User Guide
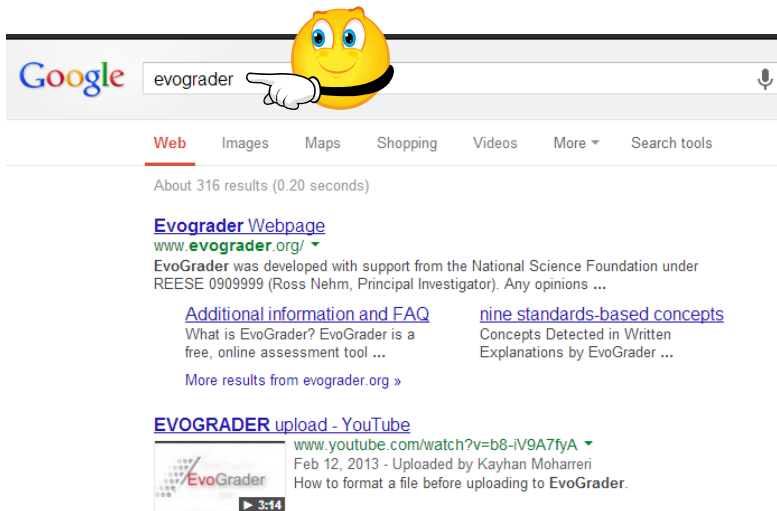
Welcome to EvoGrader

❑ ***EvoGrader*** is a free, online assessment tool for analyzing (grading) students' written explanations of evolutionary change generated in response to ACORNS instrument questions. EvoGrader was built by science education researchers, assessment experts, and computer programmers.

❑ ***EvoGrader*** uses sophisticated machine-learning methods to analyze student responses. A corpus of more than 10,000 human-graded written responses to many different types of questions was used to build the models that score student responses.

❑ It's easy to use ***EvoGrader***. All you need to do is upload an Excel file (.csv format) with students' written responses, and EvoGrader analyzes the responses for a variety of concepts--both scientific and naïve--and provides data about students' mental models.

❑ This User Guide shows you how to set up your Excel file for analysis. If you have any questions, please let us know (evograder@yahoo.com).
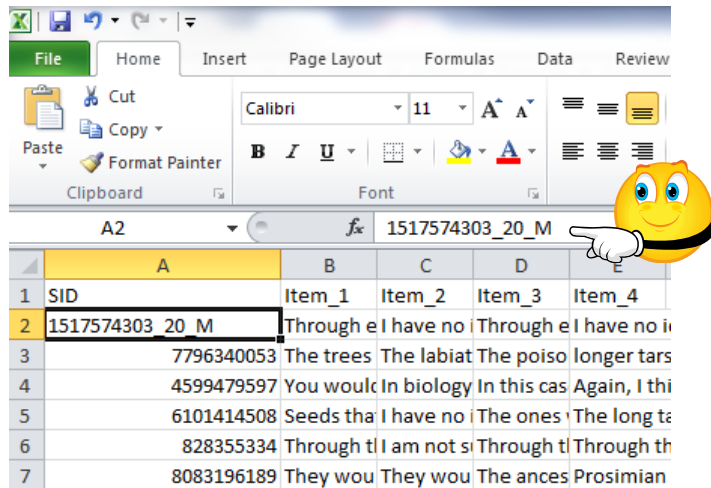
How can I find EvoGrader?
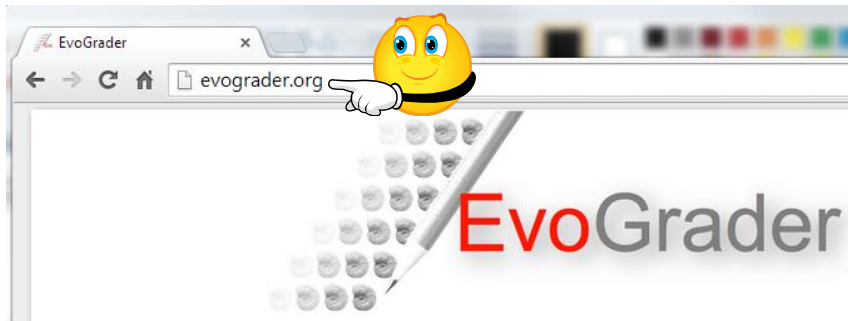
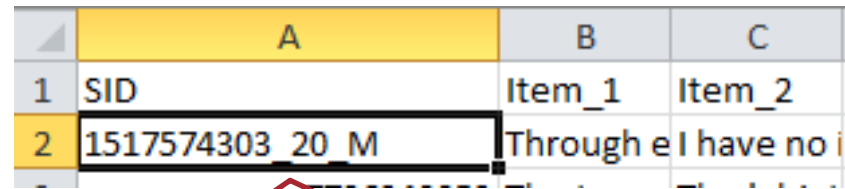You can find EvoGrader by typing the web address directly "http://www.evograder.org'

