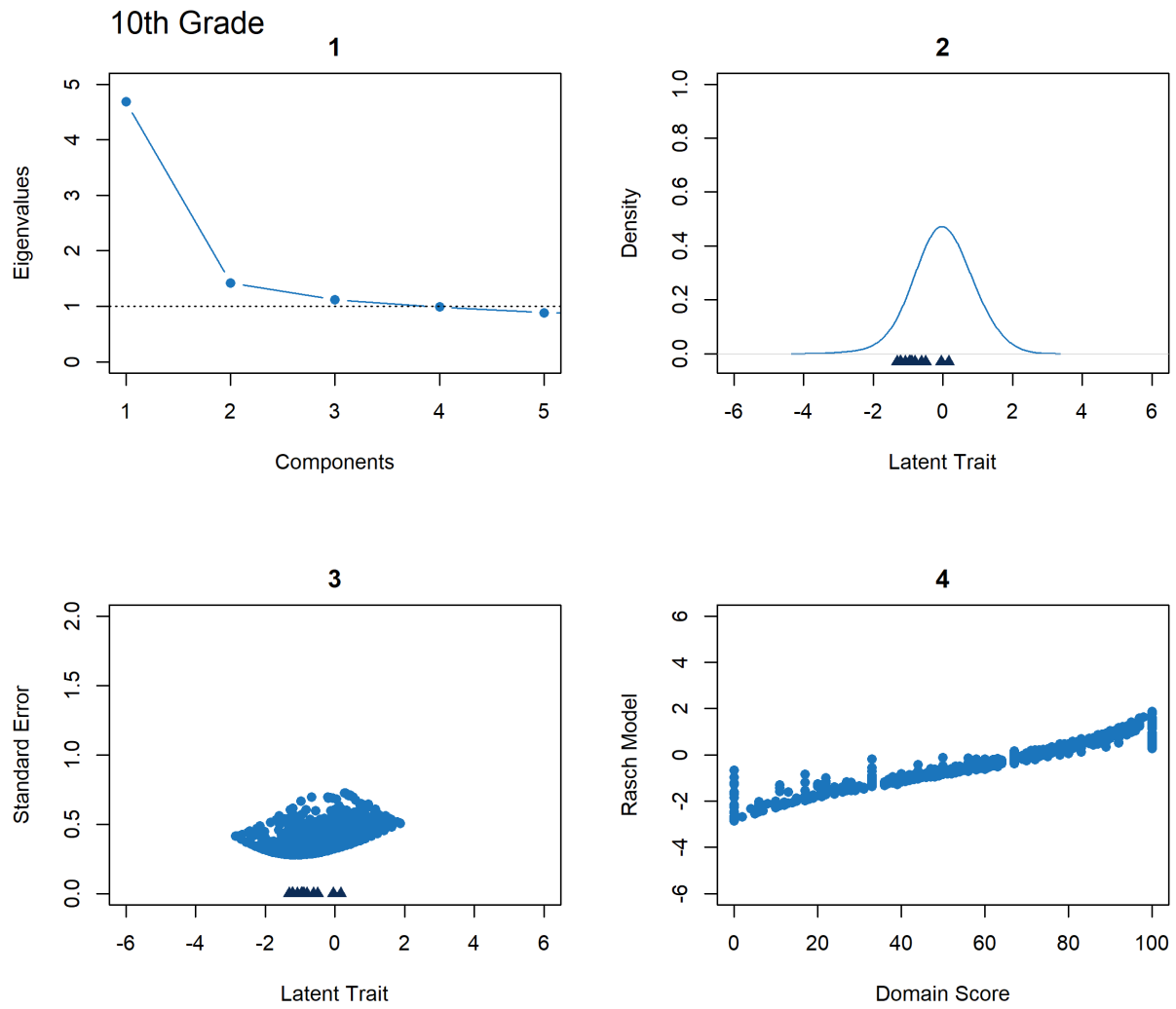
Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Science

Opportunity to Learn Science is only included on the SEED Survey in grades 5, 8, and 11. We included all **Opportunity to Learn Science** items in our analysis:

5 th Grade	8 th Grade	11 th Grade
43382a: Think about what you learned in your elementary school science classes. How often did you learn about living things (such as plants, animals, or bacteria)?	43386a: Think about what you did in your science class this year. How often did you read from a science textbook (print or digital)?	43450a: Think about what you learned in your high school science classes. How often did you learn about living things (such as plants, animals, bacteria, or cells)?
43383a: Think about what you learned in your elementary school science classes. How often did you learn about chemicals (such as vinegar, baking soda, or hydrogen peroxide)?	43388a: Think about what you did in your science class this year. How often did you watch a short video clip, movie, or video about science topics?	43451b: Think about what you learned in your high school science classes. How often did you learn about electricity (such as circuits, batteries, or light bulbs)?
43384a: Think about what you learned in your elementary school science classes. How often did you learn about rocks or minerals (such as diamond, iron, or lava rock)?	43425a: Think about your science classes in grades 6, 7, and 8. How often did you learn about living things (such as plants, animals, bacteria, or cells)?	43452a: Think about what you learned in your high school science classes. How often did you learn about chemicals (such as vinegar, baking soda, or hydrogen peroxide)?
43385a: Think about what you did in your science class this year. How often did you do science activities using tools (such as microscope, thermometer, beaker, or weighing scale)?	43426a: Think about your science classes in grades 6, 7, and 8. How often did you learn about electricity (such as circuits, batteries, or light bulbs)?	43453a: Think about what you learned in your high school science classes. How often did you learn about models of the sun, moon, or earth (such as layers of the earth, geosphere, or bodies in our solar system)?
43386a: Think about what you did in your science class this year. How often did you read from a science textbook (print or digital)?	43427a: Think about your science classes in grades 6, 7, and 8. How often did you learn about chemicals (such as vinegar, baking soda, or hydrogen peroxide)?	43454a: Think about what you learned in your high school science classes. How often did you learn about technology and engineering (such as robots, pulley systems, or ramps)?
43387a: Think about what you did in your science class this year. How often did you	43428a: Think about your science classes in grades 6, 7, and 8. How often did you	43455a: Think about what you did in your high school science classes. How often

Student Educational Equity Development (SEED) Survey

5 th Grade	8 th Grade	11 th Grade
learn about science topics on the Internet?	learn about models of the sun, moon, or earth (such as layers of the earth, geosphere, or bodies in our solar system)?	did you read from a science textbook (print or digital)?
43388a: Think about what you did in your science class this year. How often did you watch a short video clip, movie, or video about science topics?	43429a: Think about your science classes in grades 6, 7, and 8. How often did you learn about technology and engineering (such as robots, pulley systems, or ramps)?	43456a: Think about what you did in your high school science classes. How often did you read a book or magazine (print or digital) about science topics?
43389a: Think about what you did in your science class this year. How often did you write about science topics (such as science journal, lab report, or essay)?	43430a: Think about what you did in your science class this year. How often did you read a book or magazine (print or digital) about science topics?	43486a: Think about what you did in your high school science classes. How often did you use the Internet to learn about science topics?
43401a: Think about what you did in your science class this year. How often did you do the following? Make a drawing that explains why or how something happens.	43431a: Think about what you did in your science class this year. How often did you use the Internet to learn about science topics?	43487a: Think about what you did in your high school science classes. How often did you watch a short video clip, movie, or video about science topics?
43401b: Think about what you did in your science class this year. How often did you do the following? Use a science experiment to answer a question.	43432a: Think about what you did in your science class this year. How often did you use equipment to conduct investigations (such as a magnifying glass, microscope, thermometer, or weighing scale)?	43488a: Think about what you did in your high school science classes. How often did you use equipment to conduct investigations (such as a magnifying glass, microscope, thermometer, or weighing scale)?
43401c: Think about what you did in your science class this year. How often did you do the following? Put information you collect into a table or graph.	43433a: Think about what you did in your science class this year. How often did you do the following? Come up with questions to explore how something works.	43489a: Think about what you did in your high school science classes. How often did you do the following? Come up with questions to explore how something works.
43405a: Think about what you did in your science class this year. How often did you do the following? Use	43433b: Think about what you did in your science class this year. How often did you do the following? Make	43489b: Think about what you did in your high school science classes. How often did you do the following?

Student Educational Equity Development (SEED) Survey

5 th Grade	8 th Grade	11 th Grade
evidence to explain why something happens.	drawings that explain why or how something happens.	Make drawings that explain why or how something happens.
43405b: Think about what you did in your science class this year. How often did you do the following? Find news articles about science on the Internet.	43433c: Think about what you did in your science class this year. How often did you do the following? Come up with experiments to answer a research question.	43489c: Think about what you did in your high school science classes. How often did you do the following? Come up with experiments to answer a research question.
43405c: Think about what you did in your science class this year. How often did you do the following? Ask a scientific question or define an engineering problem.	43433d: Think about what you did in your science class this year. How often did you do the following? Use tables or graphs to identify relationships between variables.	43489d: Think about what you did in your high school science classes. How often did you do the following? Use tables or graphs to identify relationships between variables.
	43434a: Think about what you did in your science class this year. How often did you do the following? Use math equations to explain or support scientific conclusions.	43490a: Think about what you did in your high school science classes. How often did you do the following? Use math equations to explain or support scientific conclusions.
	43434b: Think about what you did in your science class this year. How often did you do the following? Use evidence from experiments to explain why something happens.	43490b: Think about what you did in your high school science classes. How often did you do the following? Use evidence from experiments to explain why something happens.
	43434c: Think about what you did in your science class this year. How often did you do the following? Use factual information to disagree with someone about a scientific idea.	43490c: Think about what you did in your high school science classes. How often did you do the following? Use factual information to disagree with someone about a scientific idea.
	43434d: Think about what you did in your science class this year. How often did you do the following? Combine factual information about	43490d: Think about what you did in your high school science classes. How often did you do the following? Combine factual information

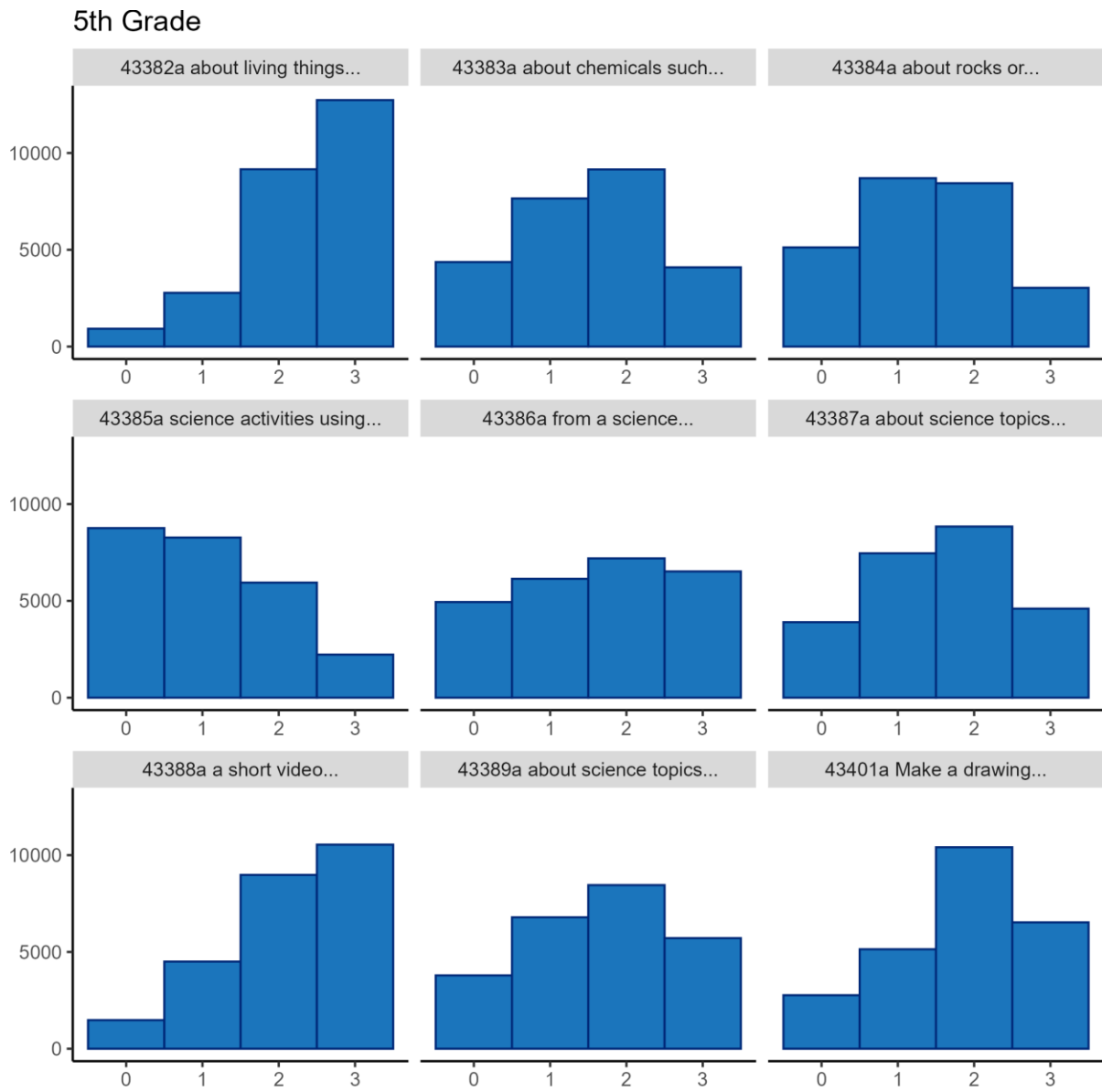
Student Educational Equity Development (SEED) Survey

5 th Grade	8 th Grade	11 th Grade
	science from multiple sources (for example, books, websites, or articles) for an assignment.	about science from multiple sources (for example, books, websites, or articles) for an assignment.

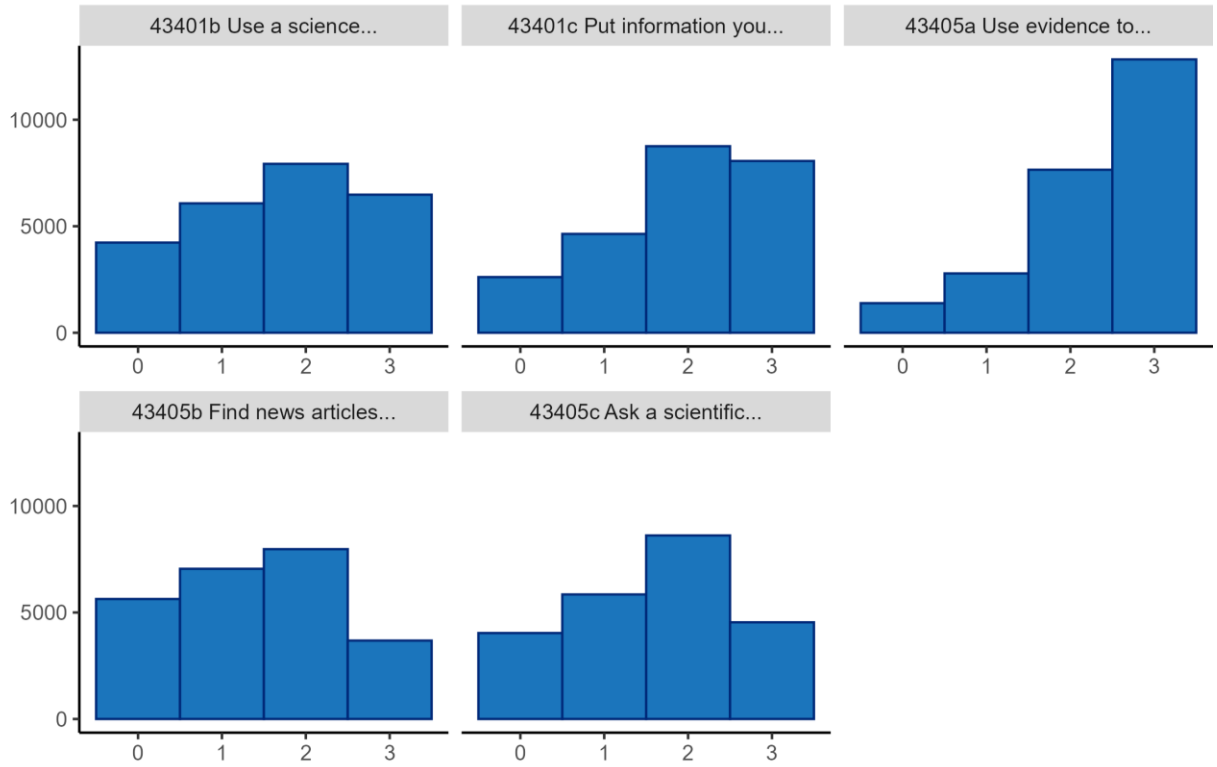
Note. Response Options: Never (0), Rarely (1), Sometimes (2), Often (3)

Descriptive Statistics

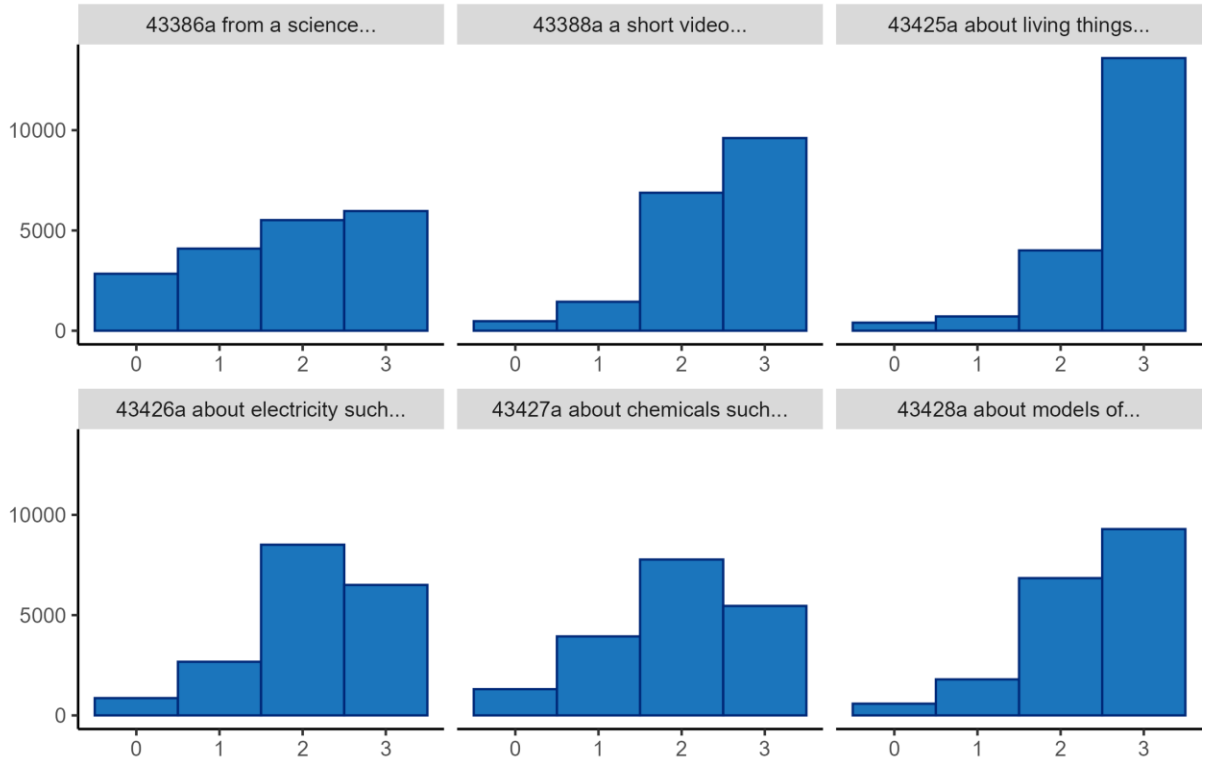
Item histograms for **Opportunity to Learn Science** are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).



