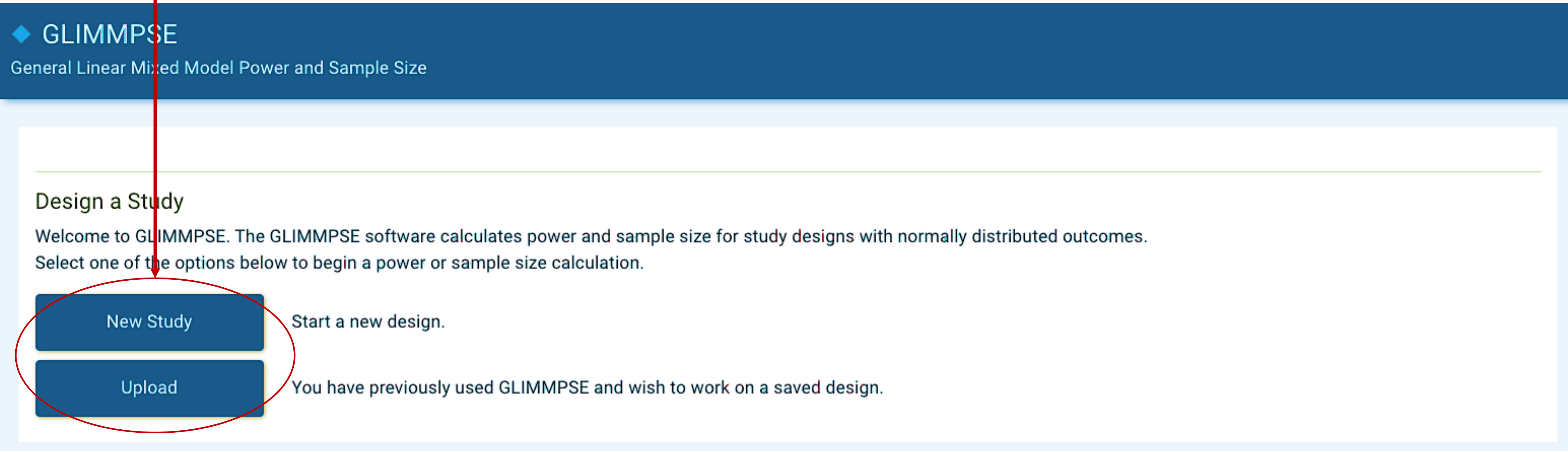
This document contains screenshots for Homework 3, a multilevel study with a between independent sampling unit factor.

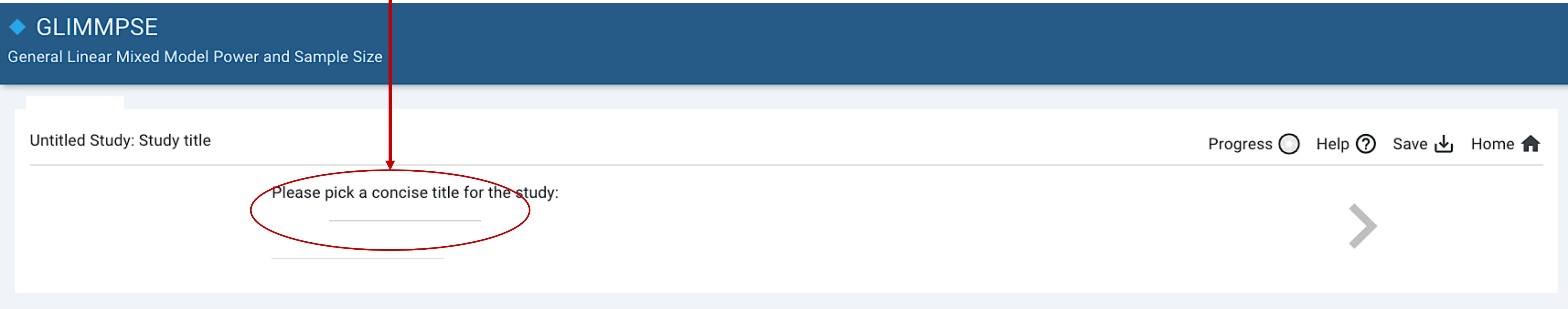
- Click the “New Study” button to start a new power and sample size analysis.

or

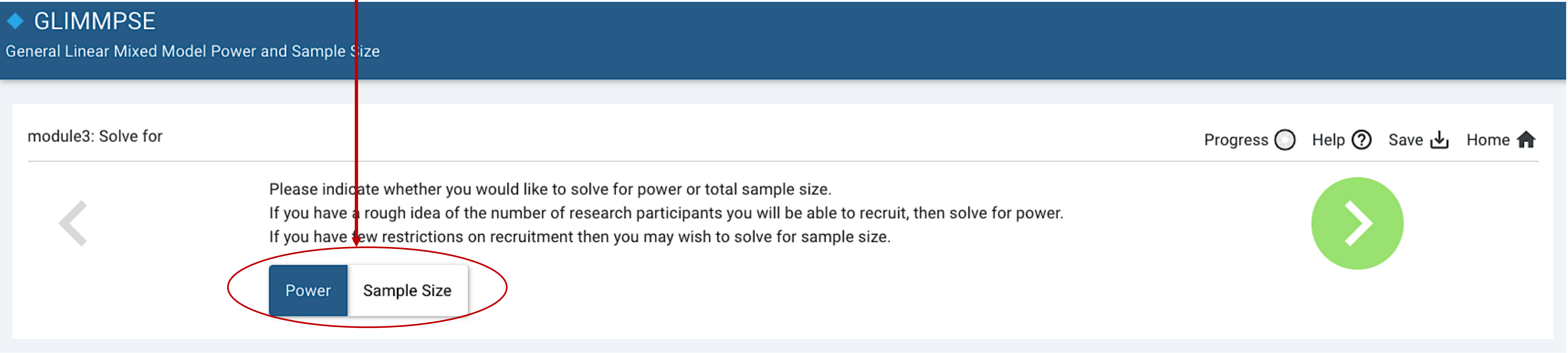
- Click the “Upload” button to upload a json file with a previous study design that you have saved.