You can search for 'EvoGrader' using Google.

How do I prepare my data file?

In order for EvoGrader to score the responses, they need to be in an **excel file** like one shown here. The format is really important, so, be sure to follow the directions or EvoGrader cannot analyze your data file.

The first cell of the first column must contain the heading SID; you can add students' identification in the first column. Although you can only use one column for identification information, it is easy to create codes that contain ID number, age, gender, and many other variables. For example, you can add "20" and "M" separated by an underscore to indicate the age and gender of a particular student.

The first cell of the second column must contain the heading 'Item' underscore '1'. Be sure the use of underscore and no spaces are allowed. If you have additional items, you should place them in sequential columns, following the same item number pattern. For example, in the data set shown here, we have four items, the item order should always begin with 1 and extend up to 8. 8 is maximum number of item that the system can process in a single analysis.

Save the file in the csv. format. No space allowed in the name of the 'csv. file'

🚫 Evo responses.csv 🙂 Evo_responses.csv

Overview of EvoGrader

Step Tracker

Shows where you are in data processing.

Workspace
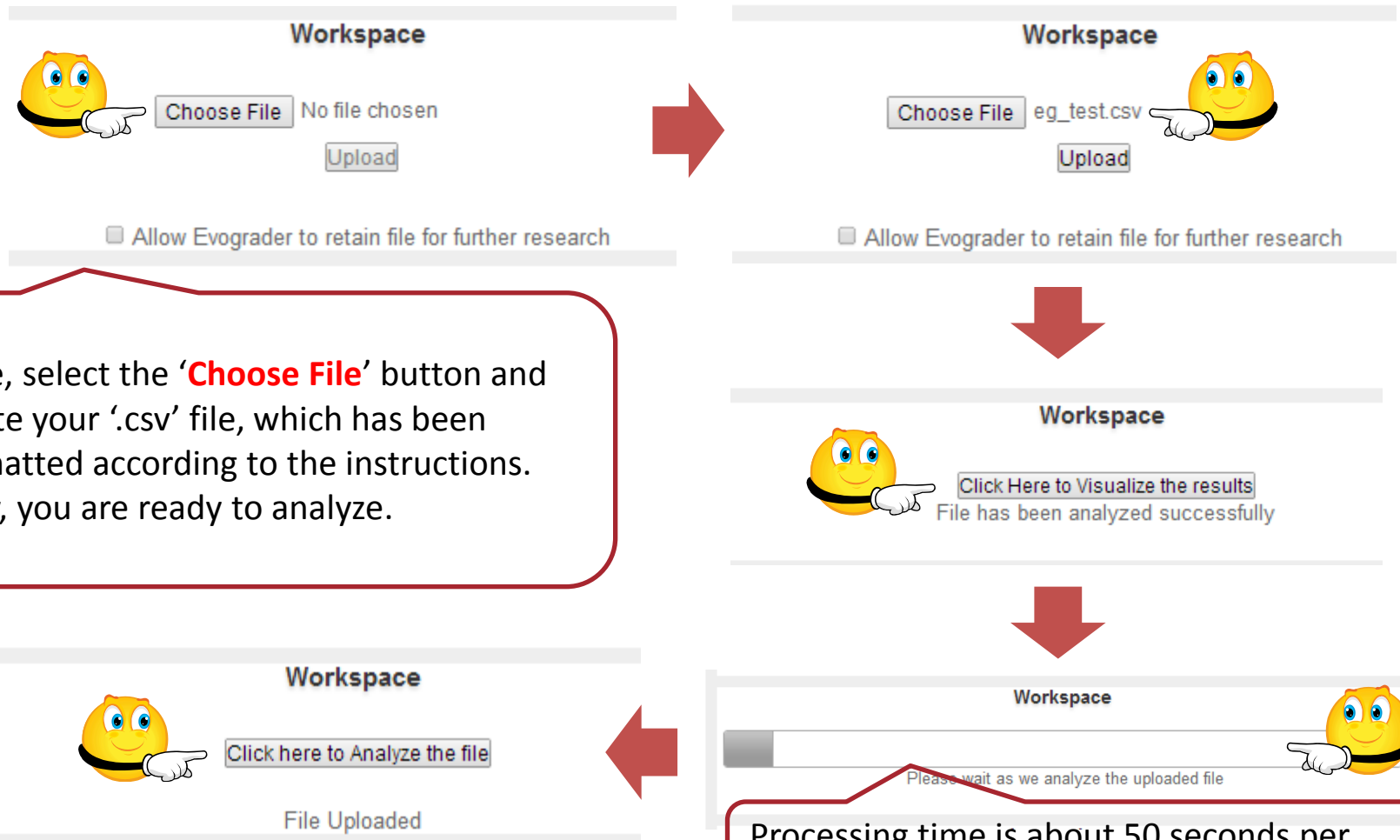
Where you upload, analyze, and interpret your data.
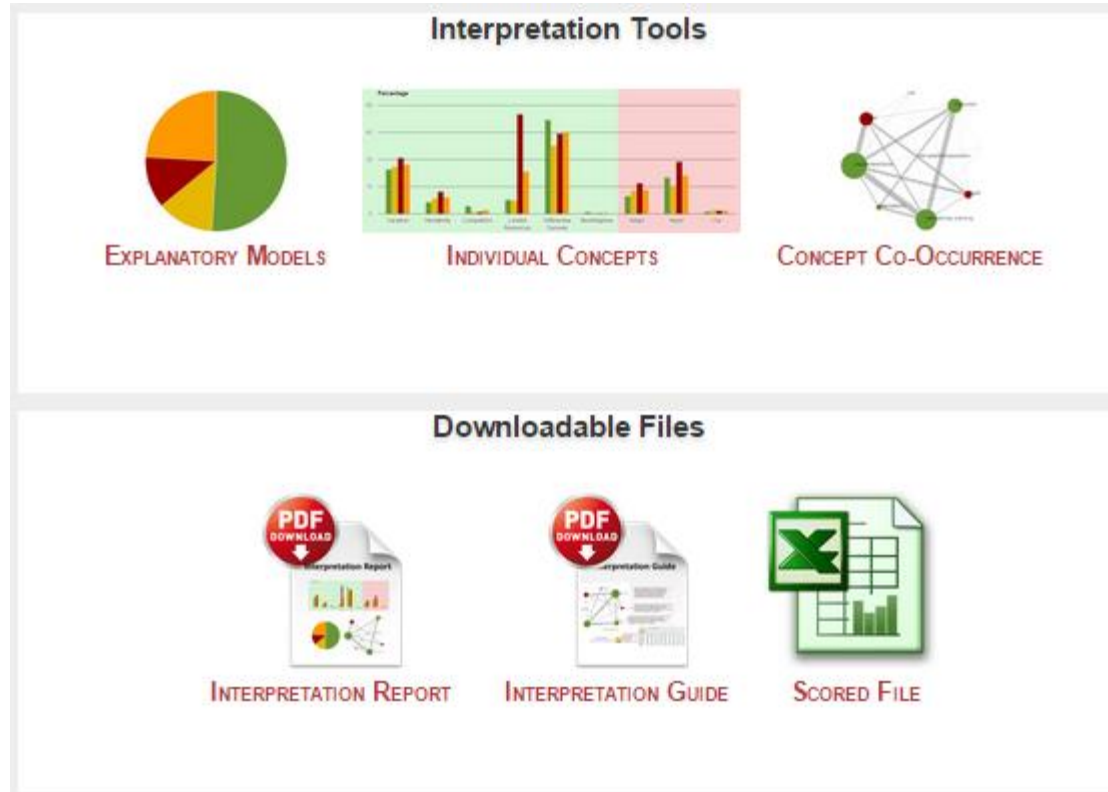
Instructions

Helpful hints and instructions.

How do I upload & analyze my file?

Here, select the '**Choose File**' button and locate your '.csv' file, which has been formatted according to the instructions. Now, you are ready to analyze.