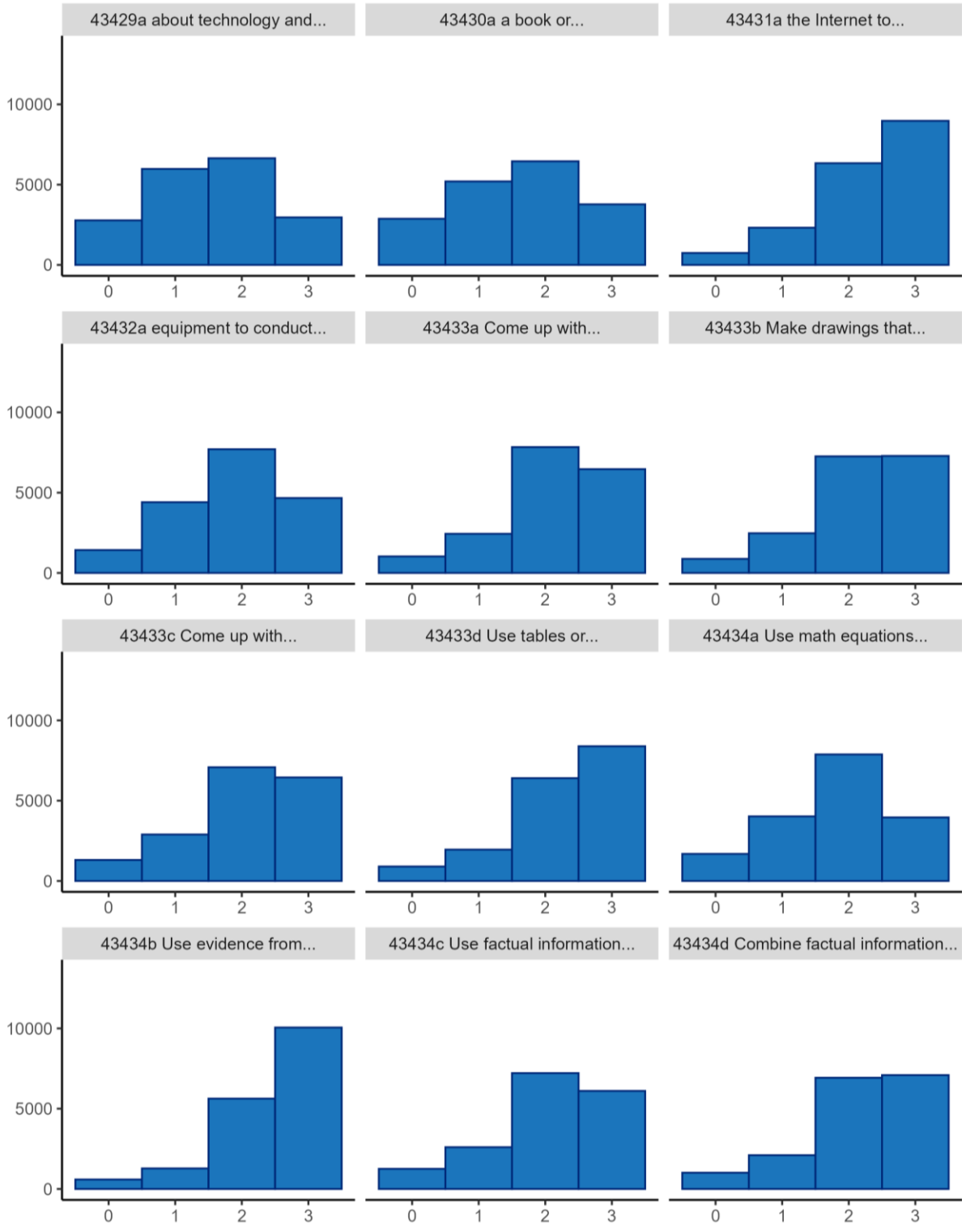
Student Educational Equity Development (SEED) Survey



8th Grade

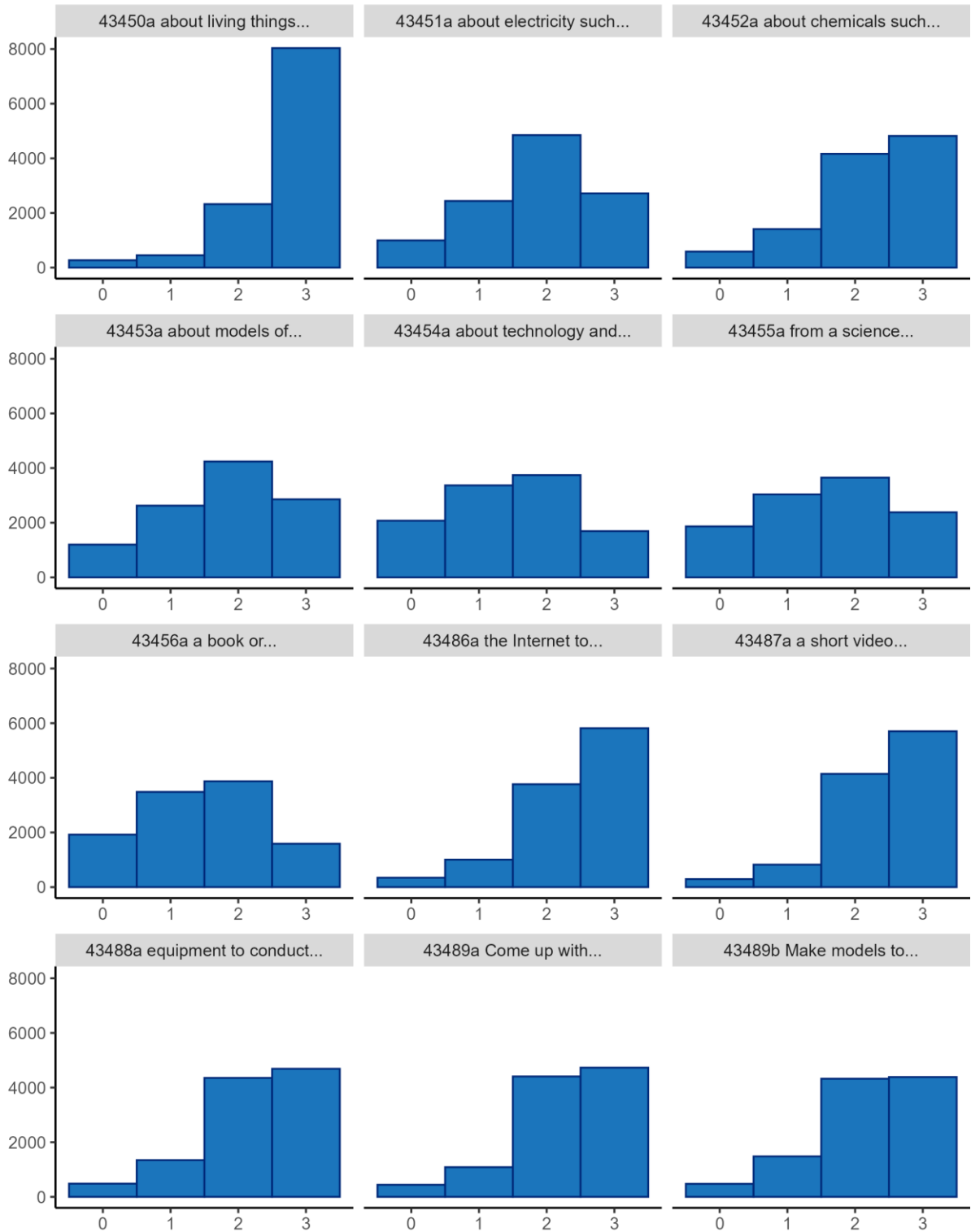


Student Educational Equity Development (SEED) Survey

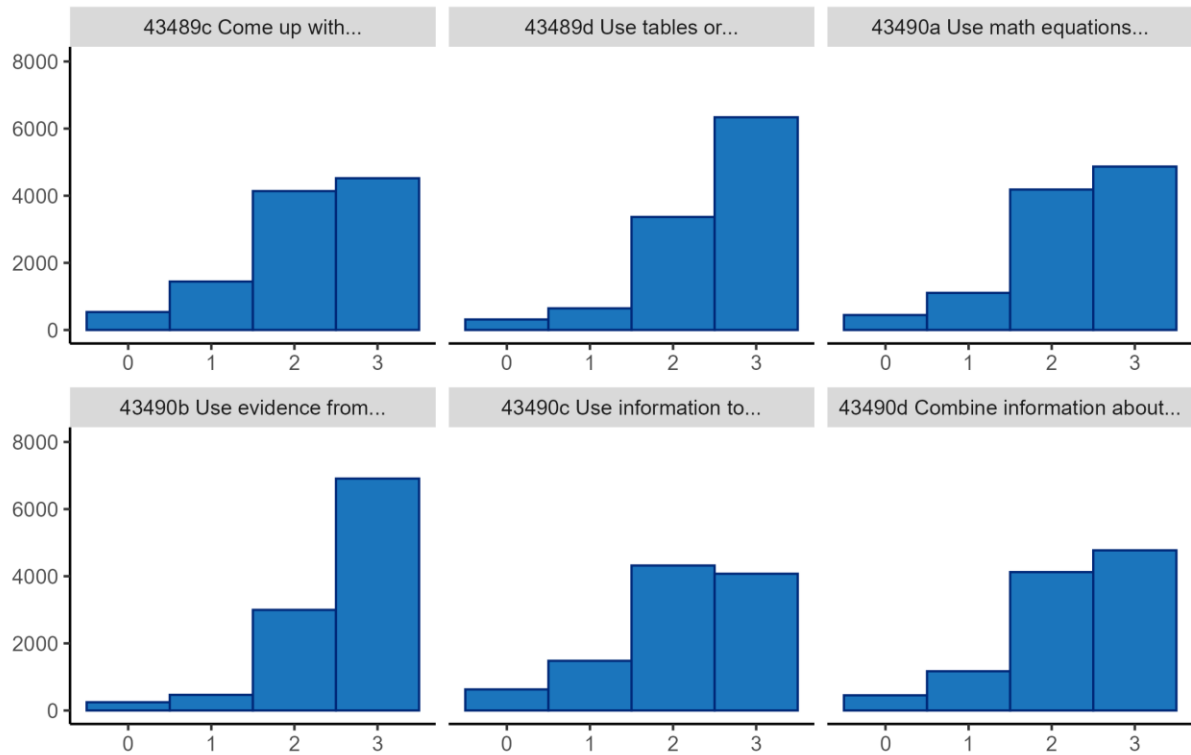


Student Educational Equity Development (SEED) Survey

11th Grade



Student Educational Equity Development (SEED) Survey



Dimensionality

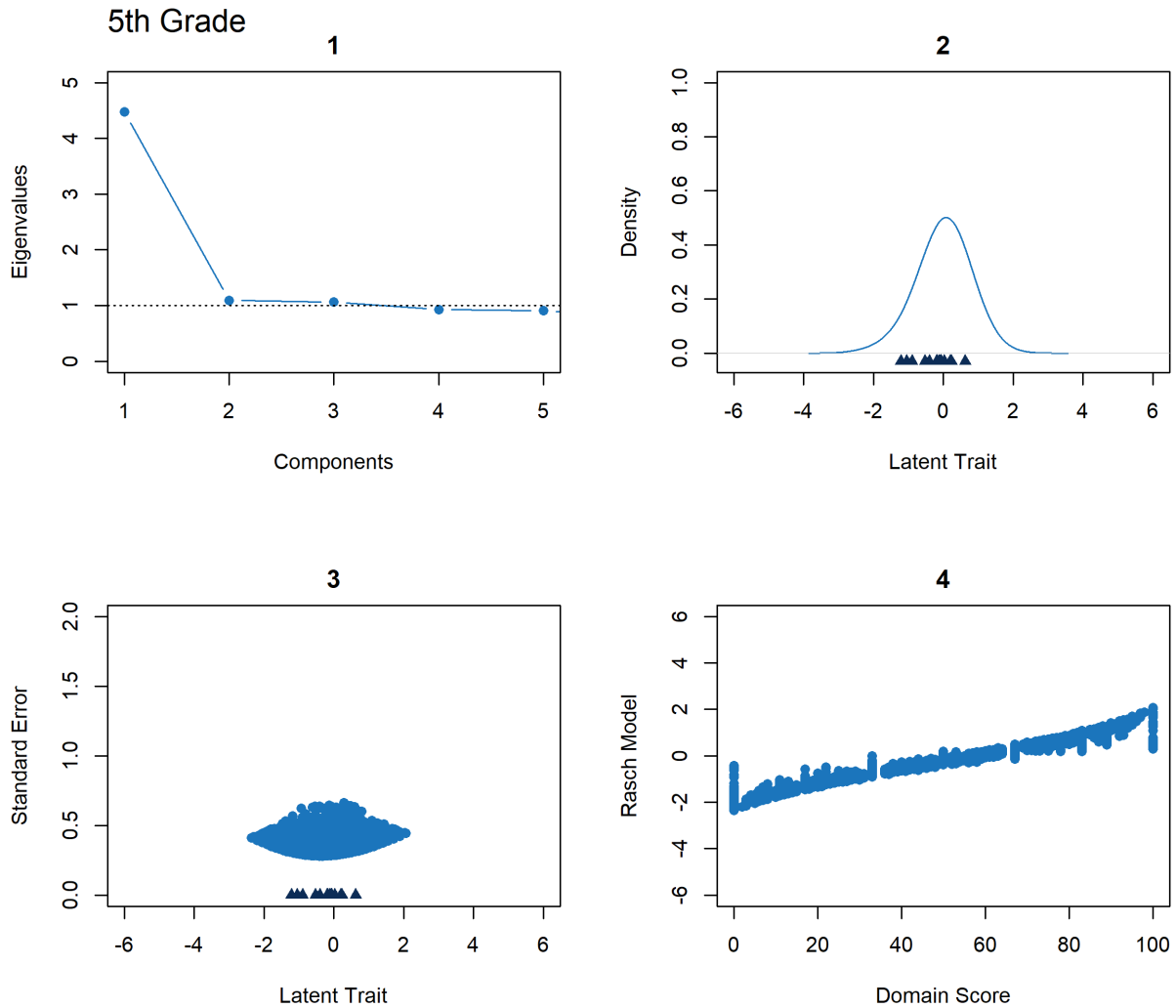
5th, 8th, 11th Grade: We selected a one component solution for 5th, 8th, and 11th grade based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figures (#1). The one, two, and three component solutions explained a meaningful amount of variance for 5th grade and the one through four component solutions explained a meaningful amount of variance for 8th and 11th grade.

Rasch Modeling

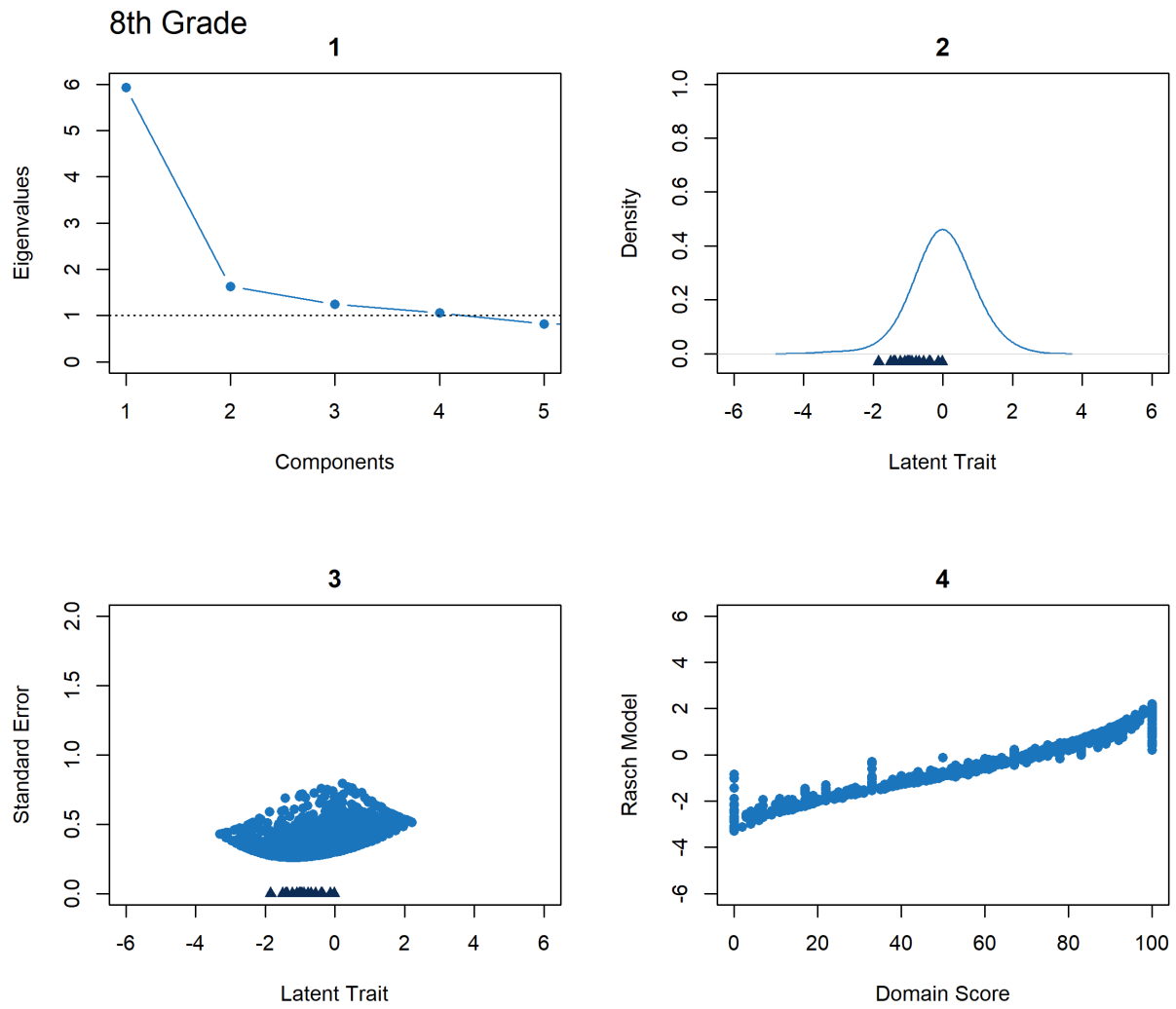
5th, 8th, 11th Grade: We retained all items for each grade based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (5th grade: -.10 to .13; 8th grade: -.15 to .23; 11th grade: -.16 to .26) and [infit](#) (5th grade: .81 to 1.00; 8th grade: .82 to 1.24; 11th grade: .82 to 1.2). The figures (#2) plot each [item's location](#) onto the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -2 and 1 for 5th grade and between -2 and 0 for 8th and 11th grade. The figures (#3) map the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) (5th grade: .82; 8th grade: .85; 11th grade: .87) was acceptable.