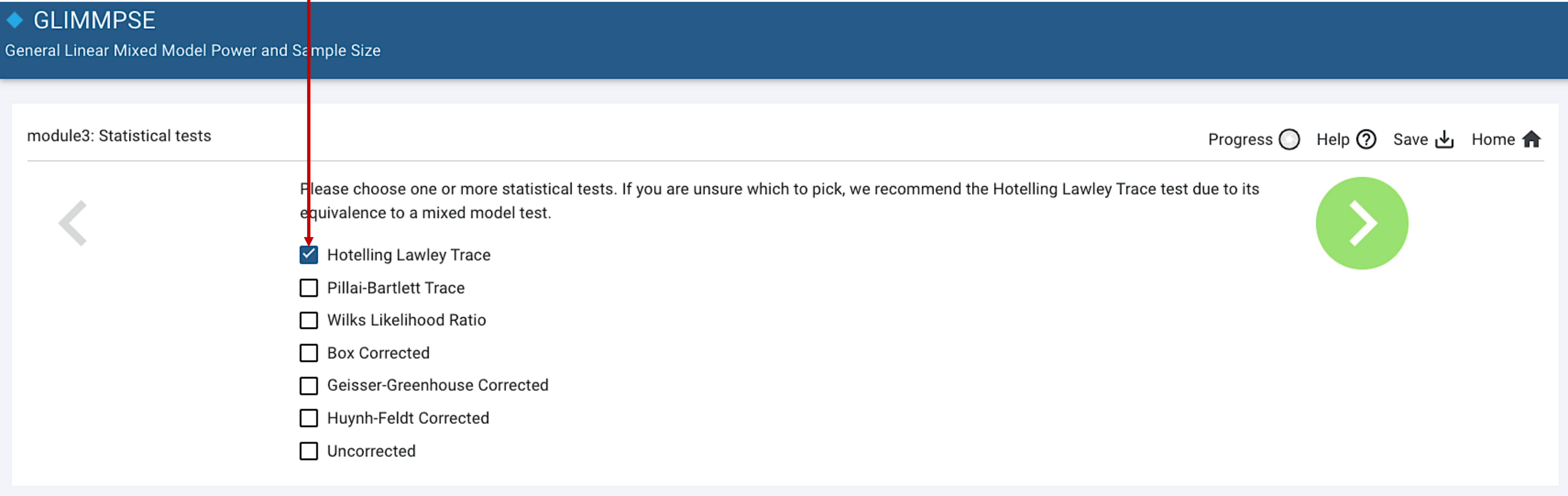
For a new study: Add title here



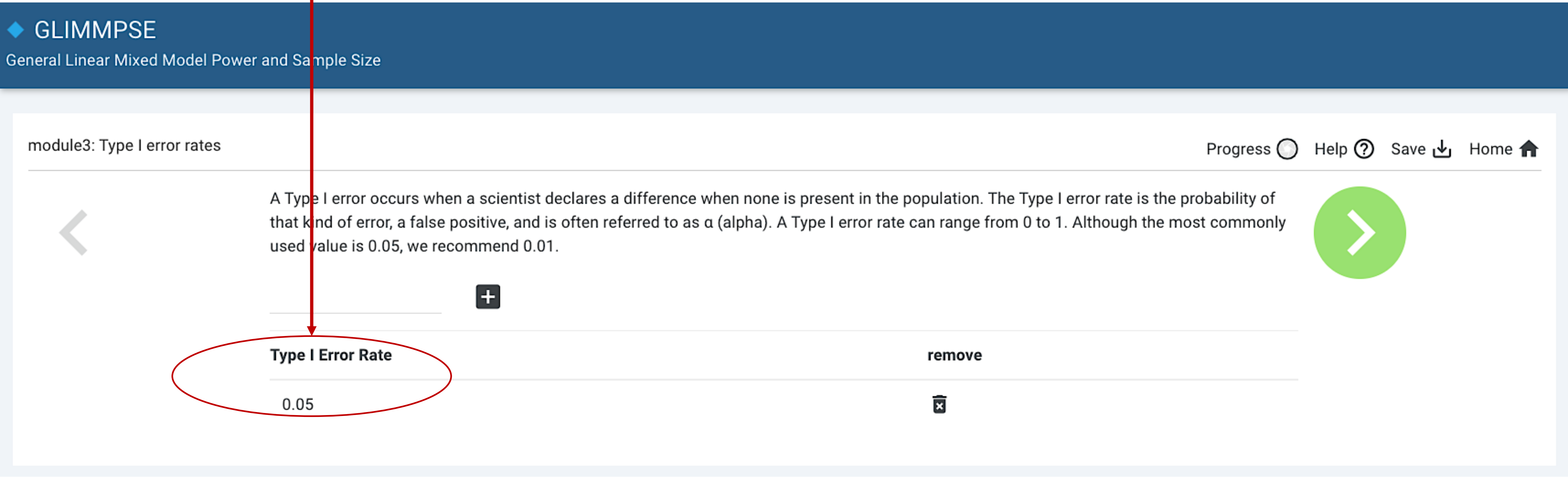
Click the “Power” or “Sample Size” button depending on what you want to solve for. In this case, we are solving for power.