Processing time is about 50 seconds per item.

# What information does EvoGrader provide?

Explanatory Models Chart

Explanatory Models chart for Item 1

If you hover your mouse over the pie chart, you will see the percentages of responses with each model type. Percentage = Total number of responses with that model/Total number of responses.

By clicking on the pie, you will see more details about each type of model.

None

Pure Scientific
Explanatory Models 1: **51.04**

Pure Scientific

Pure Naive
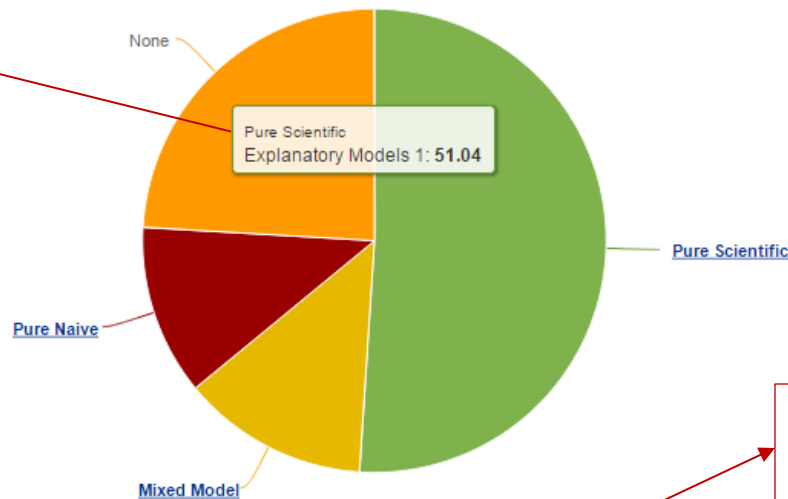
Mixed Model

You can see **different items** by clicking 'Item' button.

| Item 1 | Item 2 | Item 3 |

Explanatory Models

Model Type	Model Description	Item 1	Item 2	Item 3
Pure scientific	Explanation composed exclusively of scientific ideas	51.04%	44.54%	53.94%
Mixed model	Explanation composed of a mixture of non-normative naive and scientific ideas	13.0%	10.37%	28.91%
Pure naive	Explanation composed exclusively of non-normative naive ideas	11.89%	13.42%	7.05%
None	Explanation composed of no concept	24.07%	31.67%	10.1%

Explanatory Models Chart: detailed view

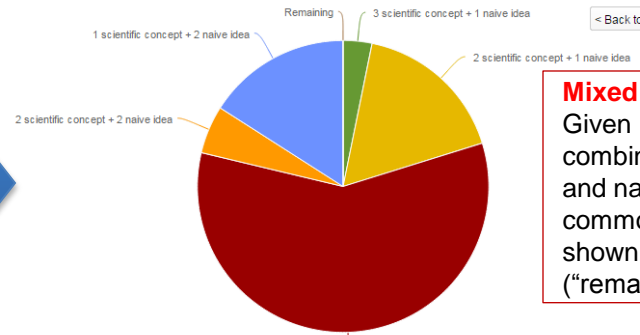You can **see more details** about **each** model type (Pure Scientific, Mixed Model, Pure Naïve), by **clicking on the model type** (e.g., click on "mixed model").
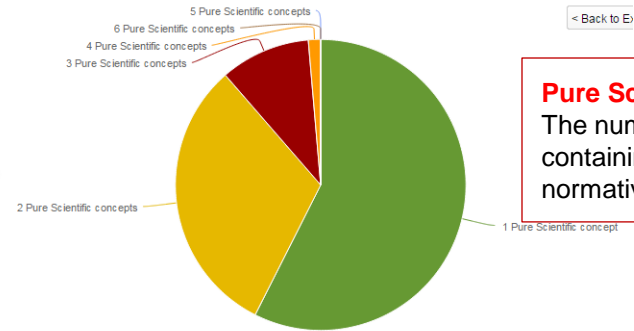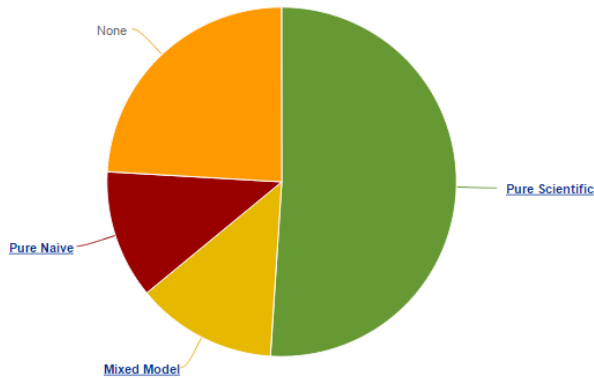
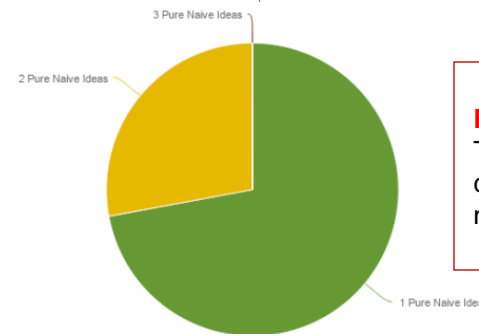**Pure Scientific Model** <u>details</u>: The number of responses containing different numbers of normative scientific ideas.