Validation

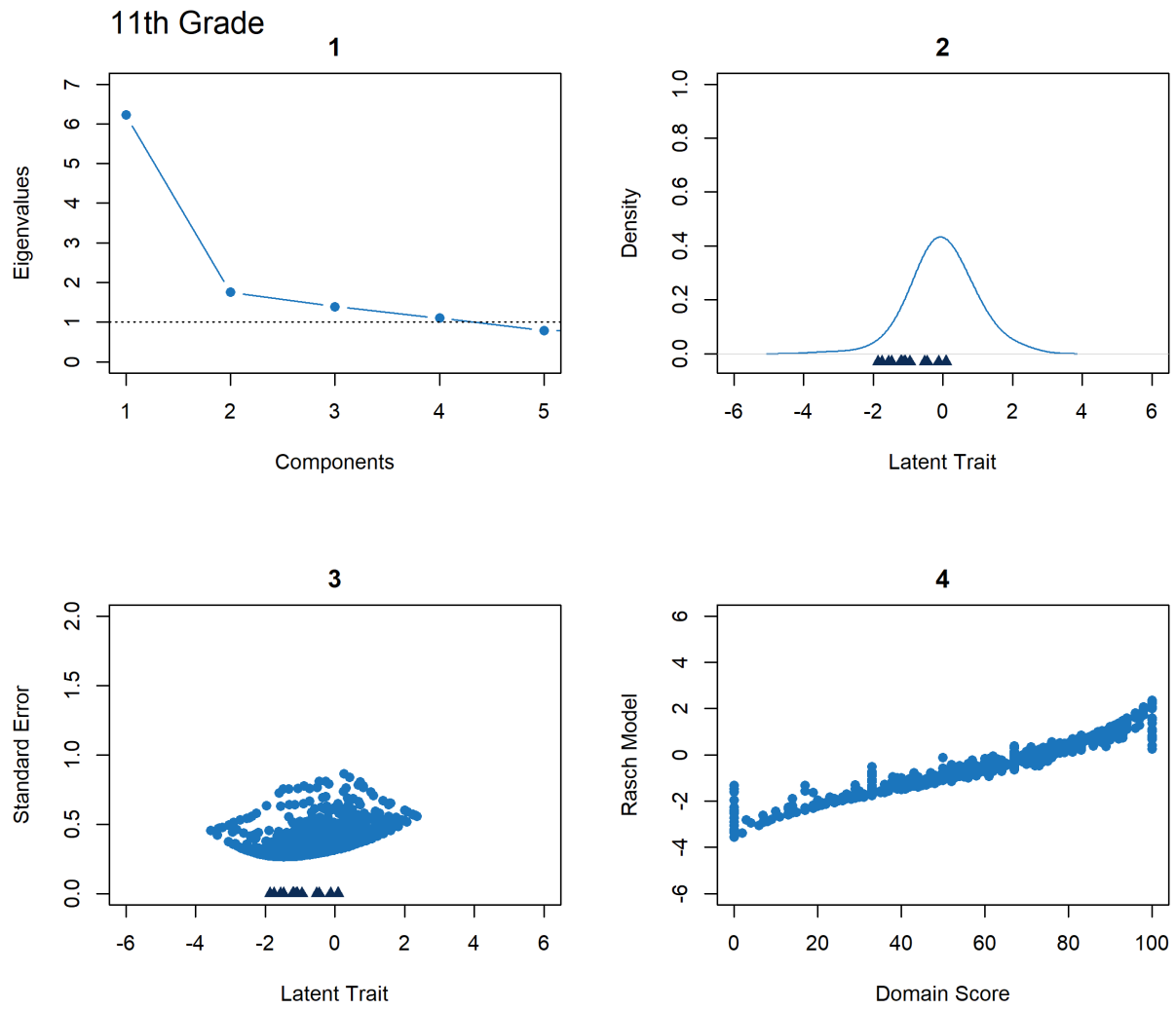
5th, 8th, 11th Grade: The figures (#4) display the correlation between the Rasch model (y-axis) and the domain score (x-axis) for each grade. The correlation was .99 for 5th grade, .98 for 8th grade, and .97 for 11th grade, suggesting that the domain scores are acceptable representations of the Rasch models.



Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Self-Efficacy

Self-Efficacy is parsed into three areas: English Language Arts (ELA), Mathematics, and Science.

English Language Arts

ELA Self-Efficacy is only included on the SEED Survey in grades 3, 6, and 9. We included all **ELA Self-Efficacy** items in our analysis:

3 rd Grade	6 th Grade	9 th Grade
43392a: Think about what you learned in reading time this year. How sure are you about doing each of the following? I can figure out the meaning of a word I don't know by using other words in a text or story.	43402a: Think about what you learned in your language arts class this year. How confident are you about doing each of the following? I can recognize the difference between fact and opinion in a text or story.	43442a: Think about what you learned in your high school language arts classes. How confident are you about doing each of the following? I can figure out the meaning of a word I don't know by using other words in a text.
43392b: Think about what you learned in reading time this year. How sure are you about doing each of the following? I can explain the meaning of something I have read.	43402b: Think about what you learned in your language arts class this year. How confident are you about doing each of the following? I can judge the reliability of sources (for example, how a website might be biased or inaccurate).	43442b: Think about what you learned in your high school language arts classes. How confident are you about doing each of the following? I can explain the meaning of something I have read.
43392c: Think about what you learned in reading time this year. How sure are you about doing each of the following? I can figure out the main idea of a text or story.	43402c: Think about what you learned in your language arts class this year. How confident are you about doing each of the following? I can critique an author's writing style.	43442c: Think about what you learned in your high school language arts classes. How confident are you about doing each of the following? I can figure out the main idea of a text.
43393a: Think about what you learned in reading time this year. How sure are you about doing each of the following? I can find text in a story to help me answer a question on an assignment.	43402d: Think about what you learned in your language arts class this year. How confident are you about doing each of the following? I can use evidence from a text or story to support my answer.	43442d: Think about what you learned in your high school language arts classes. How confident are you about doing each of the following? I can find text in an article to help me answer a question on an assignment.
43393b: Think about what you learned in reading time this year. How sure are you about doing each of the	43402e: Think about what you learned in your language arts class this year. How confident are you about	43442e: Think about what you learned in your high school language arts classes. How confident are you about

Student Educational Equity Development (SEED) Survey

3 rd Grade	6 th Grade	9 th Grade
following? I can tell when I don't understand something I'm reading.	doing each of the following? I can identify the author's perspective in a persuasive text or story.	doing each of the following? I can recognize when I don't understand something I'm reading.
43393c: Think about what you learned in reading time this year. How sure are you about doing each of the following? I can tell the difference between fact and opinion in a text or story.	43413a: Think about what you learned in your language arts class this year. How confident are you about doing each of the following? I can figure out the meaning of a word I don't know by using other words in a text or story.	43443a: Think about what you learned in your high school language arts classes. How confident are you about doing each of the following? I can recognize the difference between fact and opinion in a text.
	43413b: Think about what you learned in your language arts class this year. How confident are you about doing each of the following? I can explain the meaning of something I have read.	43443b: Think about what you learned in your high school language arts classes. How confident are you about doing each of the following? I can judge the reliability of sources (for example, how a website might be biased or inaccurate).
	43413c: Think about what you learned in your language arts class this year. How confident are you about doing each of the following? I can figure out the main idea of a text or story.	43443c: Think about what you learned in your high school language arts classes. How confident are you about doing each of the following? I can analyze the author's point of view or purpose within a text.
	43413d: Think about what you learned in your language arts class this year. How confident are you about doing each of the following? I can find text in an article or story to help me answer a question on an assignment.	43443d: Think about what you learned in your high school language arts classes. How confident are you about doing each of the following? I can use evidence from a text to support my answer.
	43413e: Think about what you learned in your language arts class this year. How confident are you about doing each of the following? I	43443e: Think about what you learned in your high school language arts classes. How confident are you about doing each of the following? I

Student Educational Equity Development (SEED) Survey

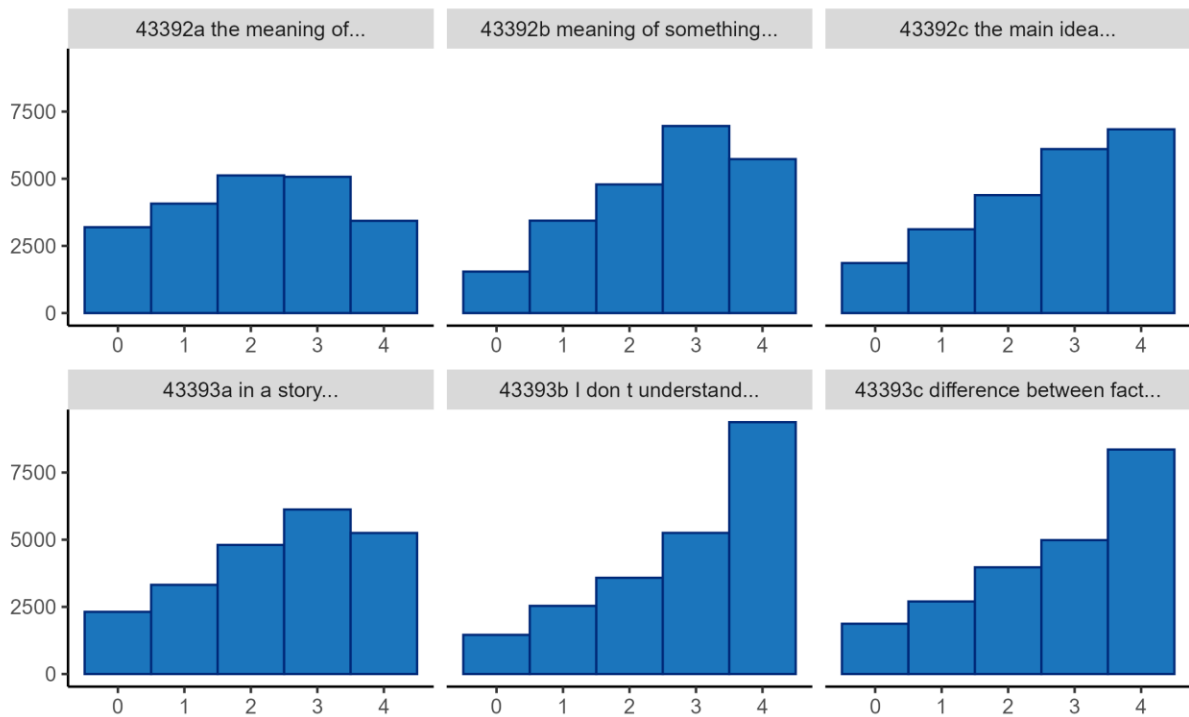
3 rd Grade	6 th Grade	9 th Grade
	can recognize when I don't understand something I'm reading.	can identify the author's perspective in a persuasive text or article.

Note. 3rd Grade Response Options: Not Sure (0), A Little Sure (1), Somewhat Sure (2), Mostly Sure (3), Very Sure (4). 6th & 9th Grade Response Options: Not Confident (0), A Little Confident (1), Somewhat Confident (2), Mostly Confident (3), Very Confident (4)

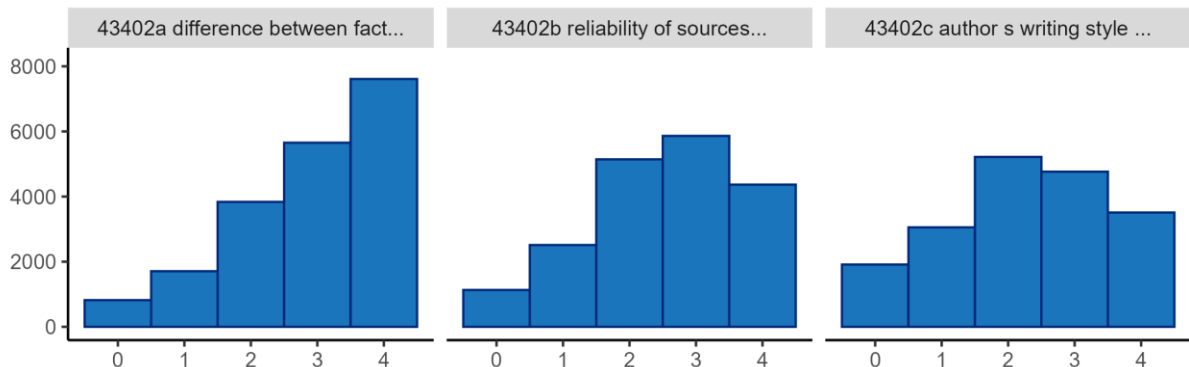
Descriptive Statistics

Item histograms for **ELA Self-Efficacy** are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).

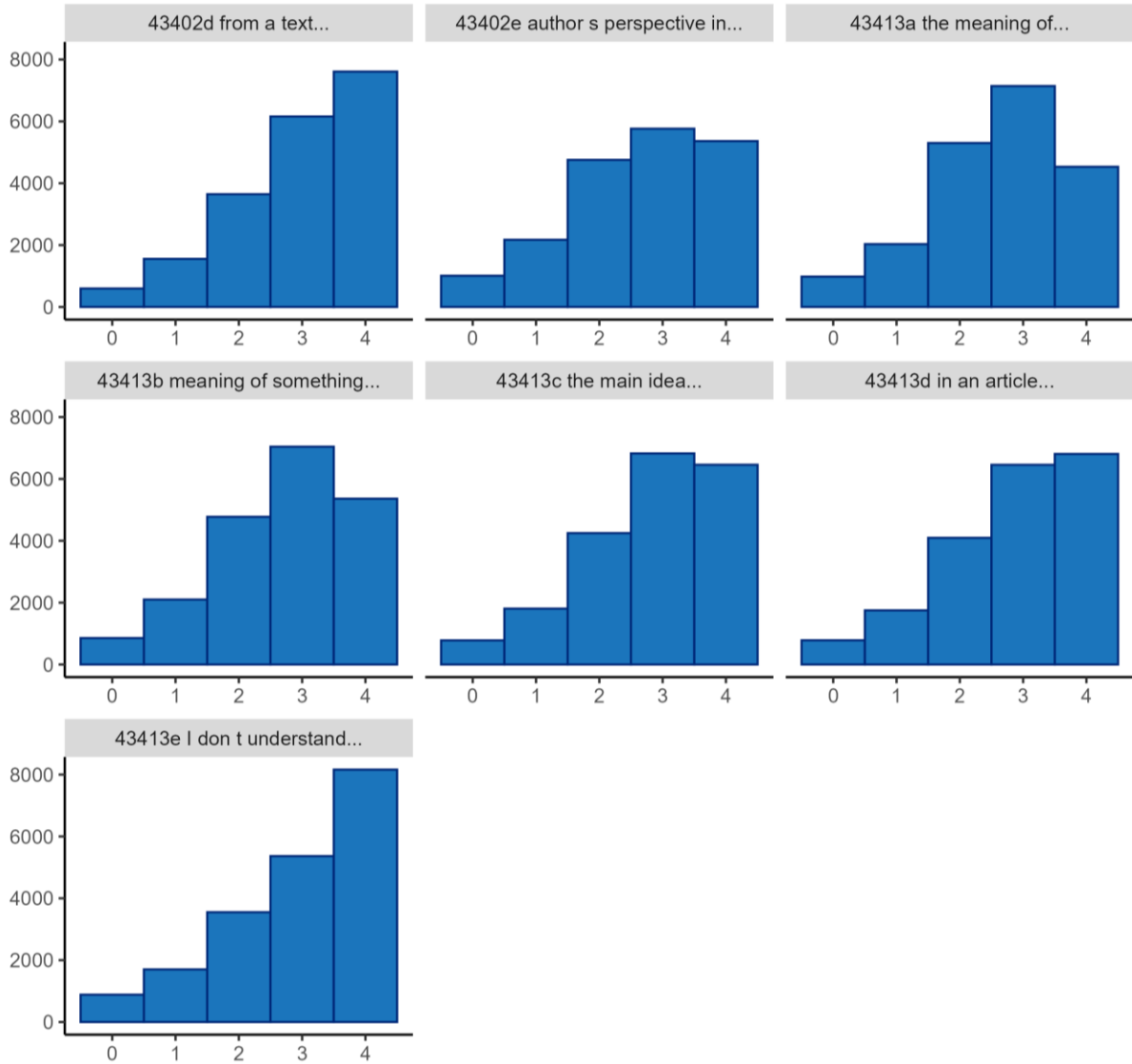
3rd Grade



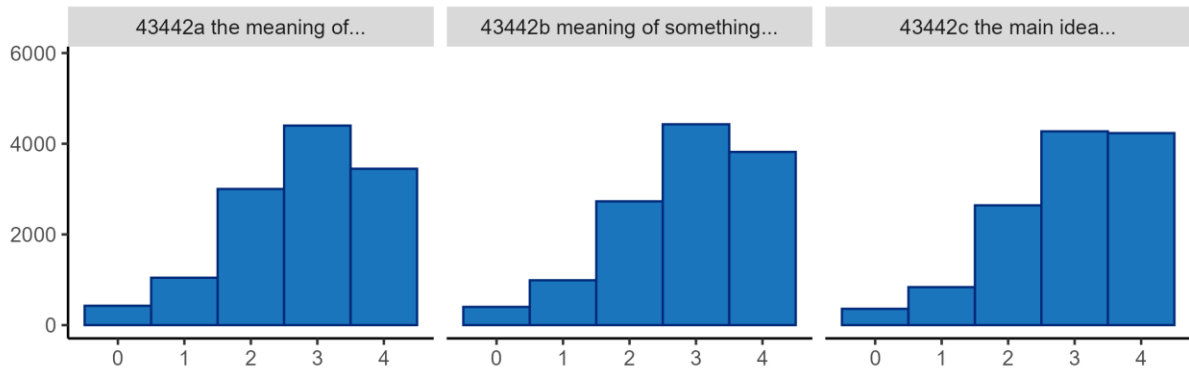
6th Grade



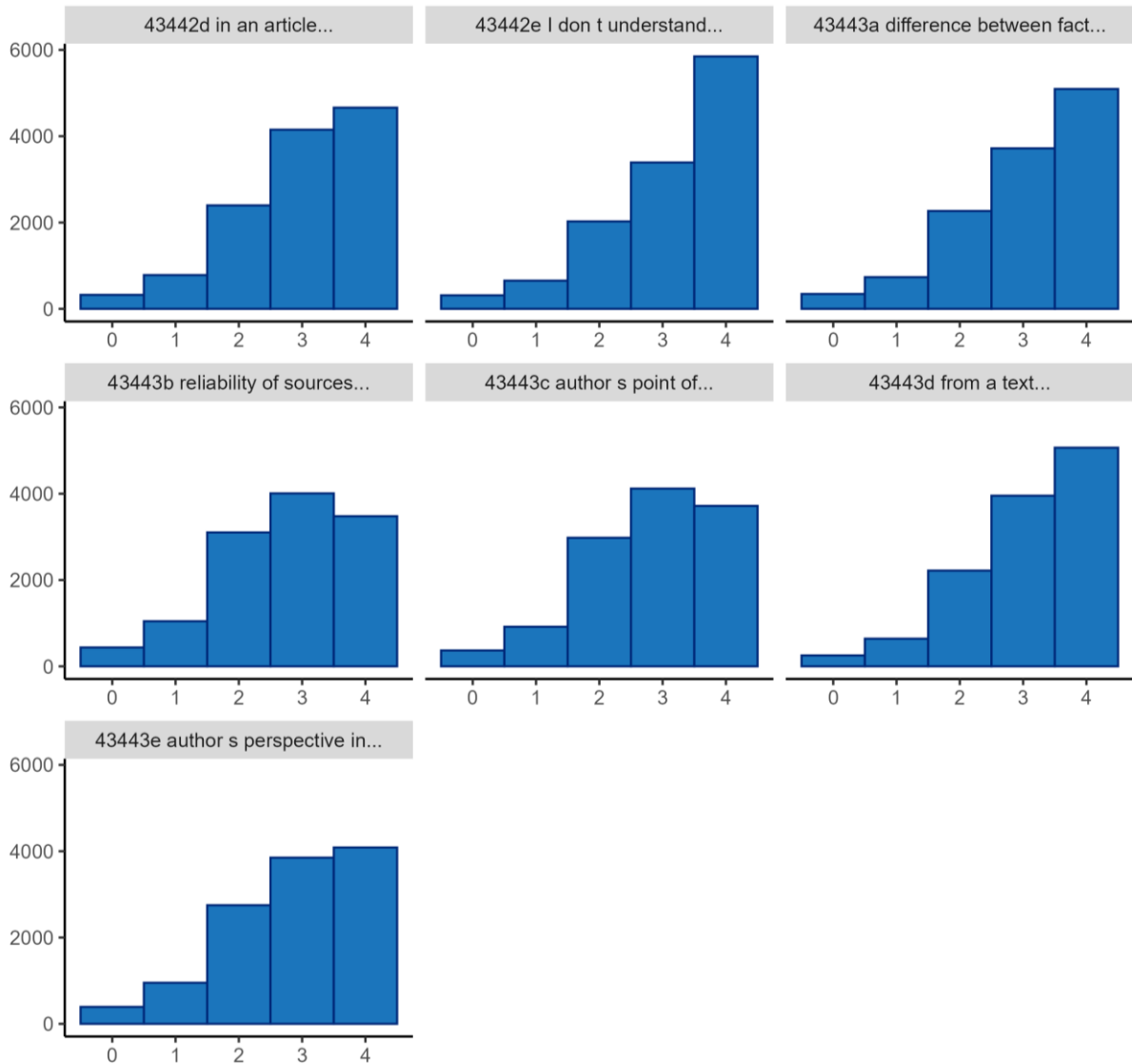
Student Educational Equity Development (SEED) Survey



9th Grade



Student Educational Equity Development (SEED) Survey



Dimensionality

3rd, 6th, 9th Grade: We selected a one component solution for 3rd, 6th and 9th grade based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figures (#1). The one component solution was the only solution that explained a meaningful amount of variance.