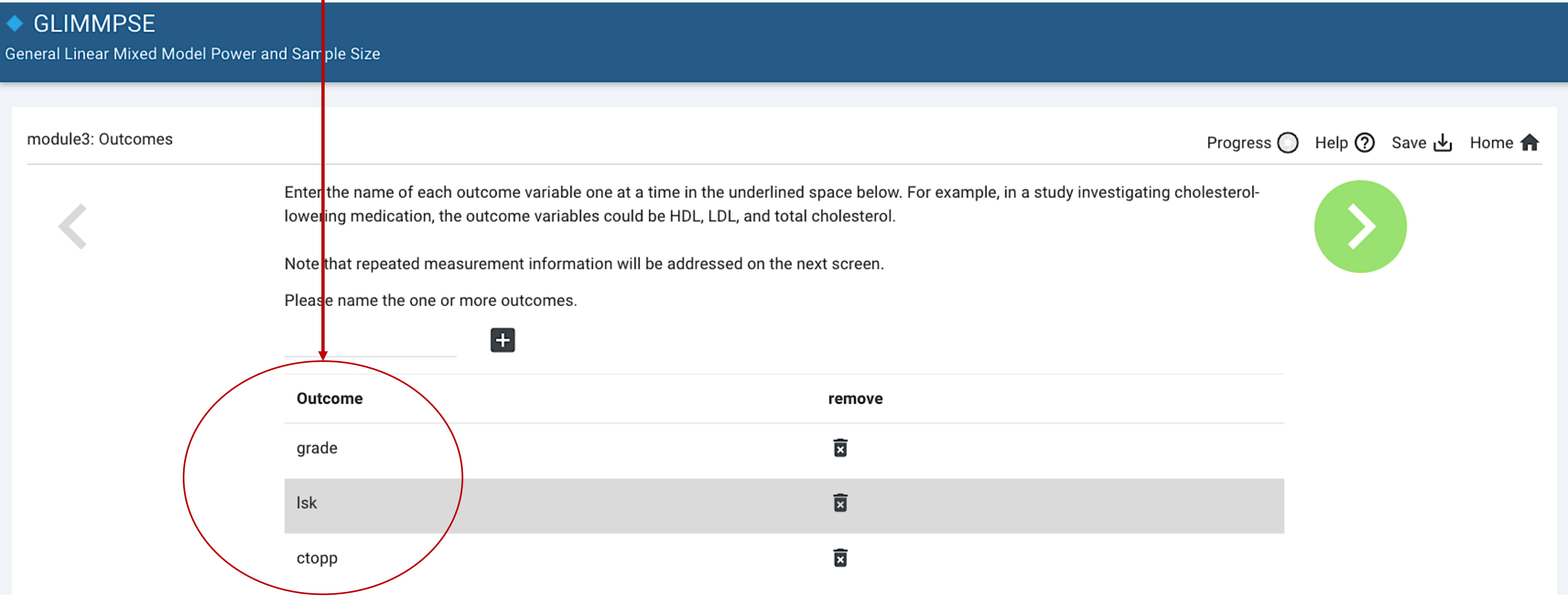
We now move to select the hypothesis test of interest. Thus, we click the Hotelling-Lawley trace.



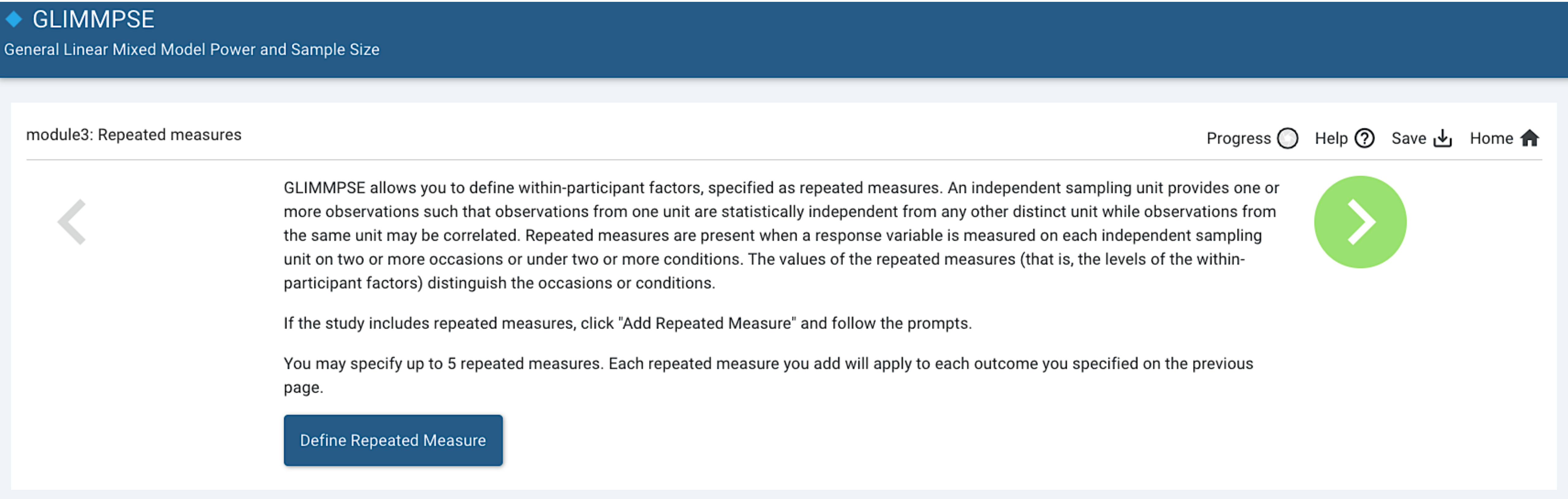
Now we choose the Type I error rate.



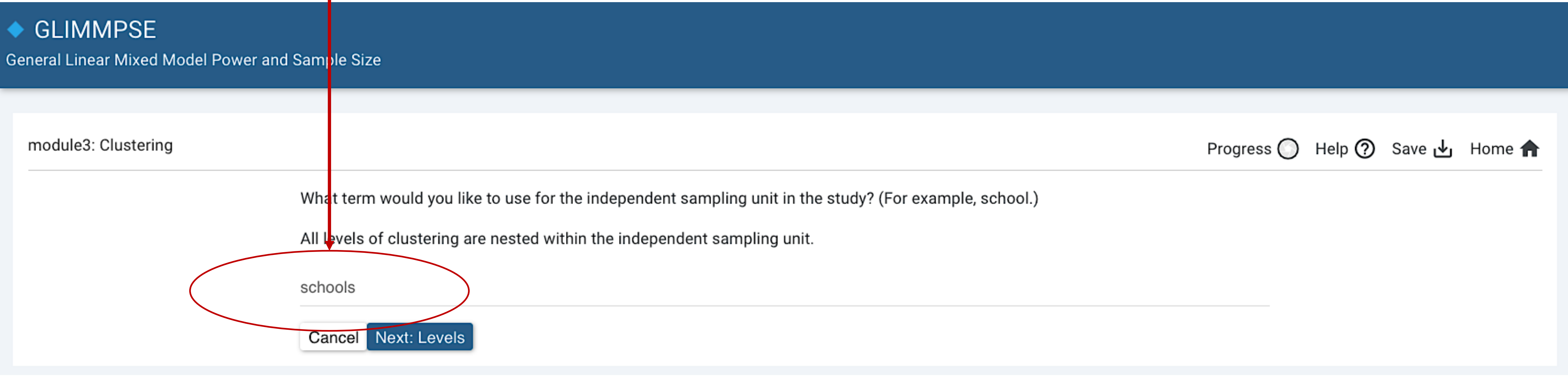
Enter the information about the three outcome variables as shown below.



