1. Extend one result from the paper. This can come in a variety of forms. For example, you can suggest a robustness check and then estimate the robustness check. You could explore heterogeneity across different covariates.

2. For whatever extension you choose, write a paragraph that describes the extension. If appropriate you should also include equations that show the estimating equation for your extension.

3. Estimate the extension in whichever software you prefer. In your writeup, you should include the output of your extension that includes a nicely formatted table or figure, depending on what extension you chose.

4. Following the guidance earlier in the course, create a replication package for your extension which includes a README file. In your replication package you should also include your writeup. Upload your replication package to the github repository you created in Part 1 of the Replication Project.

5. Submit the link to your github repository here

Answer.

The extension that I chose is exploring gender differences in multiple competence outcomes. In the paper, the authors find that gender differences in treatment effects are insignificant in treatment effects on test scores. I extended the analysis to see whether gender differences exist in terms of specific competence being assessed, based on the outcome variables in Table 3.

The regression equation is Equation (1).

$$Y_{iks2} = \alpha_s + \gamma_s \cdot Y_{iks1} + \beta_1 \cdot Treatment_i + \beta_2 Female_i + \beta_3 Female_i \times Treatment_i + \phi_k + \epsilon_{iks2} \quad (1)$$

Where Y_{iks2} is student i's outcomes, in randomization stratum k, in subject s at period 2 (endline), and Y_{iks1} is the outcomes at period 1 (baseline). $Treatment_i$ is the treatment indicator. $Female_i$ indicates the student's sex, and the coefficient β_3 of the interaction term $Female_i \times Treatment_i$ captures the gender differences in treatment effect in a specific outcome. β_1 is the treatment effect of male students, and β_2 is the average baseline difference in the outcome variable.

I estimated the equation using Stata, and Table 1 shows the output. The coefficient of interest is the *Interaction* term, as is in Table 4 in the paper. The results show that there are no significant gender differences in specific competence assessed as well.

Table 1 Heterogeneity in Treatment Effect by Specific Competence Assessed

	Proportion of questions answered correctly						
	Arithmetic computation (1)	Word problems— computation (2)	Data interpretation (3)	Fractions and decimals (4)	Geometry and measurement (5)	Numbers (6)	Pattern recognition (7)
Panel A. Mathematics							
Treatment	0.12	0.070	0.14	0.14	0.13	0.16	0.064
	(0.028)	(0.037)	(0.034)	(0.045)	(0.062)	(0.048)	(0.042)
Baseline math score	0.14	0.11	0.081	0.093	0.052	0.068	0.097
	(0.0082)	(0.010)	(0.015)	(0.012)	(0.015)	(0.012)	(0.015)
Interaction	-0.052	0.0029	-0.13	-0.087	0.029	-0.014	0.059
	(0.031)	(0.040)	(0.043)	(0.053)	(0.069)	(0.051)	(0.055)
Observations	537	537	537	537	537	537	537
R-squared	0.360	0.231	0.116	0.162	0.097	0.136	0.125

	Sentence completion	Retrieve explicitly stated information	Make straight-forward inferences	Interpret and integrate ideas and information
Panel B. Hindi				
Treatment	0.12	0.070	0.14	0.14
	(0.028)	(0.037)	(0.034)	(0.045)
Baseline Hindi score	0.14	0.11	0.081	0.093
	(0.0082)	(0.010)	(0.015)	(0.012)
Interaction	-0.052	0.0029	-0.13	-0.087
	(0.031)	(0.040)	(0.043)	(0.053)
Observations	537	537	537	537
R-squared	0.360	0.231	0.116	0.162

Notes: Robust standard errors in parentheses. The tables show the impact of the treatment on specific competences. The dependent variable in each regression is the proportion of questions related to the competence that a student answered correctly. All test questions were multiple choice items with four choices. Baseline scores are IRT scores in the relevant subject from the baseline assessment. Treatment is a dummy variable indicating a randomly assigned offer of a Mindspark voucher. All regressions include randomization strata fixed effects.