Rasch Modeling

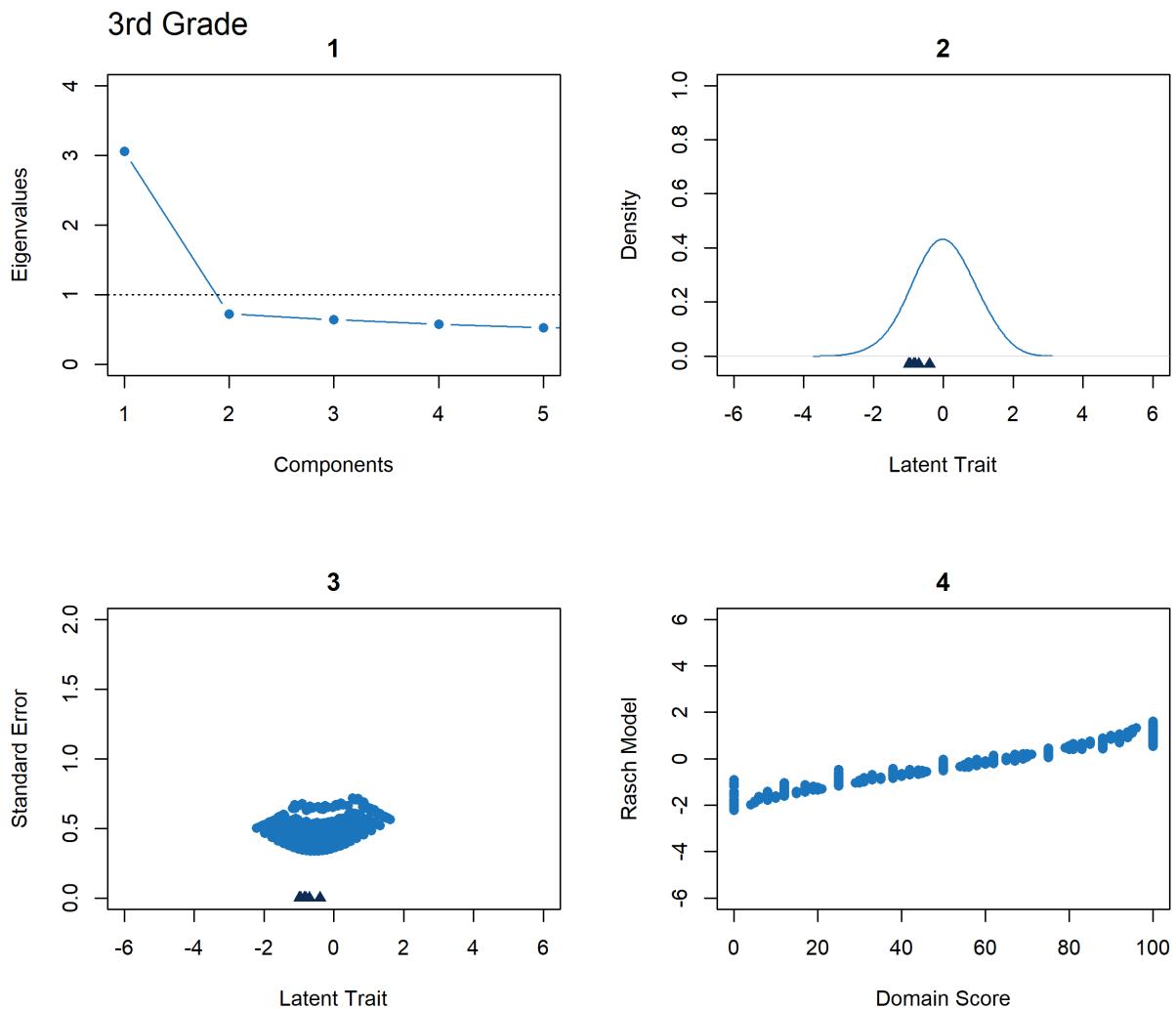
3rd, 6th, 9th Grade: We retained all items for each grade based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (3rd grade: -.12 to .11; 6th grade: -.24 to .19; 9th grade: -.27 to .27) and [infit](#) (3rd grade: .79 to .98; 6th grade: .77 to 1.26; 9th grade: .71 to 1.32). The figures (#2) plot each [item's location](#) onto the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -1 and 0 for 3rd grade, -3 and -1 for 6th grade, and -4 to -2 for 9th grade. No items assess extremely low or high levels of the latent trait. The figures (#3) map the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items

Student Educational Equity Development (SEED) Survey

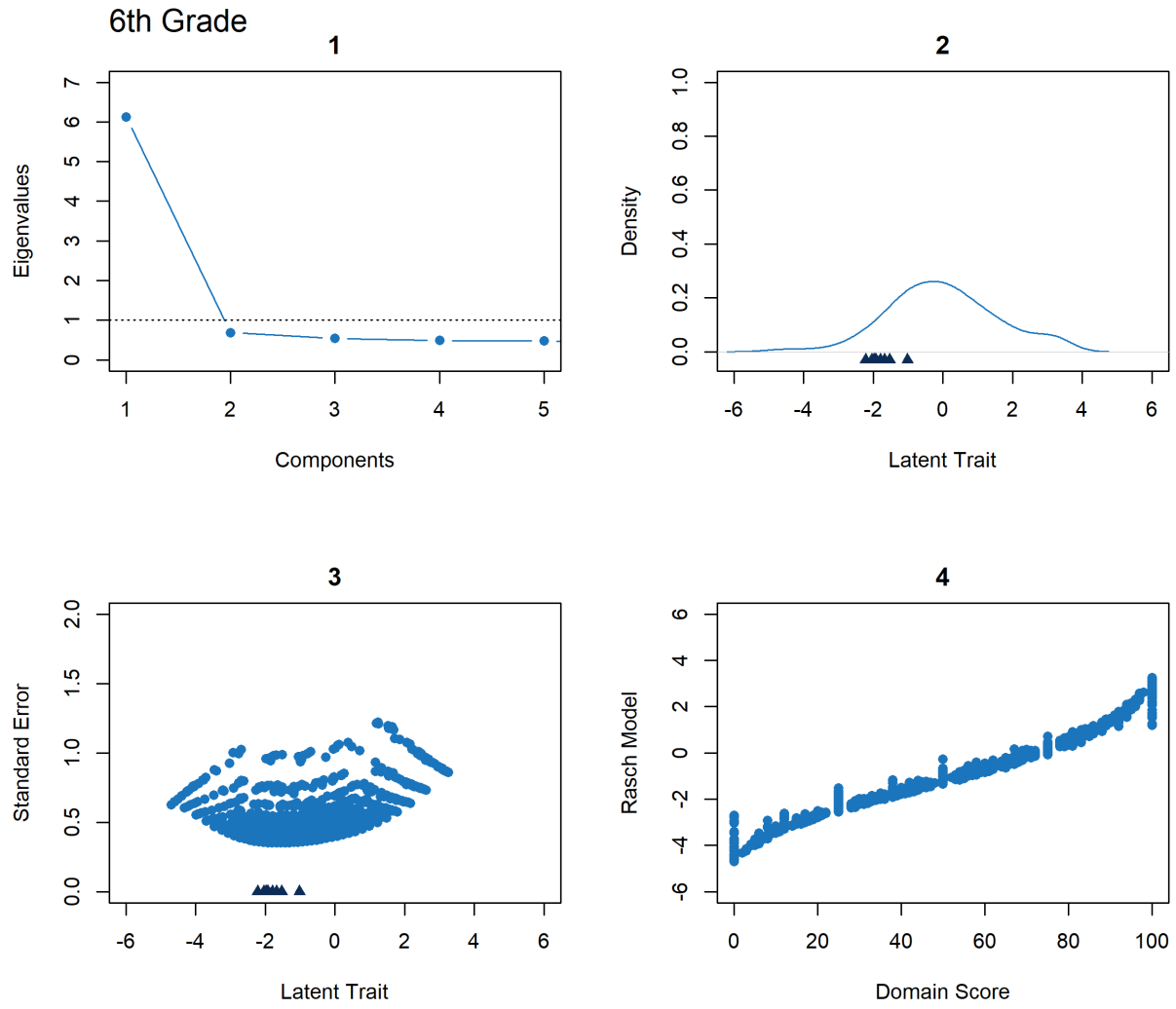
are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) (3rd grade: .78; 6th grade: .91; 9th grade: .93) was acceptable.

Validation

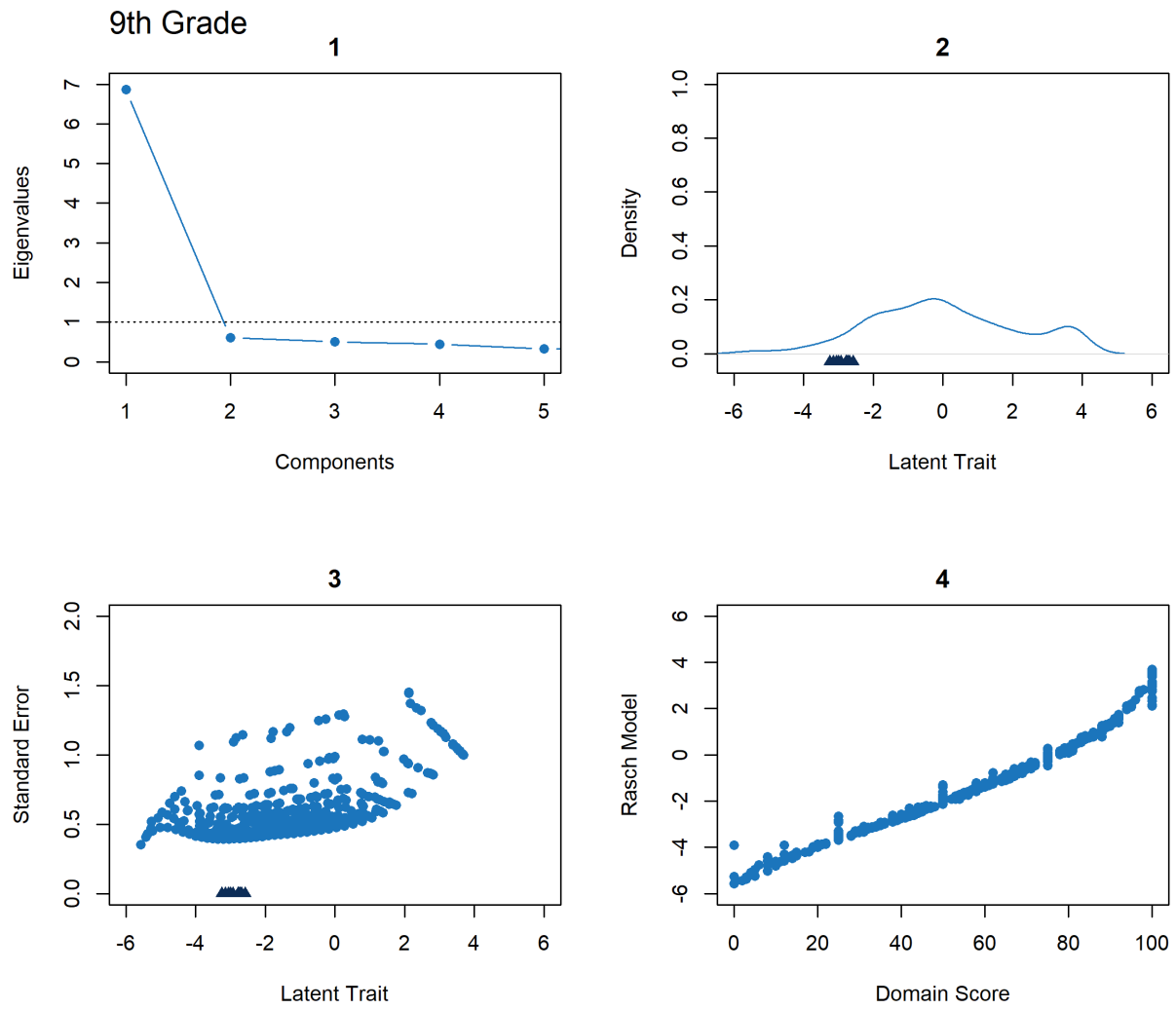
3rd, 6th, 9th Grade: The figures (#4) display the correlation between the Rasch model (y-axis) and the domain score (x-axis) for each grade. The correlation was .99 for 3rd grade and was .97 for 6th grade and 9th grade, suggesting that the domain scores are acceptable representations of the Rasch models.



Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey

Mathematics

Mathematics Self-Efficacy is only included on the SEED Survey in grades 4, 7, and 10. We included all **Mathematics Self-Efficacy** items in our analysis:

4 th Grade	7 th Grade	10 th Grade
43380a: Think about what you learned in your math class this year. How sure are you about doing each of the following? I can estimate the weight of 5 apples using pounds (lb).	43422a: Think about what you learned in your math class this year. How confident are you about doing each of the following? I can list all the different possible outcomes when a coin is flipped three times.	43448a: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can create an expression that represents the average number of miles I run in a week if I run 100 miles in w weeks.
43380b: Think about what you learned in your math class this year. How sure are you about doing each of the following? I can divide 42 stickers among 6 students.	43422b: Think about what you learned in your math class this year. How confident are you about doing each of the following? I can create an expression that represents the average number of miles I run in a week if I run 100 miles in w weeks.	43448b: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can find the price of a \$12 item that is discounted by 25%.
43380c: Think about what you learned in your math class this year. How sure are you about doing each of the following? I can find the amount of carpet needed to cover a rectangular floor if I know its length and width.	43422c: Think about what you learned in your math class this year. How confident are you about doing each of the following? I can find the price of a \$12 item that is discounted by 25%.	43448c: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can describe the properties shared by every isosceles triangle.
43380d: Think about what you learned in your math class this year. How sure are you about doing each of the following? I can know when to take a meal out of the oven if it goes in at 10:00am and it takes 3 hours and 45 minutes to cook.	43422d: Think about what you learned in your math class this year. How confident are you about doing each of the following? I can find the amount of carpet needed to cover a rectangular floor if I know its length and width.	43448d: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can decide if my classmate's math work is correct.
43380e: Think about what you learned in your math class this year. How sure are	43422e: Think about what you learned in your math class this year. How confident	43448e: Think about what you learned in your high school math classes. How

Student Educational Equity Development (SEED) Survey

4 th Grade	7 th Grade	10 th Grade
<p>you about doing each of the following? I can round \$43.19 to the nearest dollar.</p>	<p>are you about doing each of the following? I can give an example to show that a math statement is false.</p>	<p>confident are you about doing each of the following? I can give an example to show that a math statement is false.</p>
<p>43381a: Think about what you learned in your math class this year. How sure are you about doing each of the following? I can write a decimal that is equal to $7/10$.</p>	<p>43423a: Think about what you learned in your math class this year. How confident are you about doing each of the following? I can explain to a classmate how I solved a math problem.</p>	<p>43448f: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can explain to a classmate how I solved a math problem.</p>
<p>43381b: Think about what you learned in your math class this year. How sure are you about doing each of the following? I can write a fraction equal to $2/5$.</p>	<p>43423b: Think about what you learned in your math class this year. How confident are you about doing each of the following? I can use correct mathematical words and symbols when showing my work.</p>	<p>43449a: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can use correct mathematical words and symbols when showing my work.</p>
<p>43381c: Think about what you learned in your math class this year. How sure are you about doing each of the following? I can find the total number of pencils in my classroom if 26 students each have 15 pencils.</p>	<p>43423c: Think about what you learned in your math class this year. How confident are you about doing each of the following? I can determine the better deal between a 10-ounce drink for \$1.99 and a 12-ounce drink for \$2.29.</p>	<p>43449b: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can use definitions of geometric shapes to support an argument.</p>
<p>43381d: Think about what you learned in your math class this year. How sure are you about doing each of the following? I can find the total length of a group of 12 pennies side-by-side if a penny is $3/4$ of an inch wide.</p>	<p>43423d: Think about what you learned in your math class this year. How confident are you about doing each of the following? I can write the unknown number to make $4(2x - \underline{\quad}) = 8x - 12$ true.</p>	<p>43449c: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can determine the better deal between a 10-ounce drink for \$1.99 and a 12-ounce drink for \$2.29.</p>
	<p>43423e: Think about what you learned in your math class this year. How confident are you about doing each of</p>	<p>43449d: Think about what you learned in your high school math classes. How confident are you about</p>

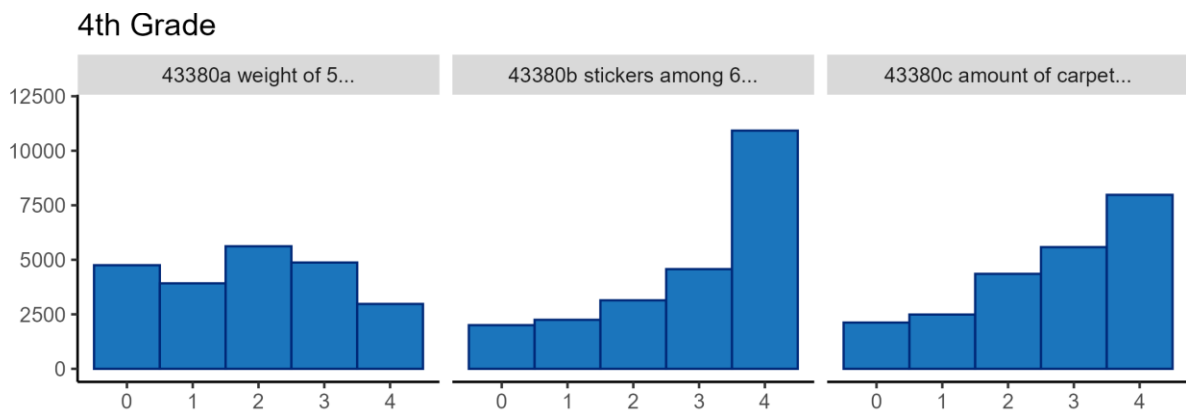
Student Educational Equity Development (SEED) Survey

4 th Grade	7 th Grade	10 th Grade
	the following? I can find the difference in altitude between a 1,493-foot mountain and a valley that is 38 feet below sea level.	doing each of the following? I can solve the equation $5x^2 - 3 = 17$ for x.
		43449e: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can graph the equation $y = -2x + 5$ on a coordinate plane.
		43449f: Think about what you learned in your high school math classes. How confident are you about doing each of the following? I can describe how the median and interquartile range can be used to compare two sets of data.