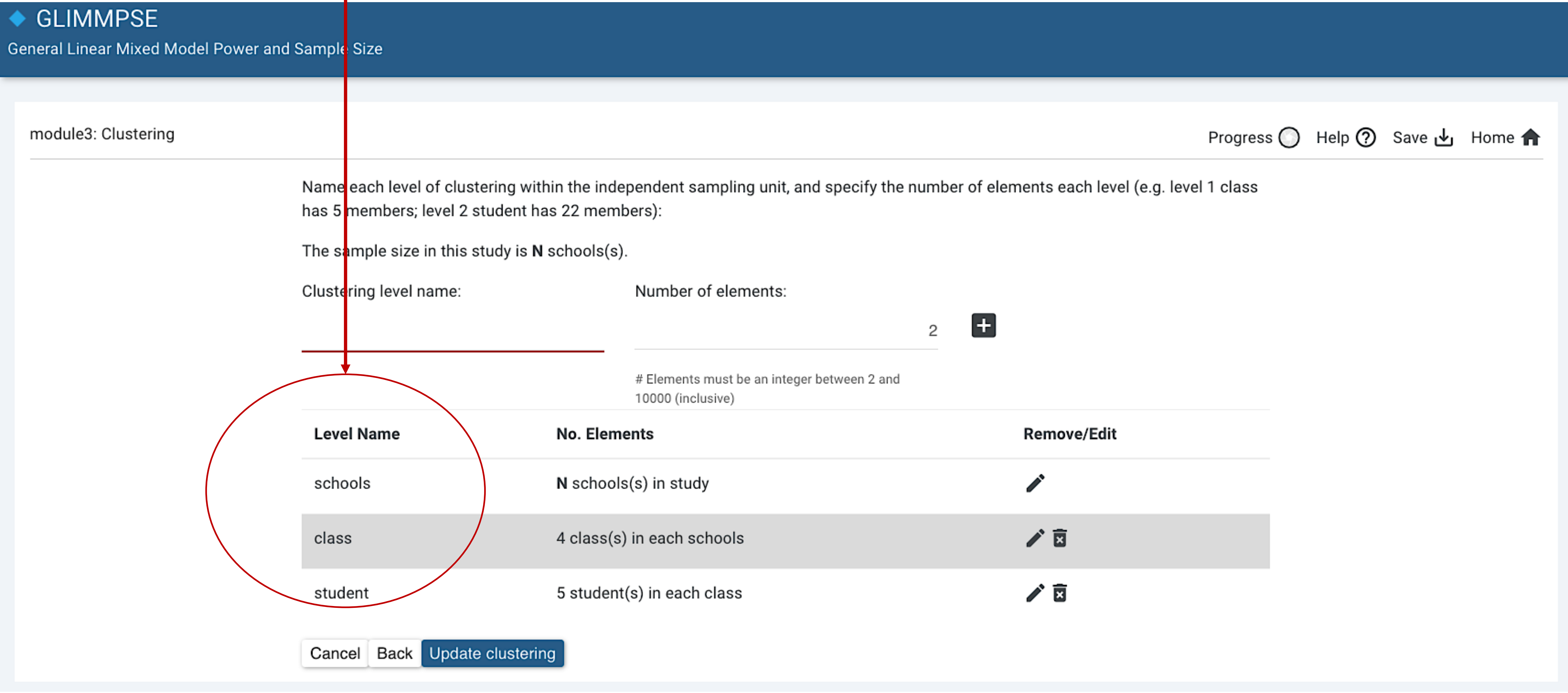
For this problem, we do not have repeated measures.



Enter the independent sampling unit as shown below.



Specify each level of clustering as shown below.



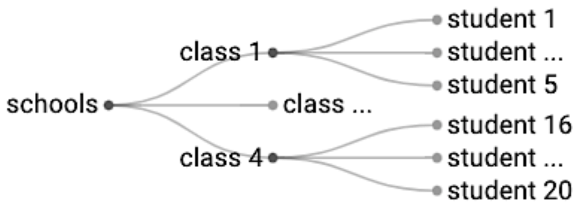
This screen shows a summary of the clustering structure.

GLIMMPSE

General Linear Mixed Model Power and Sample Size

module3: Clustering

Progress Help Save Home

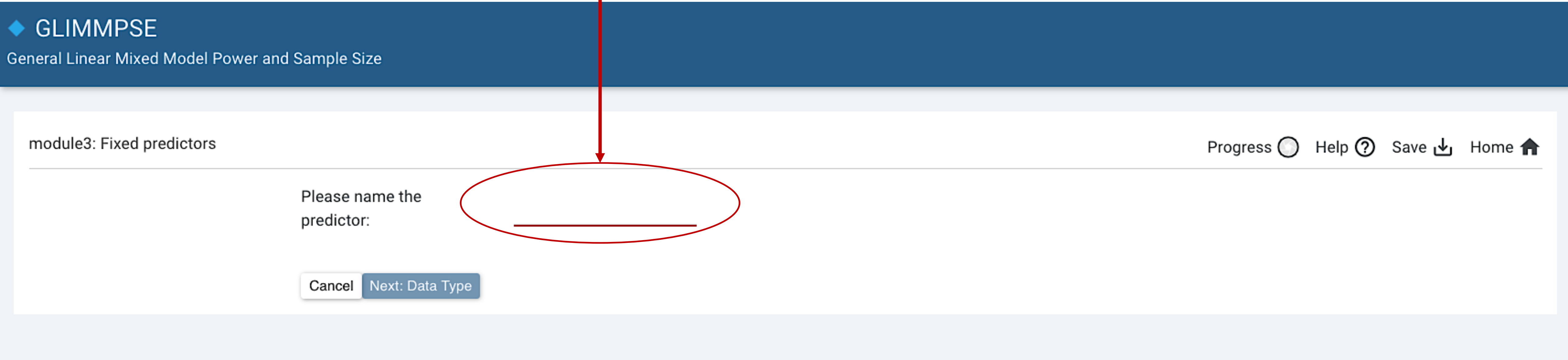


Levels of clustering within independent sampling unit schools:

Level Name	No. Elements
schools	**N** schools(s) in study
class	4 class(s) in each schools
student	5 student(s) in each class

Remove Clustering Edit Clustering

Enter fixed predictors here.