Mixed Model <u>details</u>: Given many different possible combinations of key concepts and naïve ideas, the 5 most common mixed models are shown along with others ("remaining").

Pure Naïve Model <u>details</u>: The number of responses containing different numbers of naïve ideas.

Individual Concepts Bar Graph

Bar graphs show the frequencies of **scientific key concepts** (shown in green on the left), and **naïve ideas** (shown in red on the right). If you move your mouse over each of the colored bars, exact percentages will be displayed for each concept for each item. If you click on the items in the legend, the border of each bar will change so that you can easily compare bars across concepts.
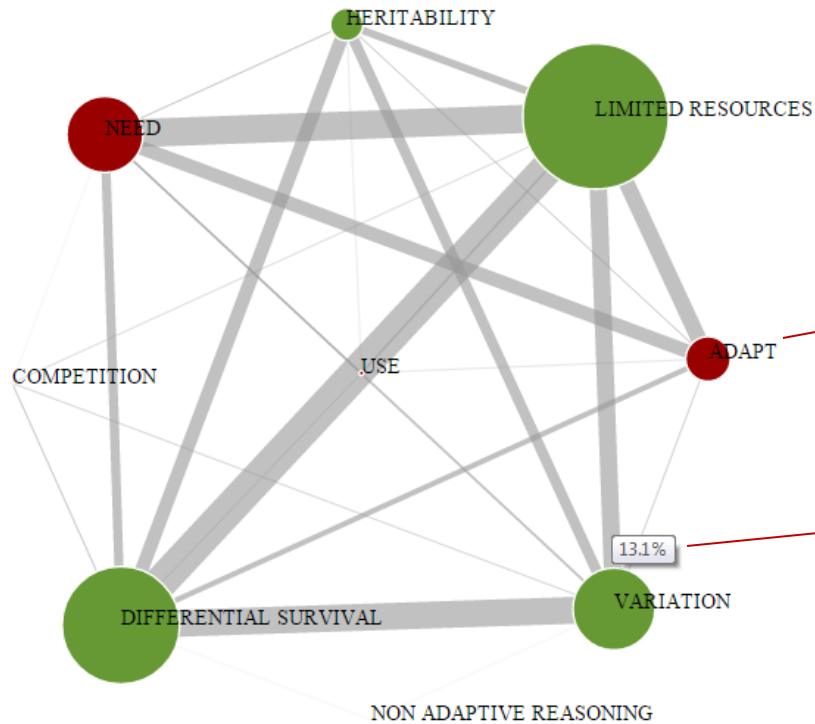