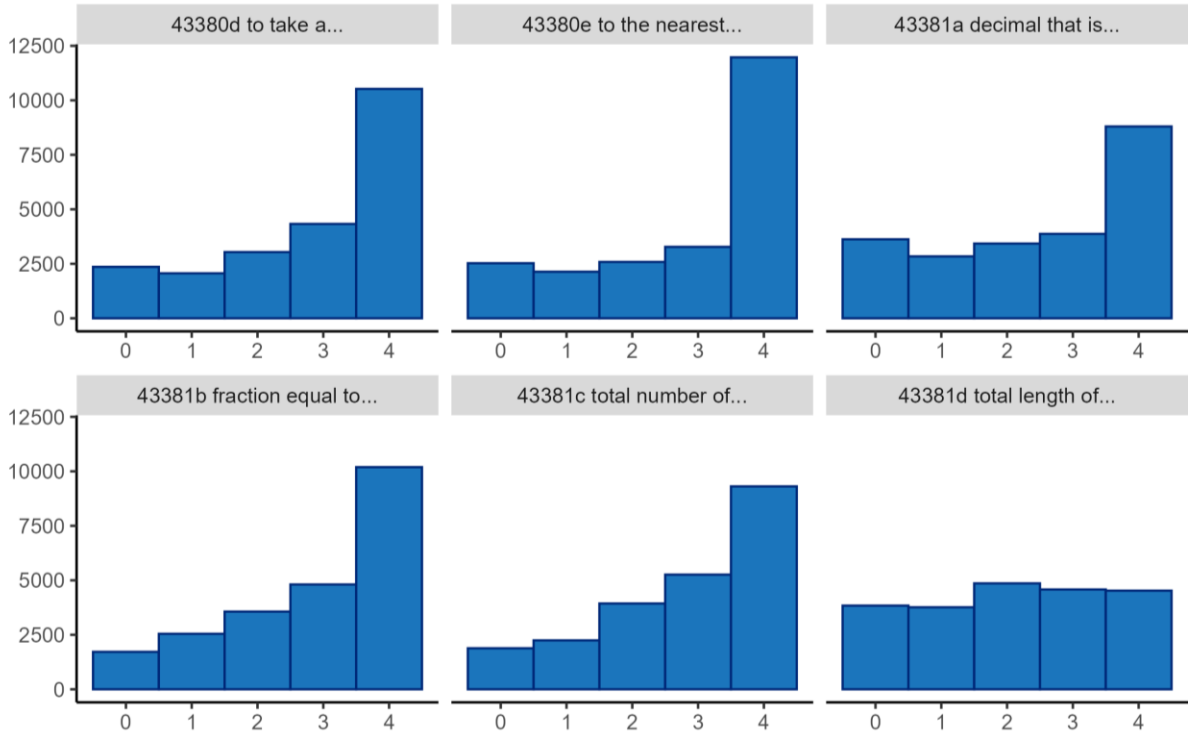
Note. 4th Grade Response Options: Not Sure (0), A Little Sure (1), Somewhat Sure (2), Mostly Sure (3), Very Sure (4). 7th & 10th Grade Response Options: Not Confident (0), A Little Confident (1), Somewhat Confident (2), Mostly Confident (3), Very Confident (4)

Descriptive Statistics

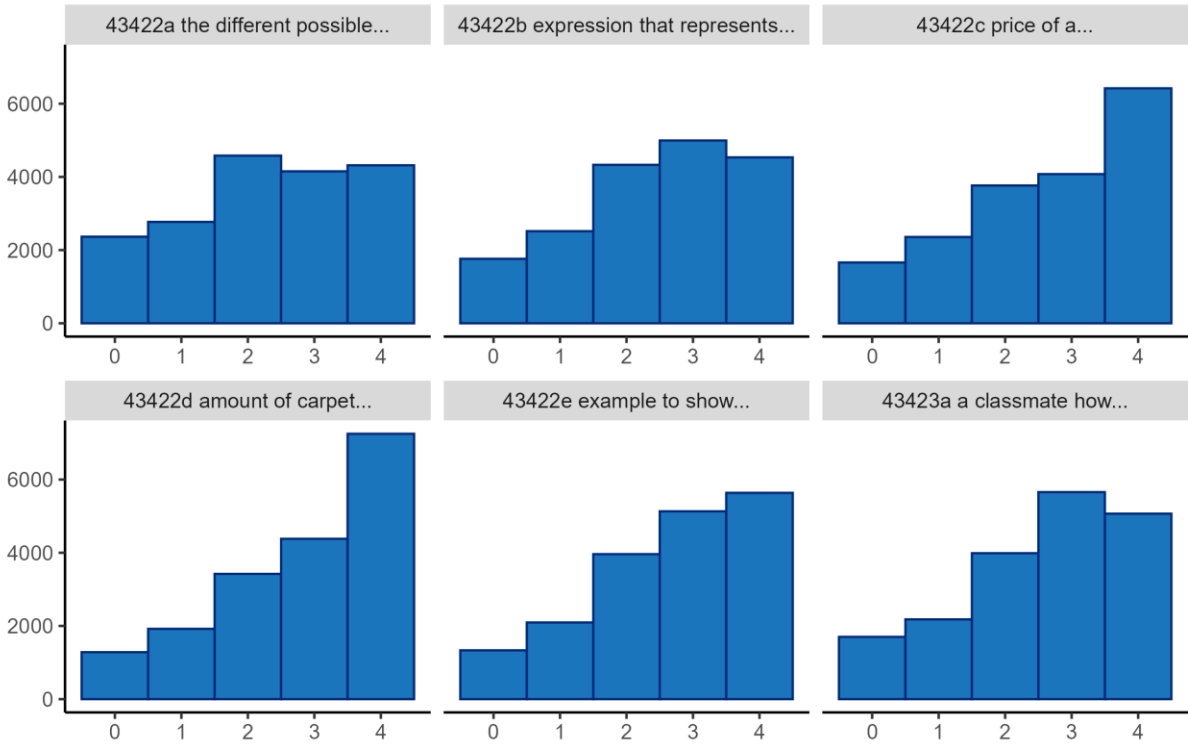
Item histograms for **Mathematics Self-Efficacy** are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).



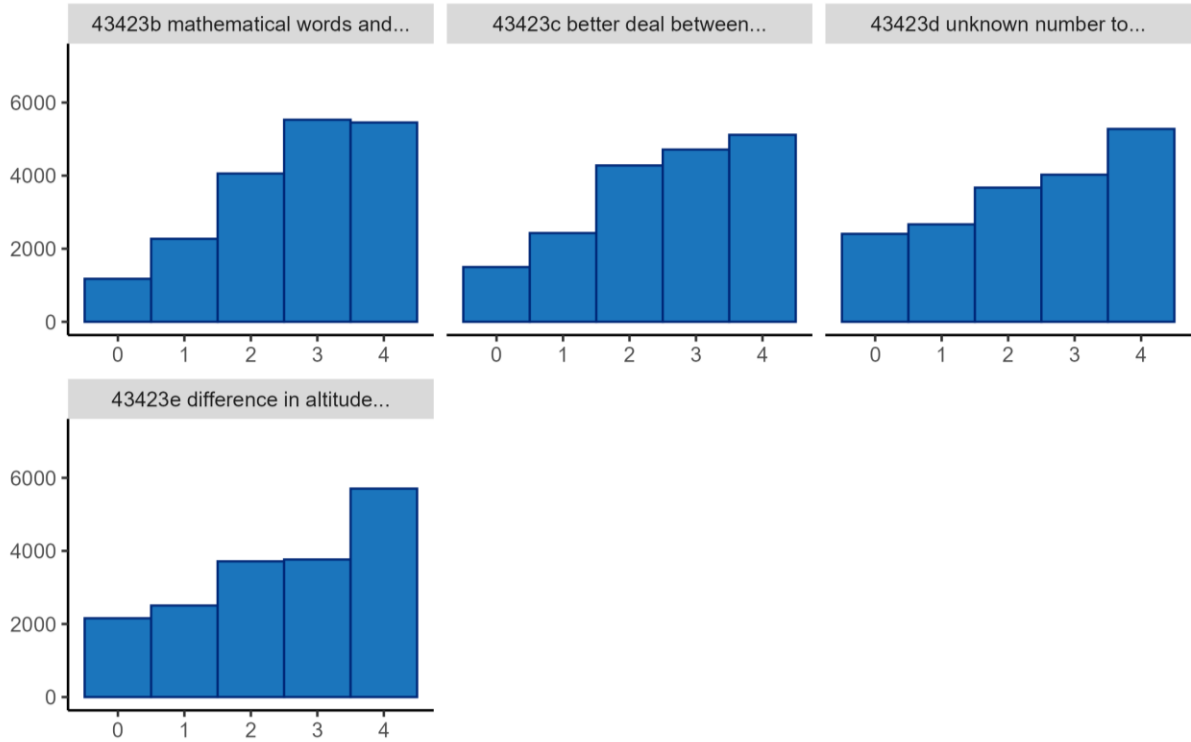
Student Educational Equity Development (SEED) Survey



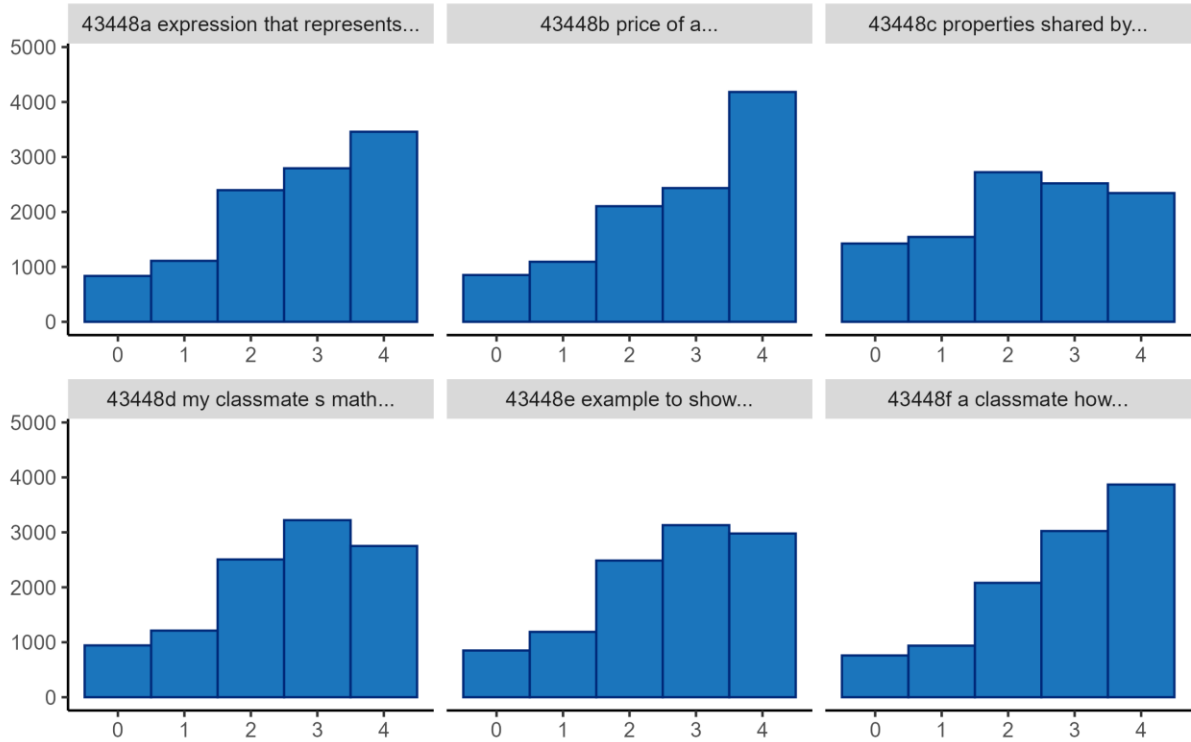
7th Grade



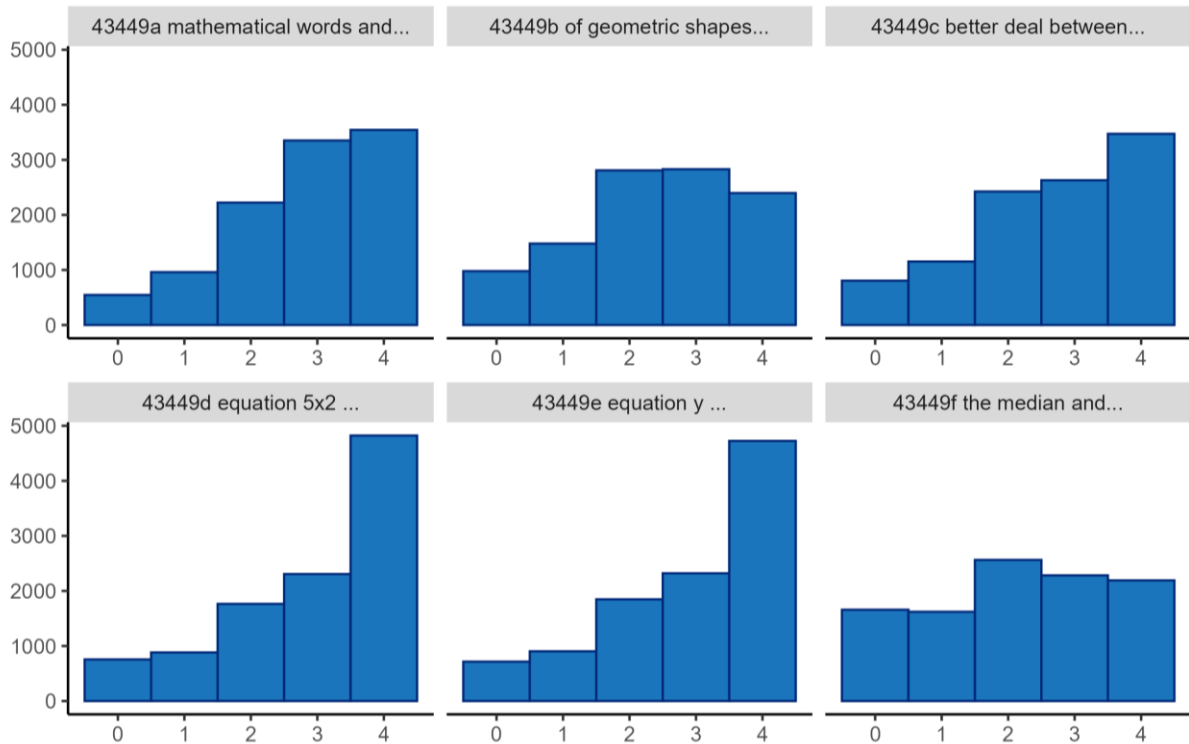
Student Educational Equity Development (SEED) Survey



10th Grade



Student Educational Equity Development (SEED) Survey



Dimensionality

4th, 7th, 10th Grade: We selected a one component solution for 4th, 7th, and 10th grade based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figures (#1). The one component solution was the only solution that explained a meaningful amount of variance.

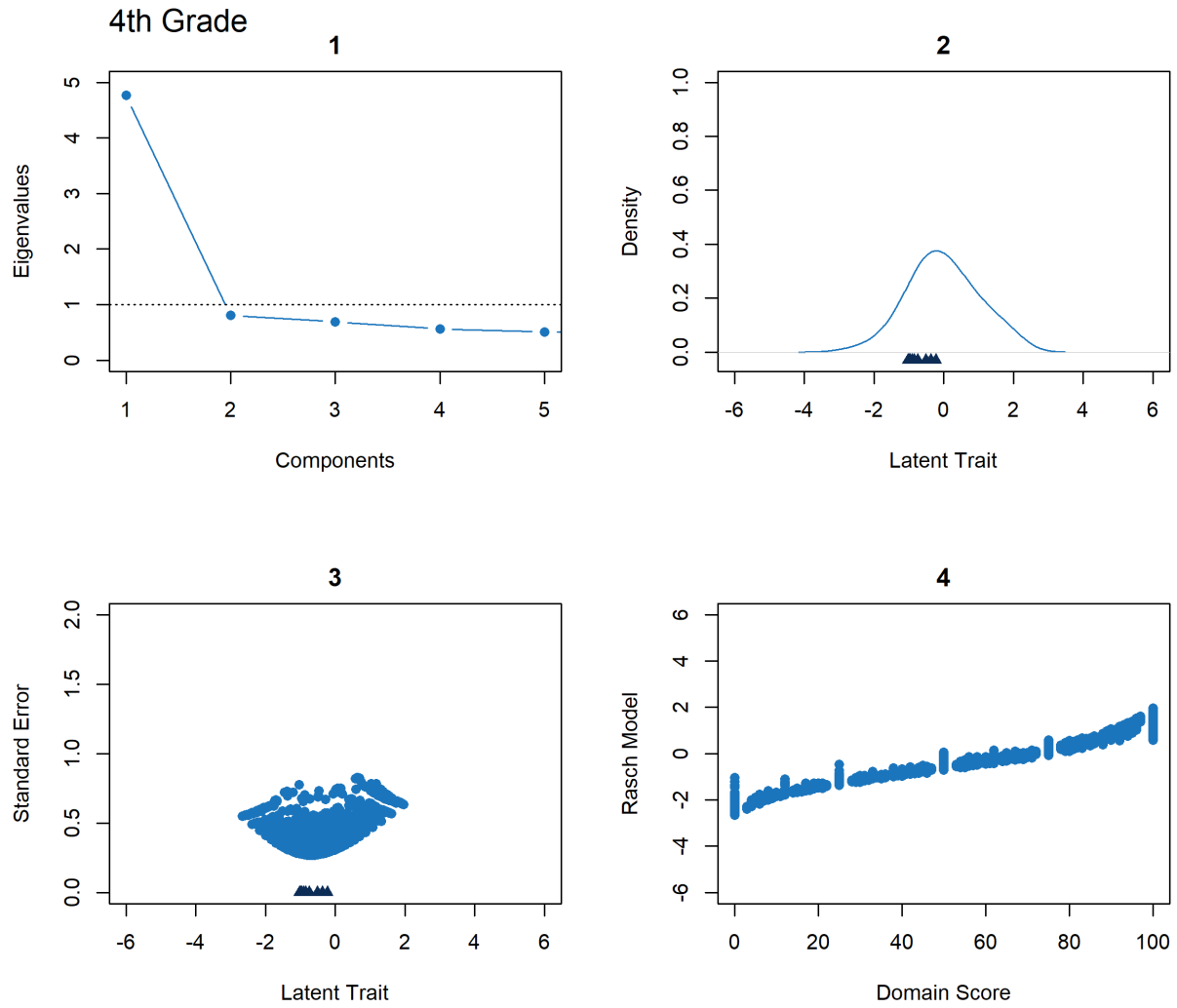
Rasch Modeling

4th, 7th, 10th Grade: We retained all items for each grade based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (4th grade: -.14 to .17; 7th grade: -.20 to .17; 10th grade: -.30 to .25) and [infit](#) (4th grade: .77 to 1.04; 7th grade: .74 to 1.21; 10th grade: .70 to 1.35). The figures (#2) plot each [item's location](#) onto the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -2 and 0. The figures (#3) map the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) (4th grade: .86; 7th grade: .92; 10th grade: .93) was acceptable.

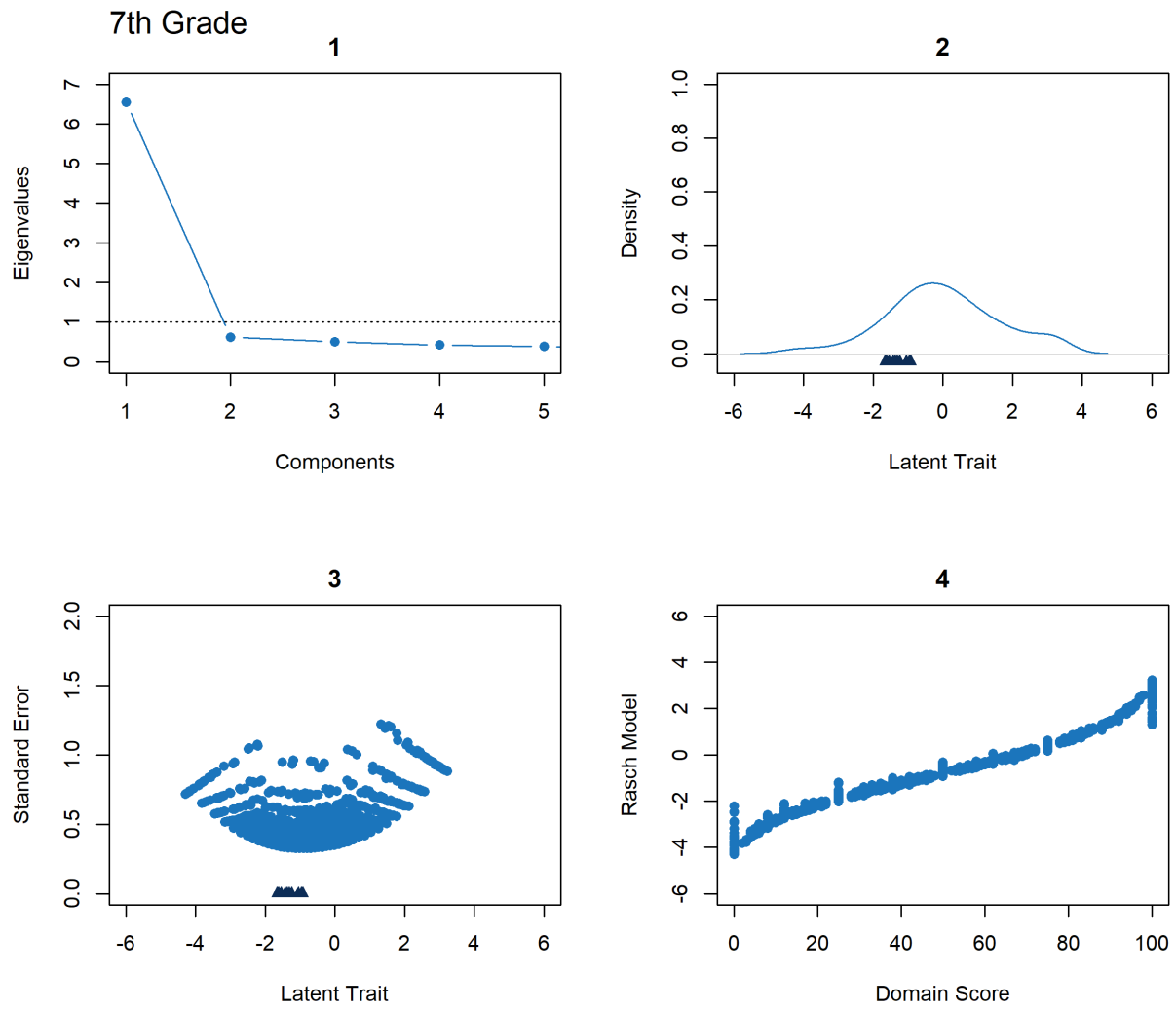
Validation

4th, 7th, 10th Grade: The figures (#4) display the correlation between the Rasch model (y-axis) and the domain score (x-axis) for each grade. The correlation was .97 for 4th, 8th, and 10th grade, suggesting that the domain scores are acceptable representations of the Rasch models.