This screen shows a summary of predictors (treatment) and groups (three literacy programs).

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General Linear Mixed Model Power and Sample Size

module3: Fixed predictors

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Each independent sampling unit has one or more observations which are statistically independent from observations from any other unit.

GLIMMPSE allows you to define fixed predictors which divide the independent sampling unit into groups. One common example of a fixed predictor is treatment, with values placebo and drug, for which the independent sampling unit is randomized to a placebo group or a drug group. Another is gender, with values male or female.

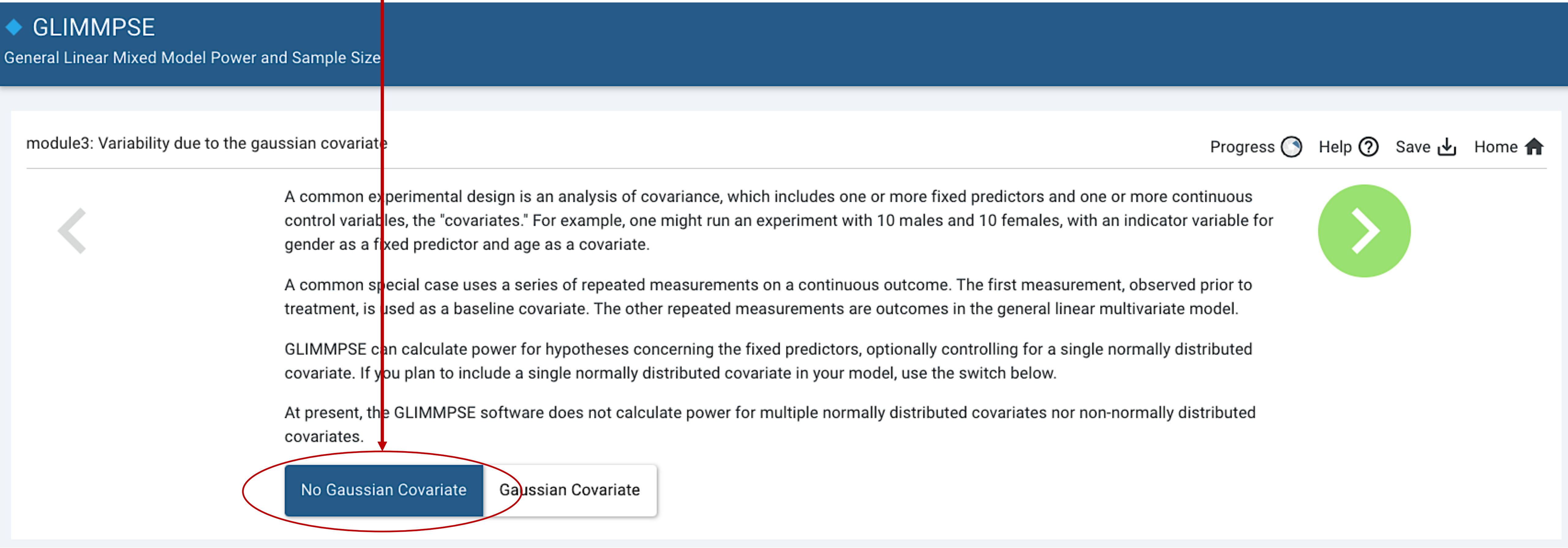
If the design has no fixed predictors, do not define any here.

Define Fixed Predictor

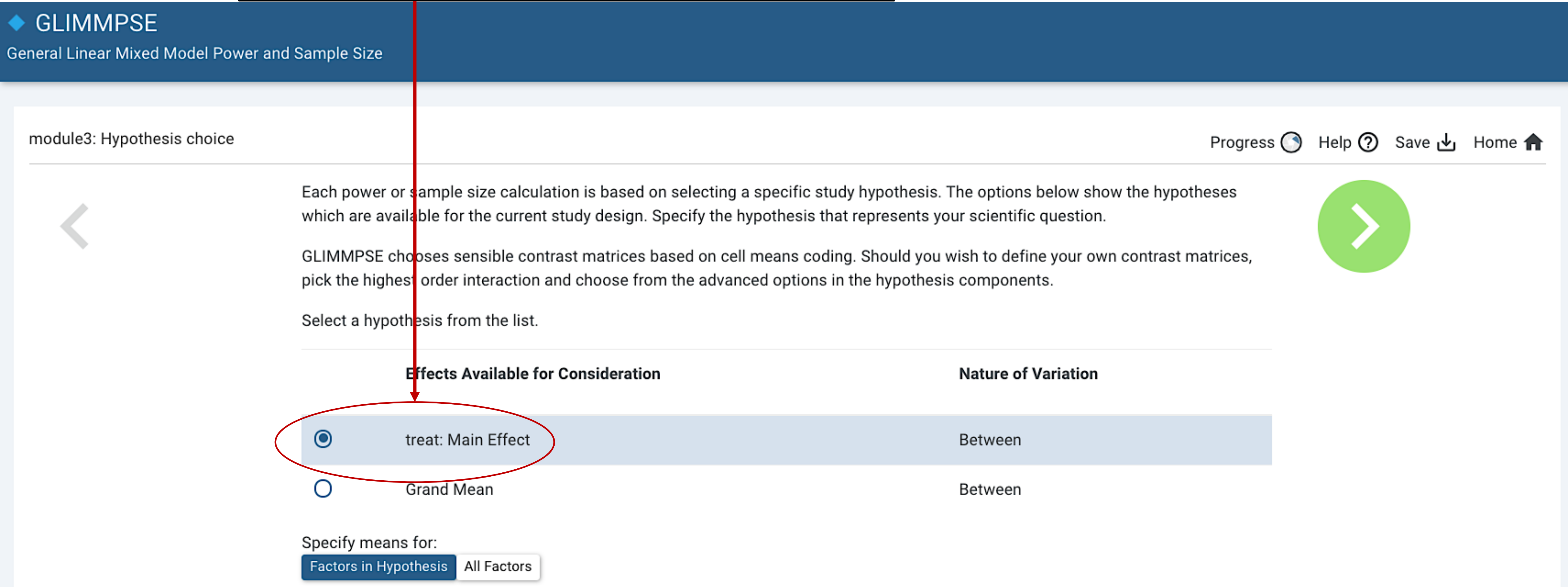
Fixed Predictors

Name	Type	Units	Groups	Remove	Edit
treat	NOMINAL		["abra", "ela", "bi"]		