Concepts Chart
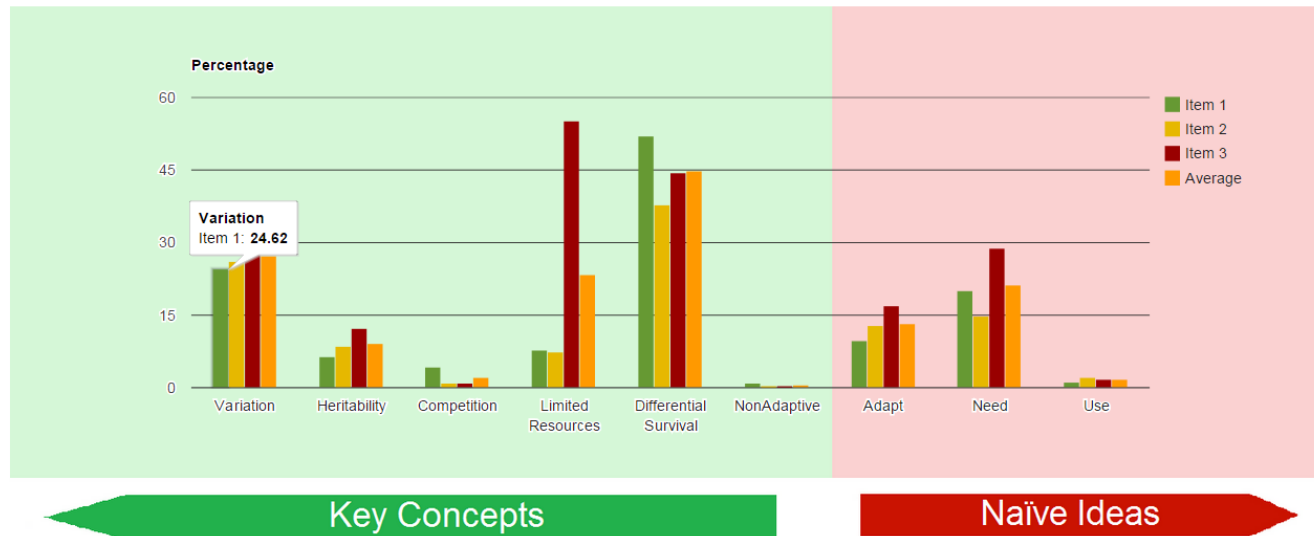
Individual Concepts

Variable Name	Concept Type	Concept Description	Item 1	Item 2	Item 3
Variation	Normative scientific Idea	The presence and causes of variation (mutation/recombination/sex)	24.62%	26.14%	30.98%
Heritability	Normative scientific Idea	The heritability of variation (The degree to which a trait is transmitted from parents to offspring)	6.36%	8.58%	12.31%
Competition	Normative scientific Idea	A situation in which two or more individuals struggle to get resources that are not available for everyone	4.29%	0.97%	0.97%
Limited Resources	Normative scientific Idea	Limited resources related to their survival such as food and predator and reproduction such as pollinator	7.75%	7.47%	55.05%
Differential Survival	Normative scientific Idea	The differential reproduction and/or survival of individuals	52.01%	37.76%	44.4%
NonAdaptive	Normative scientific Idea	Genetic drift and related non-adaptive factors contributed to evolutionary change	0.97%	0.41%	0.41%
Adapt	Non-normative naïve idea	Adjustment or acclimation to circumstances (which may be inherited)	9.82%	12.86%	16.87%
Need	Non-normative naïve idea	Goal-directed change. needs as a direct cause of evolutionary change	20.06%	14.8%	28.77%
Use	Non-normative naïve idea	The use (or lack of use) of traits directly causes their evolutionary increase or decrease	1.11%	2.07%	1.8%

Bubble Chart & Matrix file

Bubble charts illustrate the overall structure of students' explanations. The overall frequency of concepts is represented by the **size of the circles,** and co-occurrences of concepts are represented by the **thickness of the lines**.

When **you hover your mouse pointer over the circles**, you will see the percentage of each concept.
Percentage = Total number of responses including the concept / Total number of responses.

When you **hover your mouse pointer over the lines**, you will see the percentage of co-occurrences of concepts.
Percentage = Total number of responses including both concepts / Total number of responses.

Click here to generate the matrix file with co-occurrence data.

Scored results file in Excel

Let's take a look at the scored data file that you downloaded. You can see the students' ID you provided in the first column, and students' responses to Item 1 in the second column. The scored results begin with the third column. The variable names refer to key concepts and naïve ideas. For example, KC_Variation refers to the key concept of variation, which is a normative scientific idea. A score of 1 in the columns indicates the presence of a concept and the score of 0 indicates the absence of a concept. The variable, KC_Score, refers to the total number of key concepts and the NI_Score refers to the total number of naïve ideas. EvoGrader also provides one of the four models that best characterizes students' reasoning within the particular response (See page 13 and 14).

For additional resources and publications
see: www.evolutionassessment.org
For help or feedback please email: evograder@yahoo.com
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