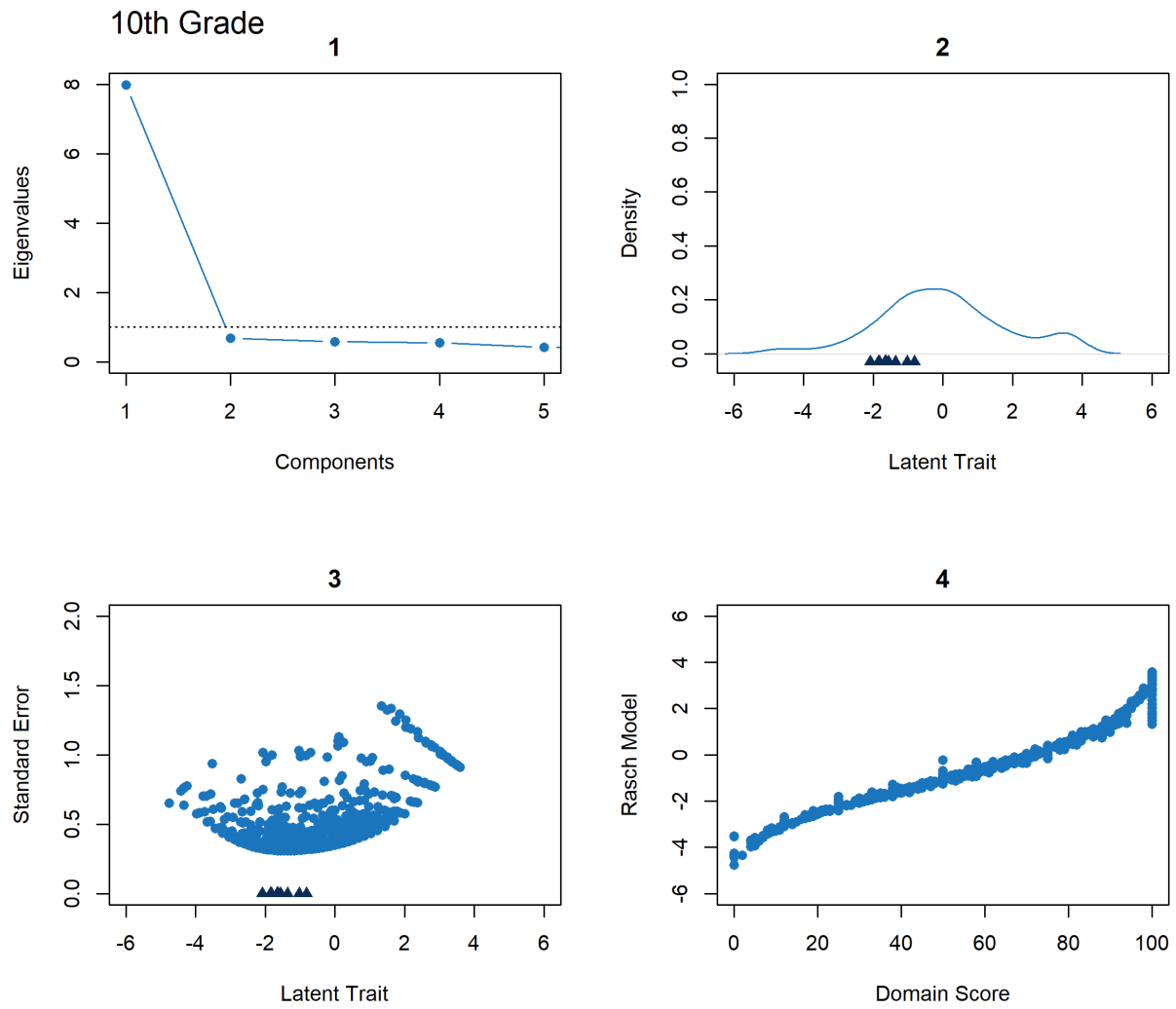
Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Science

Science Self-Efficacy is only included on the SEED Survey in grades 5, 8, and 11. We included all **Science Self-Efficacy** items in our analysis:

5 th Grade	8 th Grade	11 th Grade
43406a: Think about what you learned in your science classes. How sure are you about doing each of the following? I can describe different ways to heat or cool water.	43435a: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can describe how the length of a vibrating string affects the sound it makes.	43491a: Think about what you learned in your high school science classes. How confident are you about doing each of the following? I can describe how the length of a vibrating string affects the sound it makes.
43406b: Think about what you learned in your science classes. How sure are you about doing each of the following? I can use models to describe where animals get their energy from.	43435b: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can design an experiment to show how sunlight affects the growth of a plant.	43491b: Think about what you learned in your high school science classes. How confident are you about doing each of the following? I can design an experiment to show how sunlight affects the growth of a plant.
43406c: Think about what you learned in your science classes. How sure are you about doing each of the following? I can design an experiment to show how sunlight affects the growth of a plant.	43435c: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can describe what would happen to the number of frogs at a pond if all the insects were removed from the pond.	43491c: Think about what you learned in your high school science classes. How confident are you about doing each of the following? I can decide which tool to use if I want to measure wind speed.
43406d: Think about what you learned in your science classes. How sure are you about doing each of the following? I can use examples to show how one living thing has helped another to survive.	43435d: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can decide which tool to use if I want to measure wind speed.	43491d: Think about what you learned in your high school science classes. How confident are you about doing each of the following? I can design an experiment to test how the growth of a plant is affected by light, water, and soil quality.
43407a: Think about what you learned in your science classes. How sure are you about doing each of the following? I can explain why	43435e: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can describe how	43491e: Think about what you learned in your high school science classes. How confident are you about doing each of the following? I

Student Educational Equity Development (SEED) Survey

5 th Grade	8 th Grade	11 th Grade
some animals survive better in some environments than others.	light interacts with a glass window.	can create a diagram that shows how bees and plants need each other for survival.
43407b: Think about what you learned in your science classes. How sure are you about doing each of the following? I can describe ways the hydrosphere and atmosphere interact.	43436a: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can construct an argument based on evidence for how environmental and genetic factors influence the growth of an organism.	43492a: Think about what you learned in your high school science classes. How confident are you about doing each of the following? I can describe how the combination of parental genes can result in different traits in their offspring (for example, eye or hair color).
43407c: Think about what you learned in your science classes. How sure are you about doing each of the following? I can describe how properties are used to identify a material.	43436b: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can use a model to describe the function of a cell and the ways the parts of the cell contribute to the function.	43492b: Think about what you learned in your high school science classes. How confident are you about doing each of the following? I can use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
43407d: Think about what you learned in your science classes. How sure are you about doing each of the following? I can describe why day and night and seasons happen.	43436c: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can develop and use models to describe the cause and effect of gene transmission that results in genetic variation.	43492c: Think about what you learned in your high school science classes. How confident are you about doing each of the following? I can develop a model to describe how variations in the flow of energy in and out of Earth's systems result in changes in climate.
	43436d: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can construct an argument supported by evidence for the impacts of human populations on Earth's systems.	43492d: Think about what you learned in your high school science classes. How confident are you about doing each of the following? I can design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

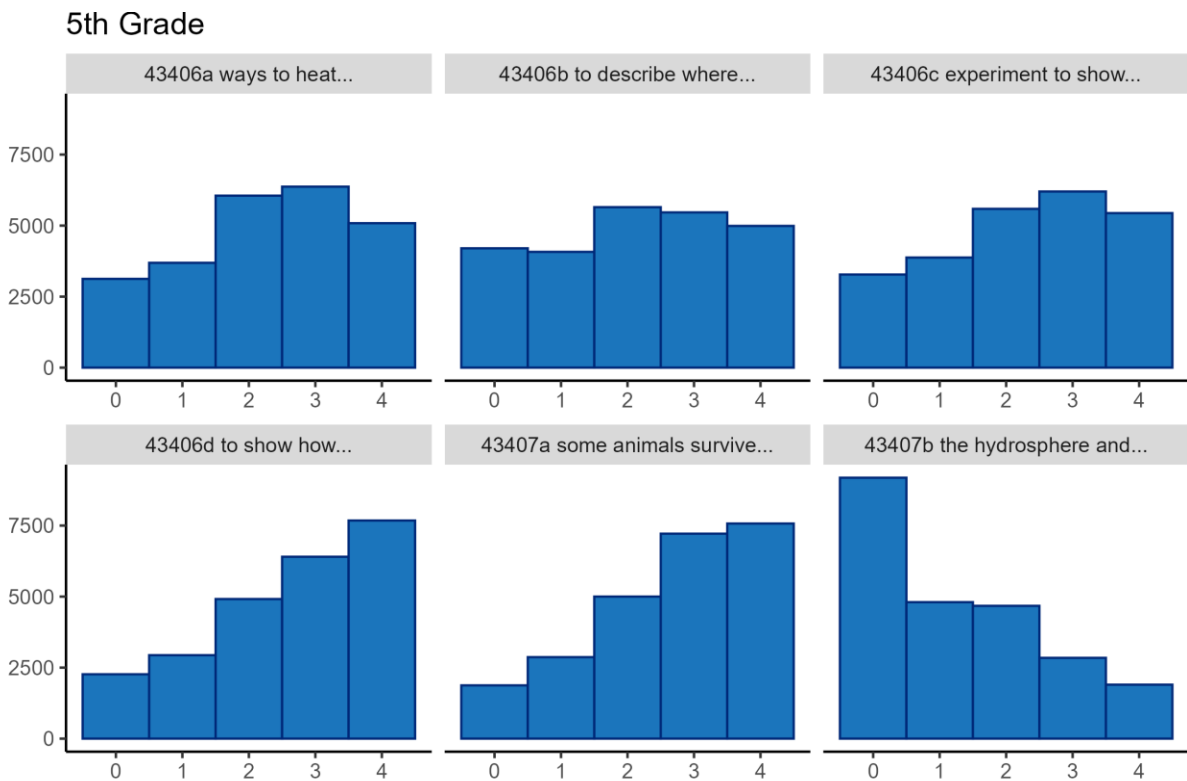
Student Educational Equity Development (SEED) Survey

5 th Grade	8 th Grade	11 th Grade
	43436e: Think about your science classes in grades 6, 7, and 8. How confident are you about doing each of the following? I can develop a model to describe the structure of a water molecule.	

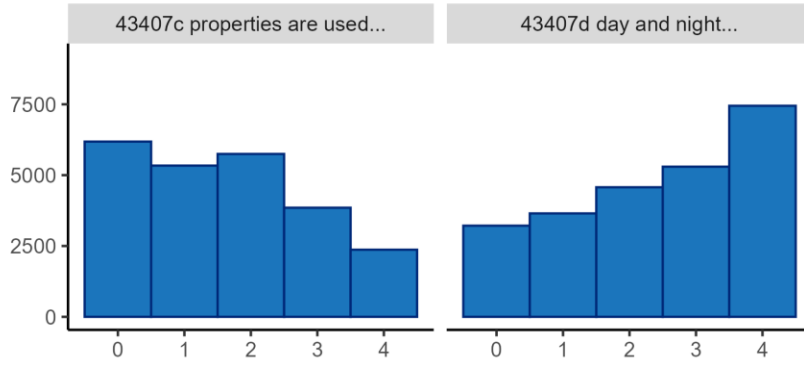
Note. 5th Grade Response Options: Not Sure (0), A Little Sure (1), Somewhat Sure (2), Mostly Sure (3), Very Sure (4). 8th & 11th Grade Response Options: Not Confident (0), A Little Confident (1), Somewhat Confident (2), Mostly Confident (3), Very Confident (4)

Descriptive Statistics

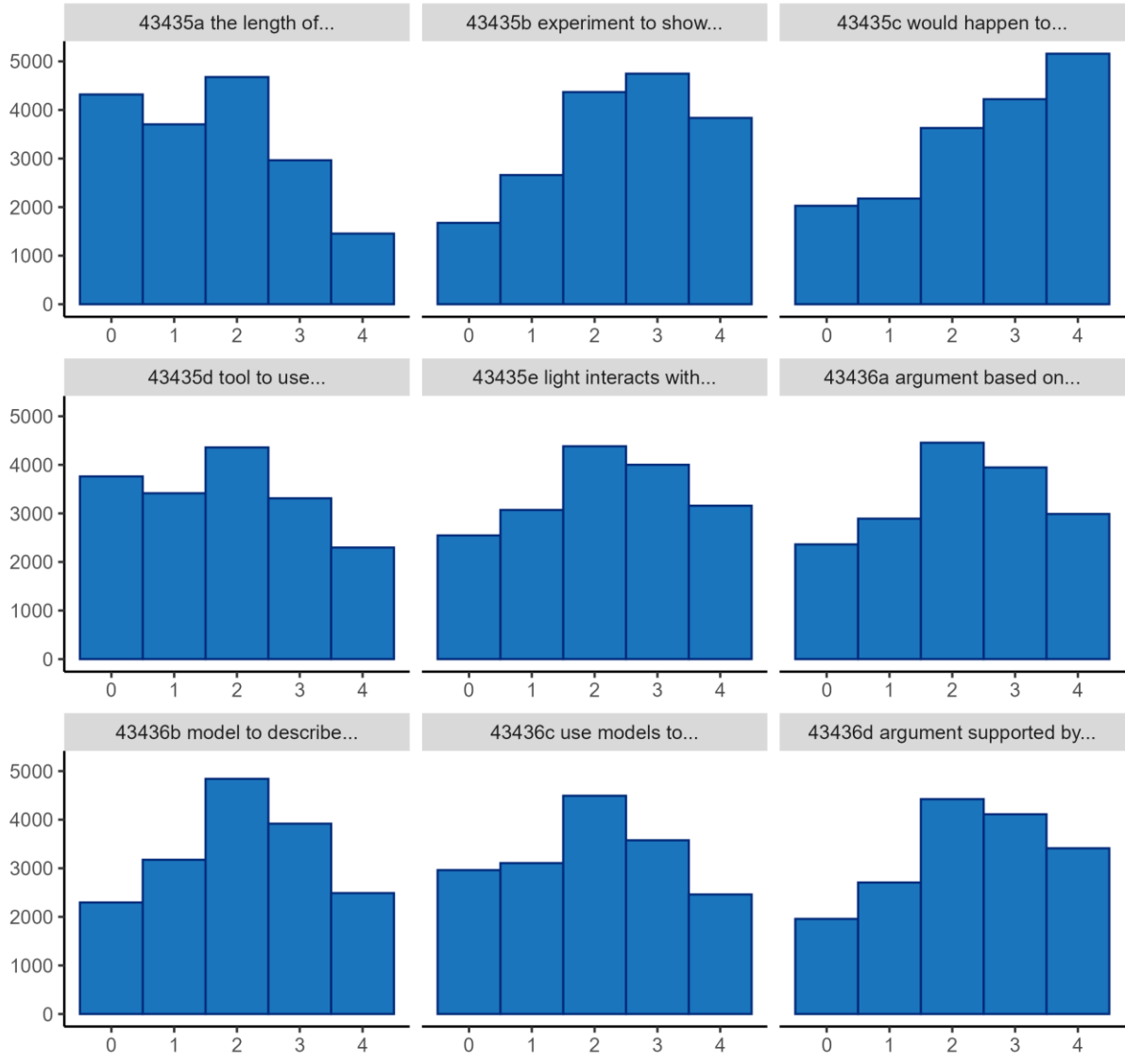
Item histograms for **Science Self-Efficacy** are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).



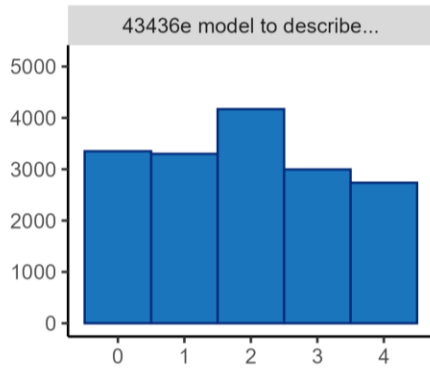
Student Educational Equity Development (SEED) Survey



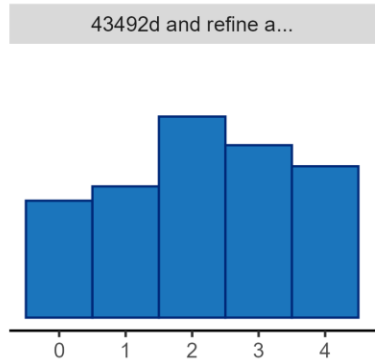
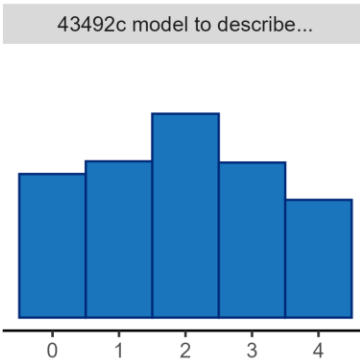
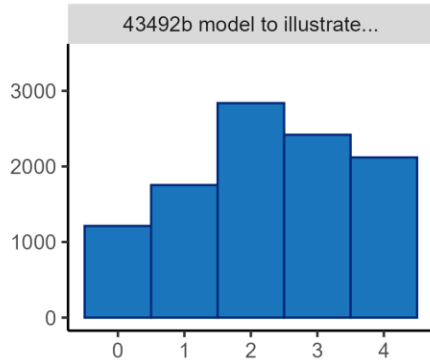
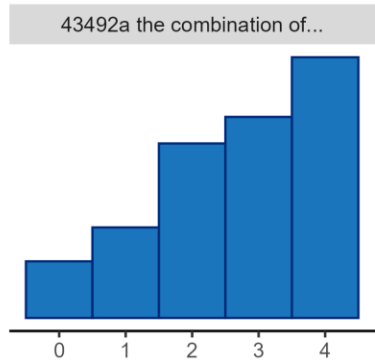
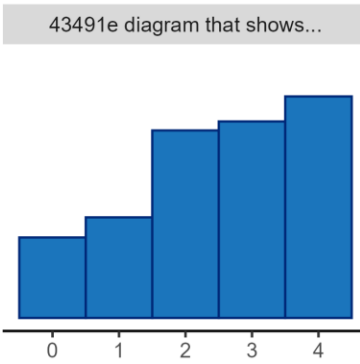
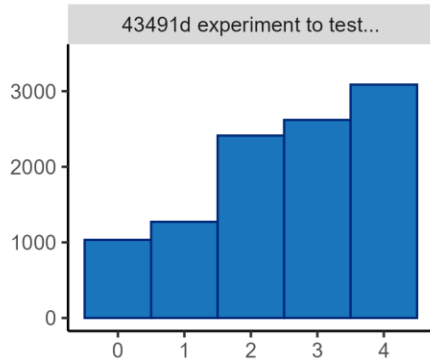
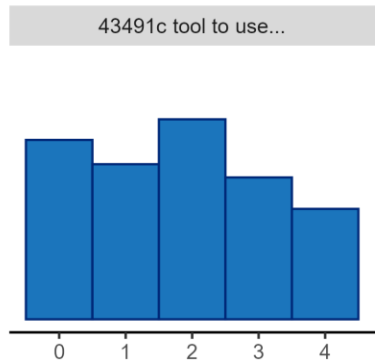
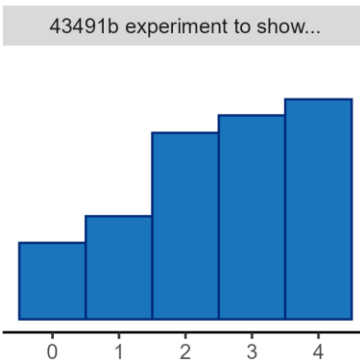
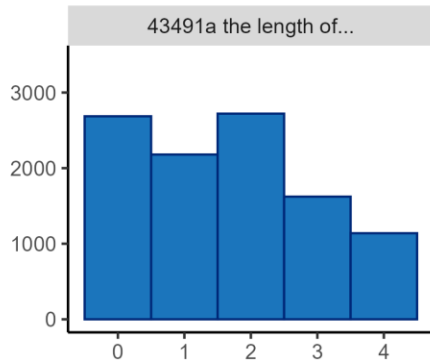
8th Grade



Student Educational Equity Development (SEED) Survey



11th Grade



Dimensionality

5th, 8th, 11th Grade: We selected a one component solution for 5th, 8th, and 11th grade based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figures (#1). The one component solution was the only solution that explained a meaningful amount of variance.