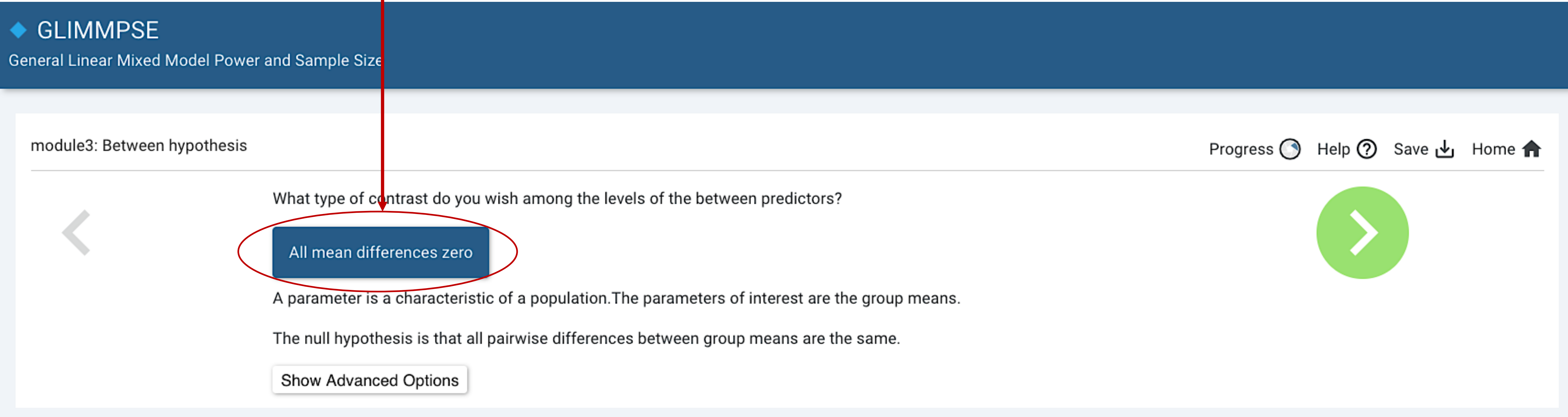
Select the option “No Gaussian Covariate” for this example.



Select the specific study hypothesis as shown below.



In this example, “All mean differences zero” was selected to indicate the type of contrast desired.



This screen gives you the option to select a value different than zero for the contrast comparison constant.

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General Linear Mixed Model Power and Sample Size

module3: Theta 0

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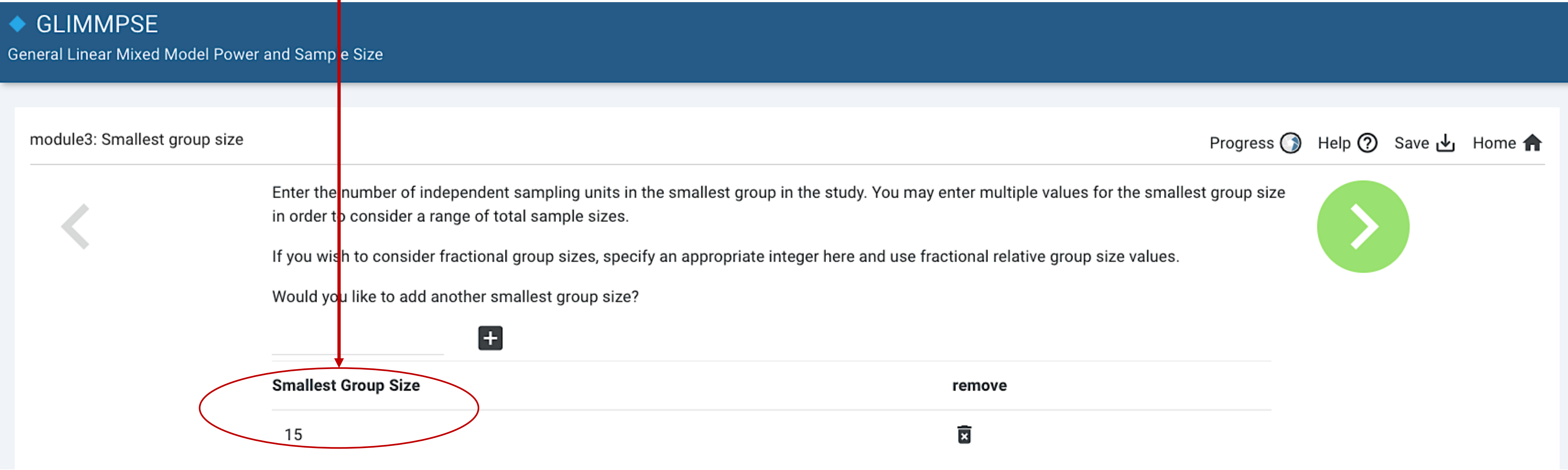
A hypothesis compares parameters to a constant, the contrast comparison constant, Θ_0. This is almost always zero. If you choose a value other than zero, be sure that you understand that the hypothesis you define is scientifically meaningful. Also note that the description and interpretation of your hypothesis given when choosing your contrasts will be affected.

Enter the smallest group size as shown.



Enter 1 for the group size ratios to reflect equal group sizes.

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General Linear Mixed Model Power and Sample Size

module3: Group size ratios

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For equal group sizes, input a "1" in the block next to each group. This is the default study design.

For unequal group sizes, specify the ratio of the group sizes. For example, consider a design with an active drug group and a placebo group. If twice as many study participants receive the placebo, a value of "2" would be selected for the placebo group, and a value of "1" would be selected for the active drug group.

Group size ratios

treat	**abra**	1
	ela	1
	bi	1

Enter the mean values for the outcome Group Reading Assessment and Diagnostic Evaluation (GRADE) within each group.

GLIMMPSE

General Linear Mixed Model Power and Sample Size

module3: Marginal means

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The table below shows the mean values for outcome **grade** within each group in the study. Each group is represented by a row in the table.

Enter the mean values you expect to observe for outcome **grade** within each group. The table should contain at least one value that is non-zero. Also, at least two groups should have means which differ by a scientifically meaningful amount.

Expected mean values, per group, for *grade*

treat	abra	0.3
	ela	0.1
	bi	0.1

Set blank values to

value

Enter the mean values for the outcome letter-sound knowledge (LSK) within each group.

GLIMMPSE

General Linear Mixed Model Power and Sample Size

module3: Marginal means

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The table below shows the mean values for outcome **lsk** within each group in the study. Each group is represented by a row in the table.

Enter the mean values you expect to observe for outcome **lsk** within each group. The table should contain at least one value that is non-zero. Also, at least two groups should have means which differ by a scientifically meaningful amount.

Expected mean values, per group, for *lsk*

treat	abra	0.3
	ela	0.1
	bi	0.1

Set blank values to

value

Enter the mean values for the outcome Comprehensive Test of Phonological Processing (CTOPP) within each group.

GLIMMPSE

General Linear Mixed Model Power and Sample Size

module3: Marginal means

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The table below shows the mean values for outcome **ctopp** within each group in the study. Each group is represented by a row in the table.

Enter the mean values you expect to observe for outcome **ctopp** within each group. The table should contain at least one value that is non-zero. Also, at least two groups should have means which differ by a scientifically meaningful amount.

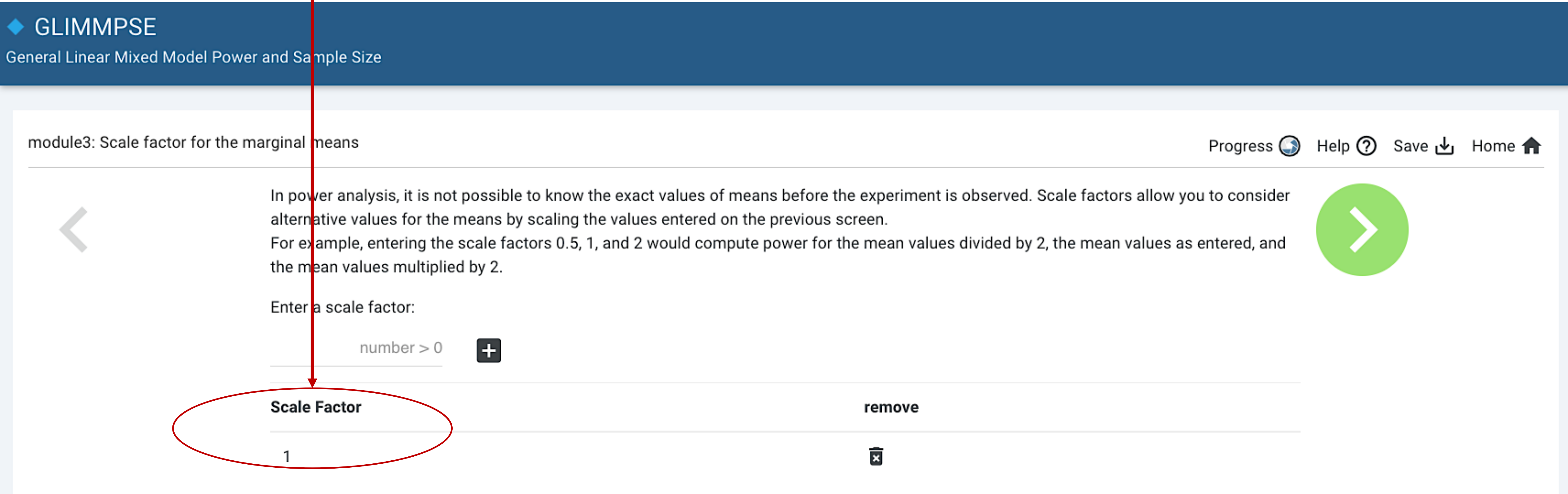
Expected mean values, per group, for *ctopp*

treat		
	abra	0.3
	ela	0.1
	bi	0.1

Set blank values to

value

Enter the scale factor for the means.



Enter the standard deviation for each outcome.

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General Linear Mixed Model Power and Sample Size