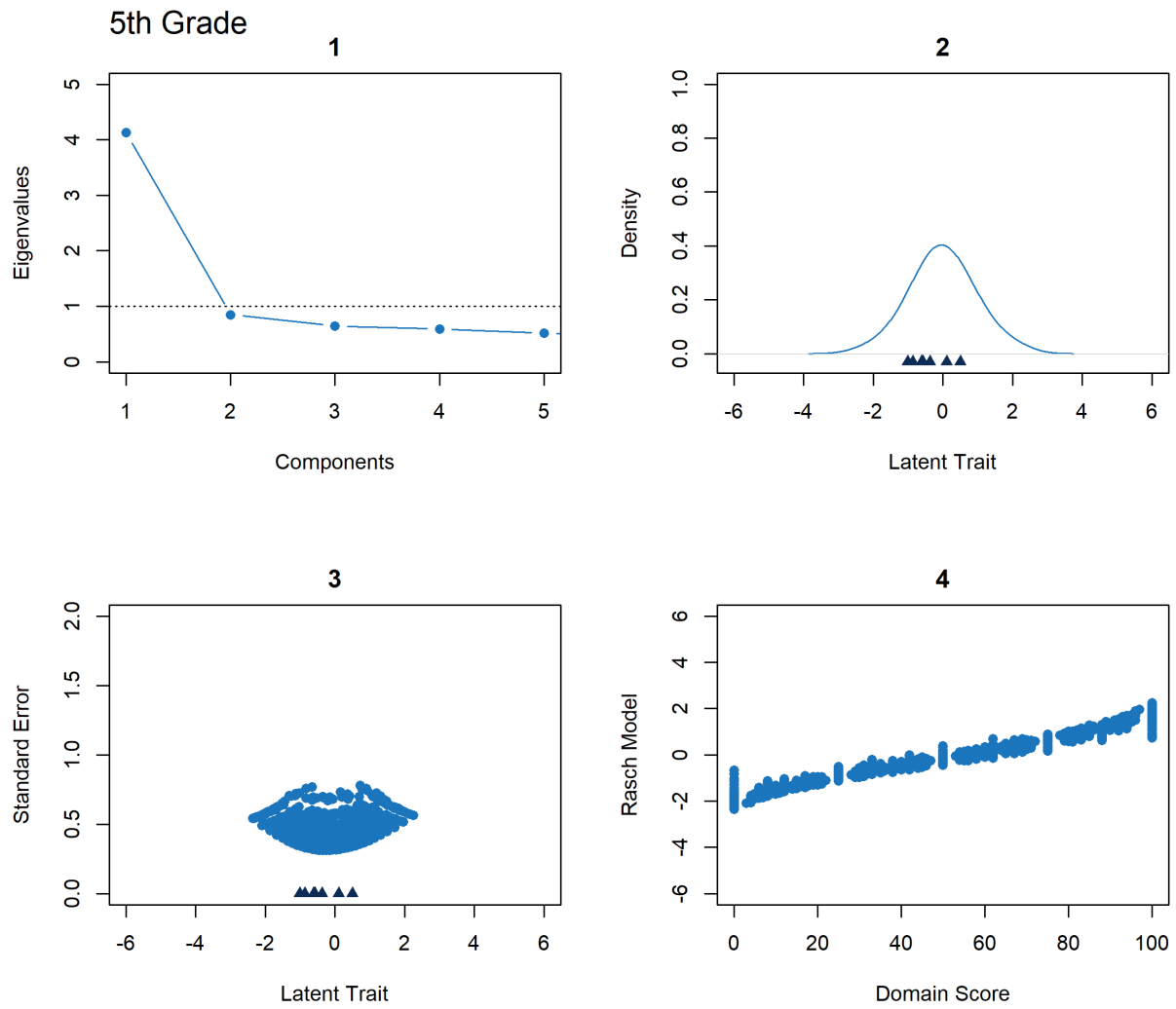
Rasch Modeling

5th, 8th, 11th Grade: We retained all items for each grade based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (5th grade: -.12 to .11; 8th grade: -.21 to .22; 11th grade: -.27 to .30) and [infit](#) (5th grade: .80 to .94; 8th grade: .75 to 1.09; 11th grade: .73 to 1.17). The figures (#2) plot each [item's location](#) onto the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -1 and 1 for 5th grade and between -2 and 0 for 8th and 11th grade. The figures (#3) map the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) (5th grade: .85; 8th grade: .92; 11th grade: .92) was acceptable.

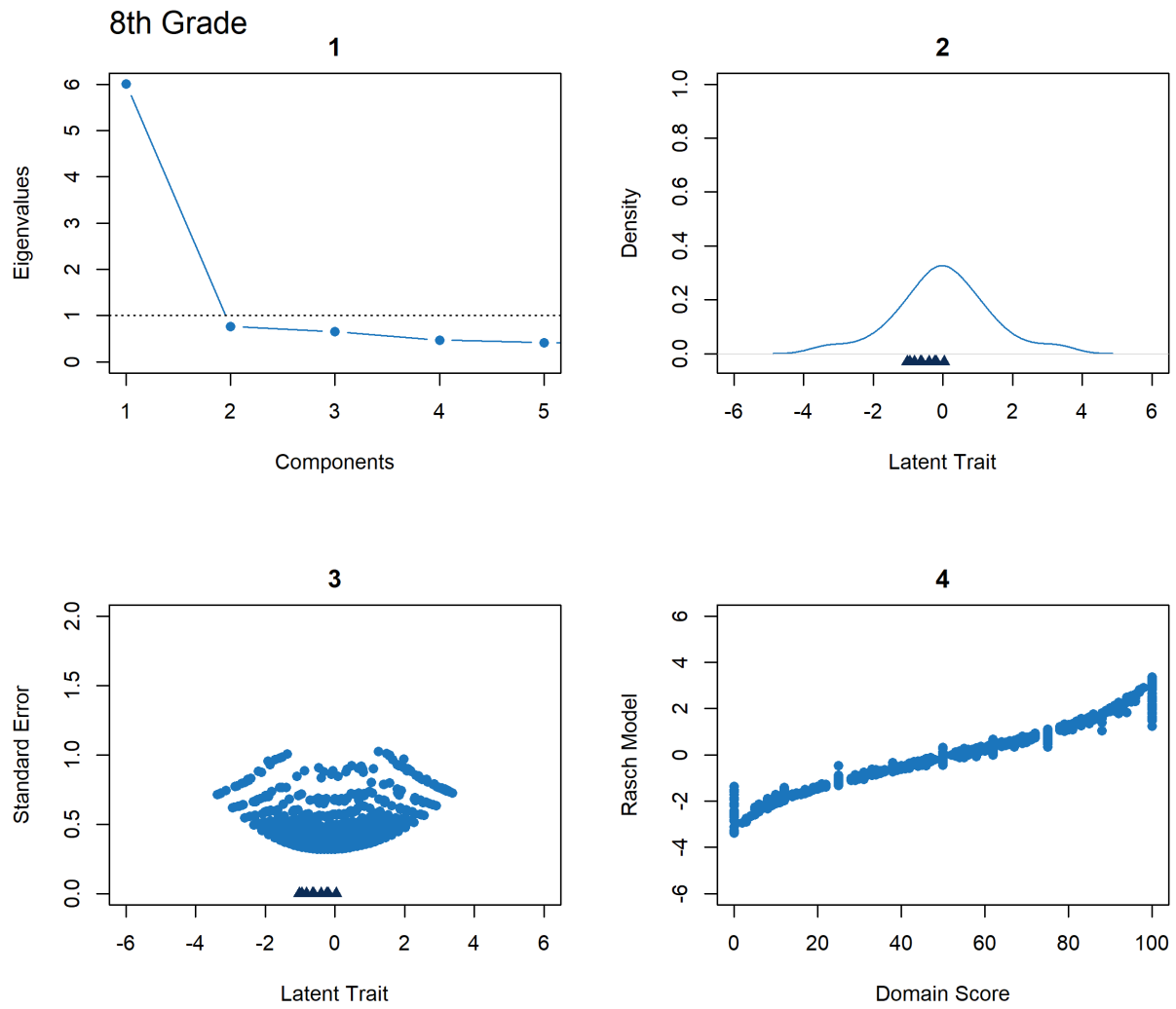
Validation

5th, 8th, 11th Grade: The figures (#4) display the correlation between the Rasch model (y-axis) and the domain score (x-axis) for each grade. The correlation was .99 for 5th grade and was .98 for 8th and 11th grade, suggesting that the domain scores are acceptable representations of the Rasch models.

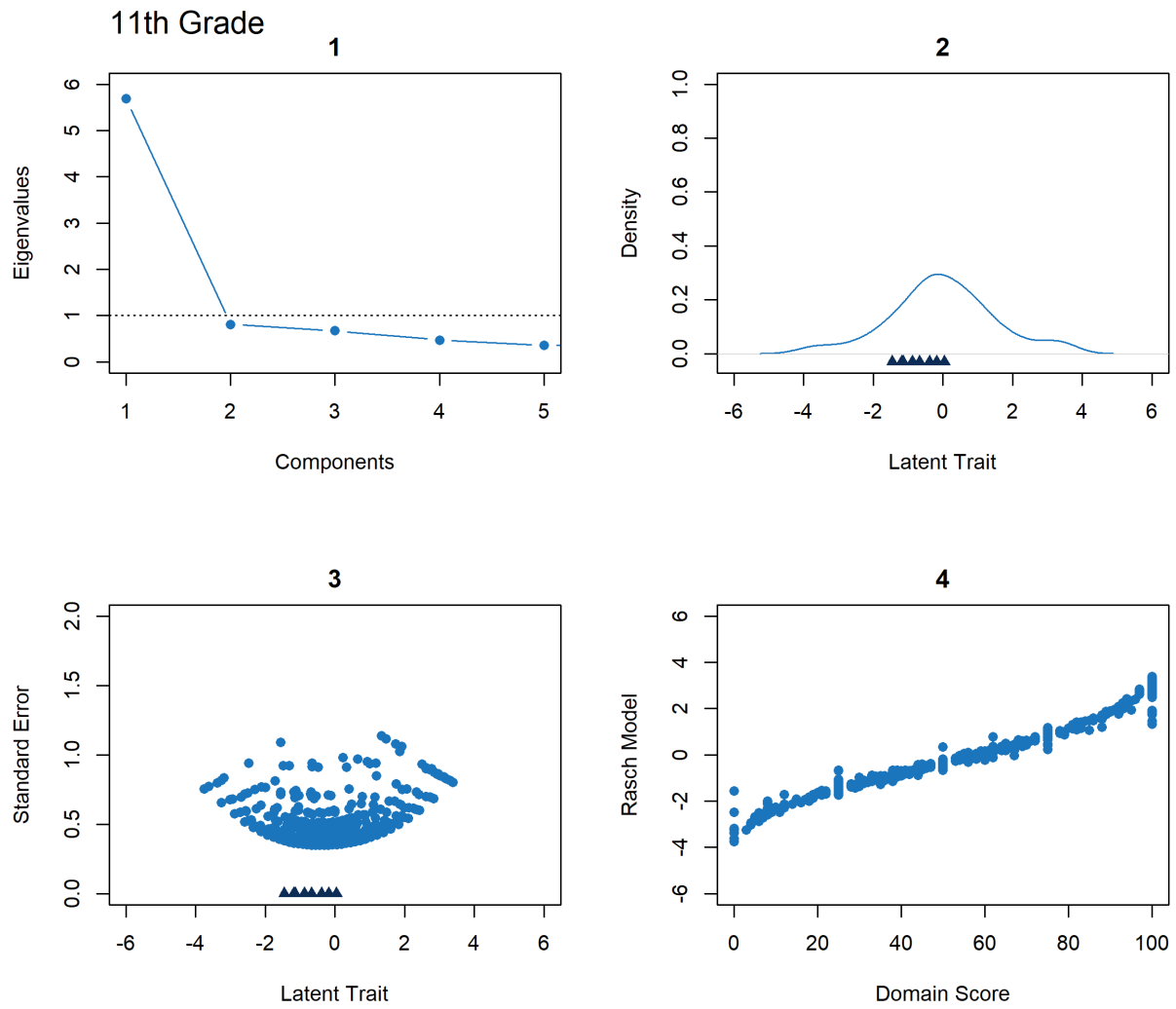
Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Student Educational Equity Development (SEED) Survey



Career Connected Learning

We included all **Career Connection Learning** items in our analysis:

9 th to 11 th Grade
43457a: How often did you do the following things at your school? Connect what you are learning in your classes to potential career opportunities.
43457b: How often did you do the following things at your school? Speak with a counselor, teacher, or another adult at your school about career opportunities
43457c: How often did you do the following things at your school? Use the internet to gather information about careers.

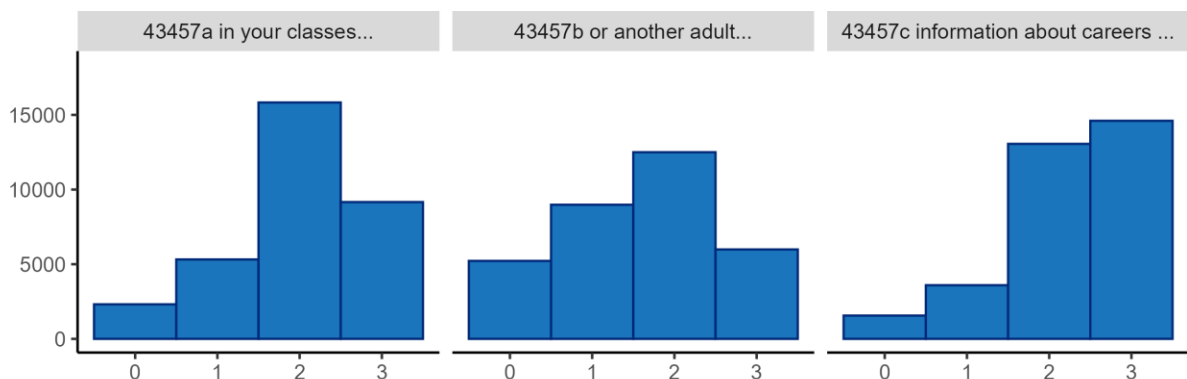
Note. *Response Options:* Never (0), Rarely (1), Sometimes (2), Often (3)

9 th to 11 th Grade
43458a: Think about the career resources and opportunities at your school. Indicate your level of agreement with the following statements. At my school, students have opportunities to complete a questionnaire to learn more about their interests and abilities.
43458b: Think about the career resources and opportunities at your school. Indicate your level of agreement with the following statements. At my school, students have opportunities to interact with business and industry professionals through internships, projects, school-based businesses, or other work experiences.
43458c: Think about the career resources and opportunities at your school. Indicate your level of agreement with the following statements. At my school, students have opportunities to visit and tour businesses or participate in job shadows.
43458d: Think about the career resources and opportunities at your school. Indicate your level of agreement with the following statements. At my school, students have opportunities to set learning goals based on interests and future career goals.

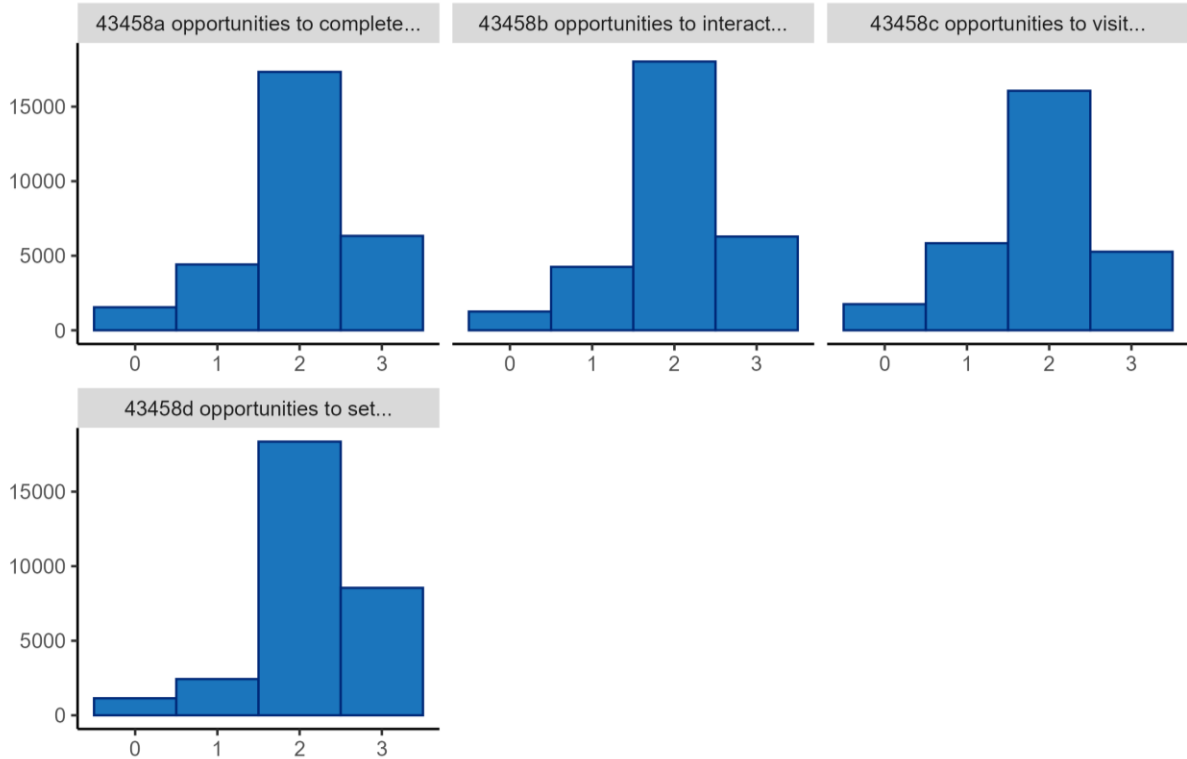
Note. *Response Options:* Strongly Disagree (0), Disagree (1), Agree (2), Strongly Agree (3)

Descriptive Statistics

Item histograms for **Career Connected Learning** are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).



Student Educational Equity Development (SEED) Survey



Dimensionality

We selected a one component solution based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figure (plot #1). The one and two component solutions explained a meaningful amount of variance.