module3: Variability across outcomes

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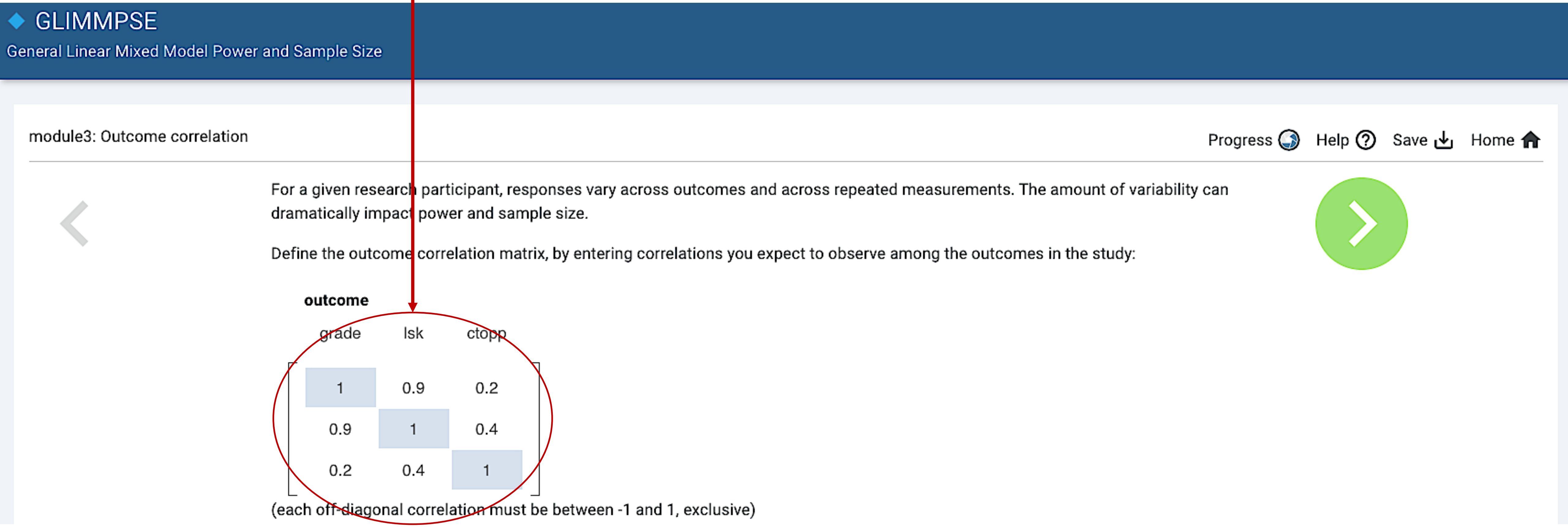
Enter the standard deviation you expect to observe for each outcome.

Outcome	Standard Deviation
grade	4.4
lsk	4.2
ctopp	0.6

Enter the outcome correlation matrix.



Enter the intra class correlation as shown below.

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General Linear Mixed Model Power and Sample Size

module3: Intra-class correlation

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Define the intra class correlation for cluster schools

The correlation within level **class** must be a number between -0.333 < r < 1 0.11

The correlation within level **student** must be a number between -0.250 < r < 1 0.04

Enter the scale factor for variability.

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General Linear Mixed Model Power and Sample Size

module3: Scale factor variance

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Changes in variability can dramatically affect power and sample size results. It is not possible to know the variability until the experiment is observed. Scale factors allow you to consider alternative values for variability by scaling the calculated covariance matrix. For example, entering the scale factors 0.5, 1, and 2 would compute power for the covariance matrix divided by 2, the covariance matrix as entered, and the covariance matrix multiplied by 2.

You may add up to 10 scale factors.

Choose a number greater than zero

Scale Factor	remove
1	

For this example, we don't need to specify the confidence intervals.

GLIMMPSE

General Linear Mixed Model Power and Sample Size

module3: Confidence intervals

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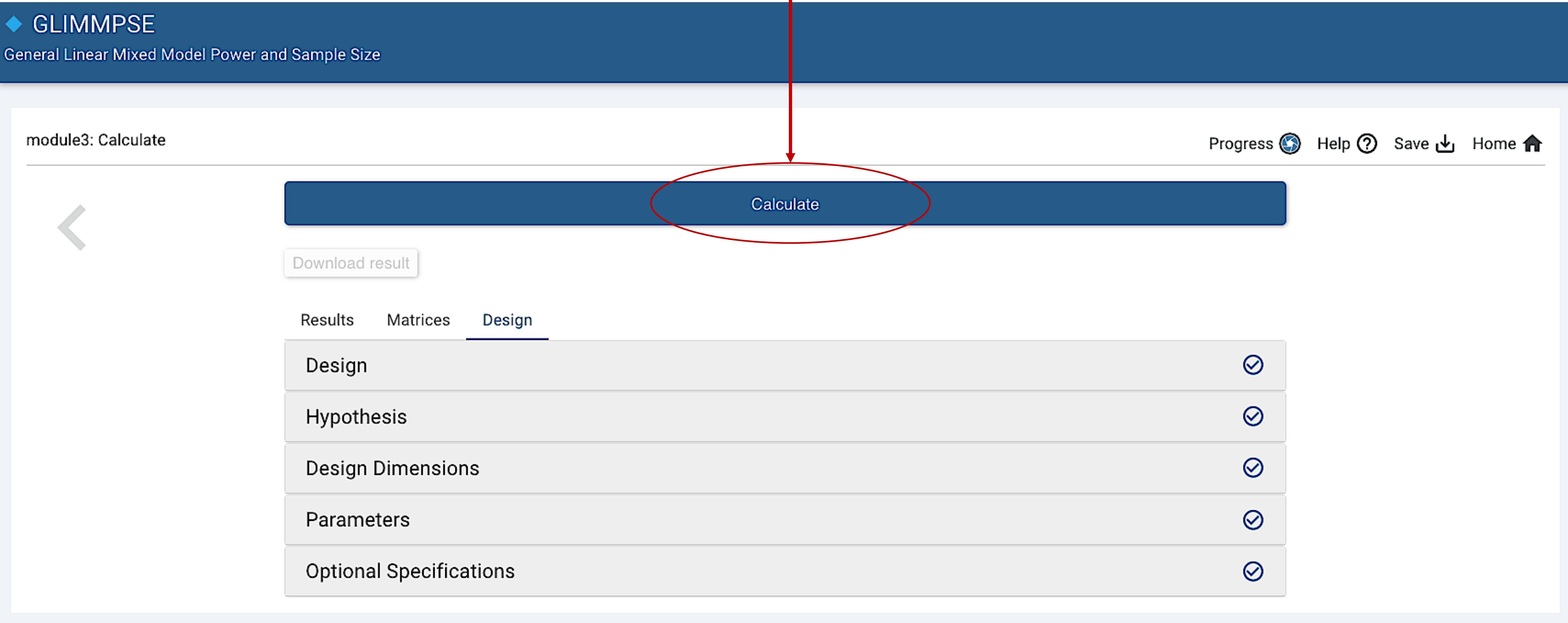
If the means (**B**) or the error covariance (Σ_e) are sample estimates, then the power values produced from these matrices will be random quantities. To account for this randomness, GLIMMPSE can calculate confidence intervals for power values using the techniques described by Taylor and Muller (1995), Gribbin et al. (2013), and Park (2007).

Include Confidence Intervals

When we hit the “Calculate” button, the results are shown in the power results table.



We can save results and study design inputs by using the “Save” button.