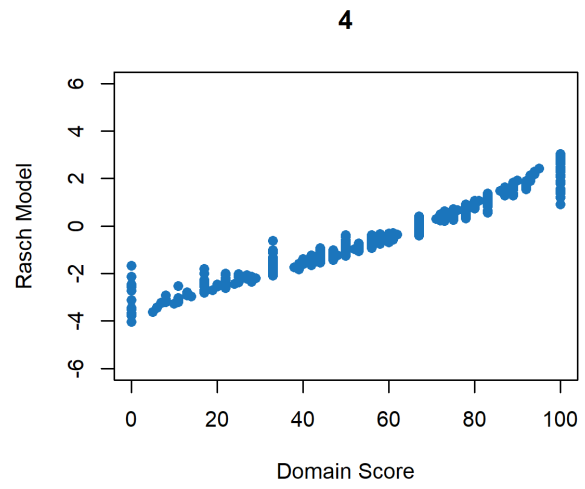
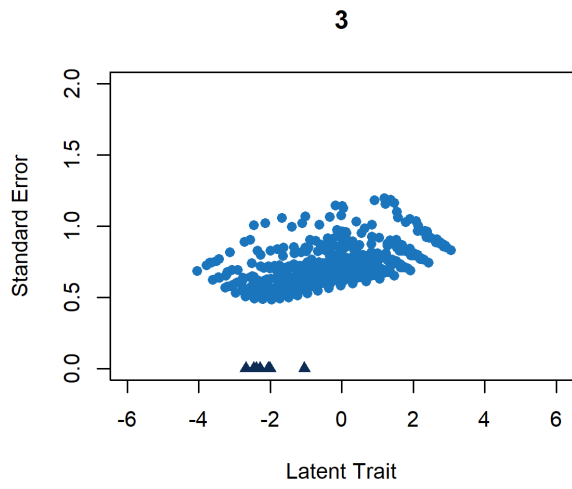
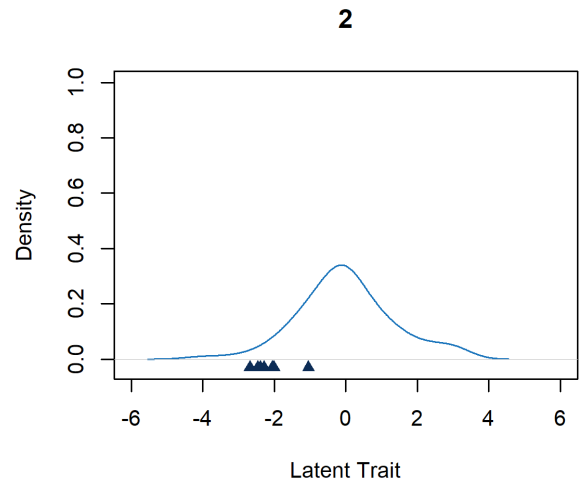
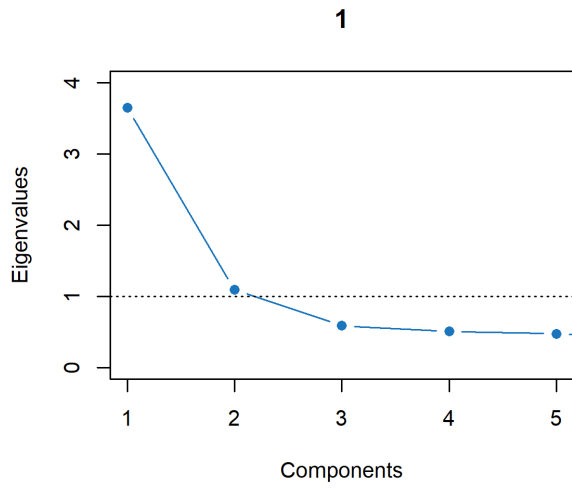
Rasch Modeling

We retained all items based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (-.15 to .25) and [infit](#) (.78 to 1.02). The figure (plot #2) shows each [item's location](#) across the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -3 and -1. The figure (plot #3) maps the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) was .82 and therefore acceptable.

Validation

The figure (plot #4) displays the correlation between the Rasch model (y-axis) and the domain score (x-axis). The correlation was .98, suggesting that the domain score is an acceptable representation of the Rasch model.

Student Educational Equity Development (SEED) Survey



Well-Rounded Education

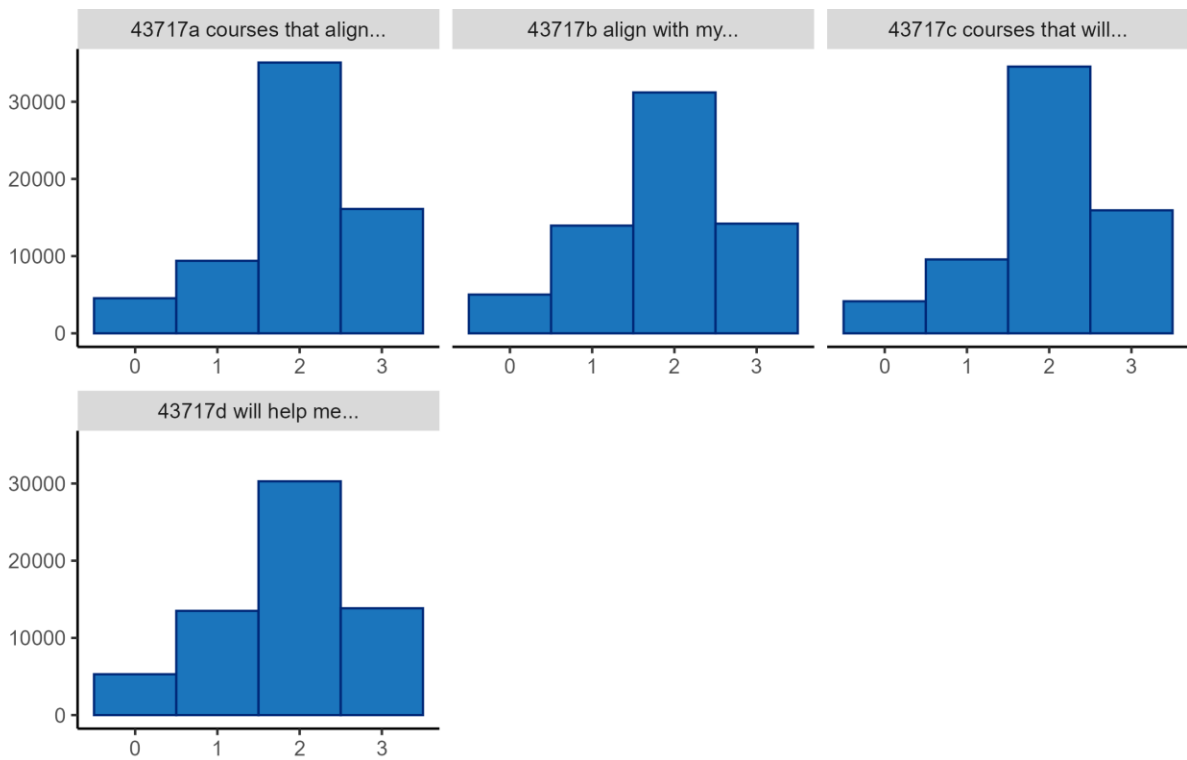
We included all **Well-Rounded Education** items in our analysis:

7 th to 11 th Grade
43717a: Think about this school year and the courses available at your school. How much do you agree with each statement? I have opportunities to take courses that align with my interests.
43717b: Think about this school year and the courses available at your school. How much do you agree with each statement? I am taking courses that align with my interests.
43717c: Think about this school year and the courses available at your school. How much do you agree with each statement? I have opportunities to take courses that will help me achieve my future goals.
43717d: Think about this school year and the courses available at your school. How much do you agree with each statement? I am taking courses that will help me achieve my future goals.

Note. *Response Options:* Strongly Disagree (0), Disagree (1), Agree (2), Strongly Agree (3)

Descriptive Statistics

Item histograms for **Well-Rounded Education** are shown below. The histograms plot the response options for each item (x-axis) by the number of students who selected the response (y-axis).



Dimensionality

We selected a one component solution based on the output of the [PCA](#). The [scree plot](#) for the items is shown in the figure (plot #1). The one and two component solutions explained a meaningful amount of variance.

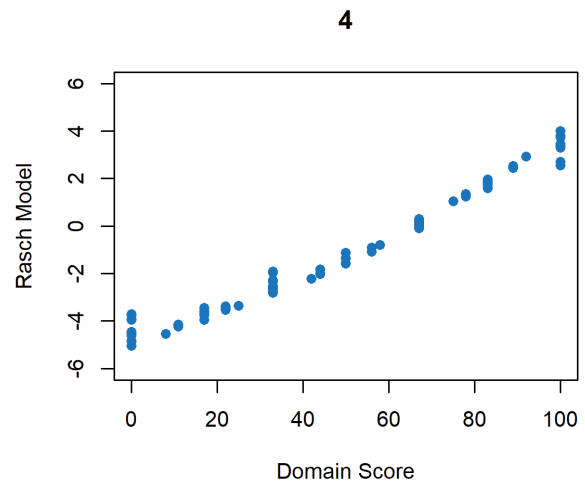
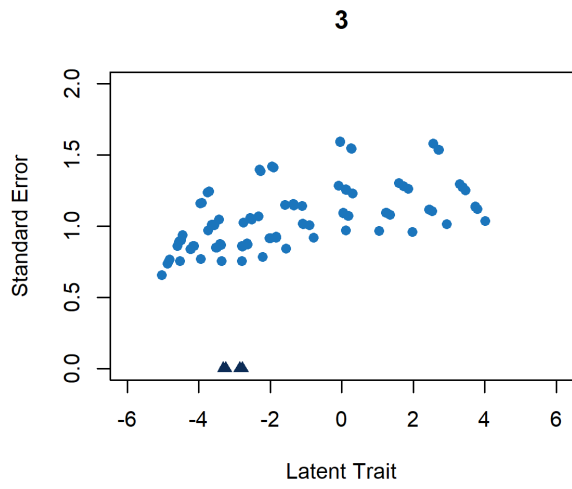
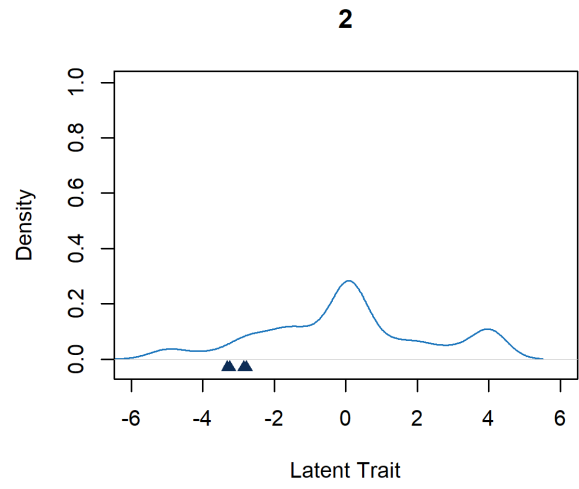
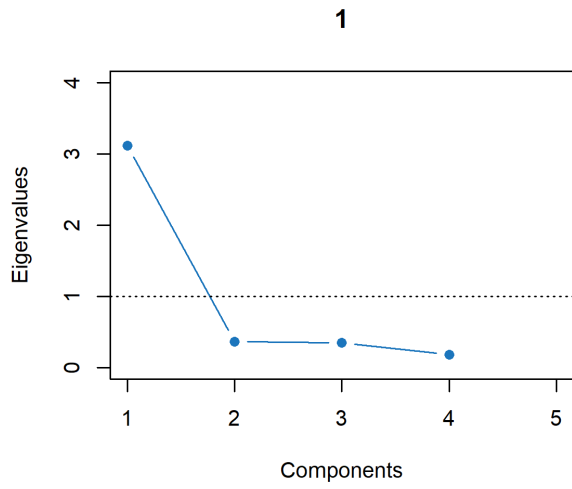
Rasch Modeling

We retained all items based on the output of the [Rasch model](#). Items showed acceptable [residual correlations](#) (-.38 to .26) and [infit](#) (.65 to .71). The figure (plot #2) shows each [item's location](#) across the latent trait. Item locations are represented by triangles on the x-axis. Item locations were clustered between -2 and -2. The figure (plot #3) maps the [standard error](#) of the Rasch model (y-axis) across the latent trait (x-axis). The standard error is minimized in regions of the latent trait where items are most densely clustered, as indicated by the triangles along the x-axis. Consequently, estimates within that clustered range are obtained with higher precision, whereas estimates outside that range are associated with increased uncertainty due to the fewer number of items to deliver information. [Marginal reliability](#) was .86 and therefore acceptable.

Validation

The figure (plot #4) displays the correlation between the Rasch model (y-axis) and the domain score (x-axis). The correlation was .99, suggesting that the domain score is an acceptable representation of the Rasch model.

Student Educational Equity Development (SEED) Survey



Discussion

This report outlined ODE's process for creating and validating domain scores for the following SEED Survey domains: Access to Learning Resources, Sense of Belonging, Opportunity to Learn (ELA, Mathematics, Science), Self-Efficacy (ELA, Mathematics, Science), Career Connected Learning, and Well-Rounded Education. A summary of the results is provided below:

- 1. Descriptive Statistics.** Item distributions were varied, with some being normal and others being positively or negatively skewed.
- 2. Dimensionality.** Results of the [PCAs](#) and [scree plots](#) indicated that a one component solution explained a meaningful amount of variance for each domain. In some cases, multi component solutions also explained a meaningful amount of variance. We selected a one component solution in all scenarios for parsimony, simplicity, and straightforward interpretation.
Note. Though the one component solutions provide practical benefits, results suggest that some domains might be more comprehensively modeled through multiple components. Additionally, there are other approaches to assessing dimensionality that were not covered in this report, including exploratory and confirmatory factor analysis. These approaches have different theoretical bases and goals and could therefore produce different solutions. ODE may model SEED Survey data using other such approaches in the future, based on their relevance to specific needs, priorities, or research goals.
- 3. Rasch Modeling.** We specified Rasch models for each domain. All items included in the Rasch models showed acceptable residual correlations and infit, providing initial evidence that all items should be retained. Item locations generally ranged between -3 and 1, meaning that they targeted mid-low to mid-center levels of the domains. Two domains—ELA Self-Efficacy (9th grade only) and Well-Rounded Education—stood out as having lower item locations (ranging from -4 to -2). Marginal reliability was $\geq .7$ for all domains except Opportunity to Learn ELA (3rd grade only). We took the low marginal reliability for this domain to mean that no items should be retained and that the items should not be combined to create a domain score.
Note. ODE may add or revise SEED Survey items in the future in order to better target higher levels of the domains. Additionally, we may add or revise the 3rd grade Opportunity to Learn ELA items in order to improve marginal reliability and create a domain score. It is possible that these items were not interpreted as intended. ODE may conduct cognitive labs with 3rd graders that include think-aloud opportunities and structured observation to elicit evidence of item functioning.
- 4. Validation.** We created domain scores for all domains, except for 3rd grade Opportunity to Learn ELA. All domain scores were correlated with the Rasch models at or above .95.

Student Educational Equity Development (SEED) Survey

Note. As indicated above, no items targeted exceptionally high levels of the domains (>3). Consequently, domain scores may be prone to greater error when trying to estimate these exceptionally high levels.

The results indicate that domain scores are a sufficient estimate of each respective domain. They can therefore be used to identify systemic strengths and areas for growth that ODE, schools, districts, and community partners can target to improve educational equity, and efficiently track the results of these improvements over time. ODE encourages schools and districts to use these data, in combination with other sources, to inform planning and systemic changes geared at improving student experience and outcomes. Moving forward, ODE plans to release SEED Survey Domain Scores Data files as a part of our regular annual reporting. To learn more about the SEED Survey, access data files, and view other reports and research briefs, visit the [SEED webpage](#).

Glossary

Principal Components Analysis (PCA): A principal components analysis is used to identify how many components (i.e., underlying concepts) a set of items measures. It first estimates a covariance matrix between items and then explains the item covariance through different component solutions (i.e., a one component solution, two component solution, and so on). Based on the output of the PCA, analysts select a component solution that is both parsimonious (does not include more components than are necessary) and accounts for a sufficient amount of variance.

- **Component:** Components are linear combinations of items, assigning different amounts of weight to each item.
- **Scree plot:** Scree plots are used in PCA as a way to visually determine how many components the set of items measures. Scree plots map the number of possible components (x-axis) by the associated eigenvalue (y-axis). The eigenvalue indicates how much variance is explained by each new component added to the model. Eigenvalues >1 indicate a meaningful amount of variance explained and those <1 indicate that the additional component did not explain a meaningful amount of variance.⁷

Rasch Modeling: A Rasch model specifies that a set of items all measure the same underlying concept (i.e. latent trait). It estimates the probability of a student responding affirmatively to each item as a function of the difference between the level of the latent trait and the item intensity.⁸

- **Residual correlations:** The Rasch model assumes that items correlate largely through the latent trait. Additional item correlations beyond what is accounted for via the latent trait are referred to as residual correlations. Residual correlations $< .4$ are acceptable and those larger than $.4$ suggest incongruence to the model.⁹
- **Infit statistics:** Infit statistics are a metric which provide information about how well each item aligns with the Rasch model.¹⁰ Infits $> .6$ and < 1.4 are acceptable and those outside this range suggest misfit (i.e., the response patterns do not adequately adhere to the expected pattern).
- **Item locations:** An item location indicates the point on the latent trait scale where a given item provides the most information.¹¹ The latent trait has a possible range of -6 to

⁷ Guttman, L. (1954). Some necessary conditions for common-factor analysis. *Psychometrika*, 19, 149-161.

<http://dx.doi.org/10.1007/BF02289162>; Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, 20, 141-151.

<http://dx.doi.org/10.1177/001316446002000116>

⁸ Rasch, G. (1960). *Probabilistic models for some intelligence and attainment tests*. Copenhagen: Nielson & Lydiche. Wright, B. D. (1977). Solving measurement problems with the Rasch model. *Journal of Educational Measurement*, 14(2), 97-116. <https://www.jstor.org/stable/1434010>; Wright, B. D., & Stone, M. H. (1979). *Best test design*. Chicago: Mesa Press.

⁹ Chen, W.-H., & Thissen, D. (1997). Local dependence indexes for item pairs using item response theory. *Journal of Educational and Behavioral Statistics*, 22(3), 265-289. <https://doi.org/10.3102/10769986022003265>

¹⁰ Linacre, J. M. (2002). What do infit and outfit, mean-square and standardized mean. *Rasch Measurement Transactions*, 16(2), 878. <https://www.rasch.org/rmt/rmt162f.htm>

¹¹ de Ayala, R.J. (2009). *The theory and practice of item response theory*. New York: Guilford Press.

Student Educational Equity Development (SEED) Survey

6. Item locations < -3 are very low on the latent trait and those > 3 are very high on the latent trait.

- **Standard error (SE):** The standard error is an estimate of uncertainty for each student's latent trait (i.e., θ),¹² and is the standard deviation of the posterior distribution for θ when using EAP estimation. Values closer to zero are preferable and represent greater precision (as opposed to values further from zero).
- **Marginal reliability:** Marginal reliability is the proportion of variance in the latent trait that is not due to measurement error. It is the ratio of between-student variance to total variance (i.e., between-student plus within-student variance; within-student variance is the measurement error variance).¹³ Values $\geq .7$ are acceptable and those $< .7$ suggest that the scale has poor precision and accuracy.¹⁴
- **Expected a Posteriori (EAP):** EAP is a Bayesian estimator for the latent trait (i.e., θ), and represents the mean of the posterior distribution for θ .¹⁵ EAP is a robust estimator for scales with few items, scales with sparse or missing responses, and scales with item mistargeting (i.e., item location gaps).¹⁶

¹² de Ayala, R.J. (2009). *The theory and practice of item response theory*. New York: Guilford Press.

¹³ Green, B. F., Bock, R. D., Humphreys, L. G., Linn, R. L., & Reckase, M. D. (1984). Technical guidelines for assessing computerized adaptive tests. *Journal of Educational Measurement*, 21(4), 347-360. <https://doi.org/10.1111/j.1745-3984.1984.tb01039.x>; Sireci, S. G., Thissen, D., & Wainer, H. (1991). On the reliability of testlet-based tests. *Journal of Educational Measurement*, 28(3), 237-247. <https://doi.org/10.1111/j.1745-3984.1991.tb00356.x>

¹⁴ Mislevy, R. J., & Stocking, M. L. (1989). A consumer's guide to LOGIST and BILOG. *Applied Psychological Measurement*, 13(1), 57-75. <https://doi.org/10.1177/014662168901300106>

¹⁵ Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory*. New York: McGraw-Hill.

¹⁶ Gorin, J. S., Dodd, B. G., Fitzpatrick, S. J., & Shieh, Y. Y. (2005). Computerized adaptive testing with the partial credit model: Estimation procedures, population distributions, and item pool characteristics. *Applied Psychological Measurement*, 29(6), 433-456. <https://doi.org/10.1177/0146621605280072>