# Experiment Overview: Free Trial Screener

Udacity tested a change where if the student clicked "start free trial", they were asked how much time they had available to devote to the course. If the student indicated 5 or more hours per week, they would be taken through the checkout process as usual. If they indicated fewer than 5 hours per week, a message would appear indicating that Udacity courses usually require a greater time commitment for successful completion, and suggesting that the student might like to access the course materials for free. At this point, the student would have the option to continue enrolling in the free trial, or access the course materials for free instead.
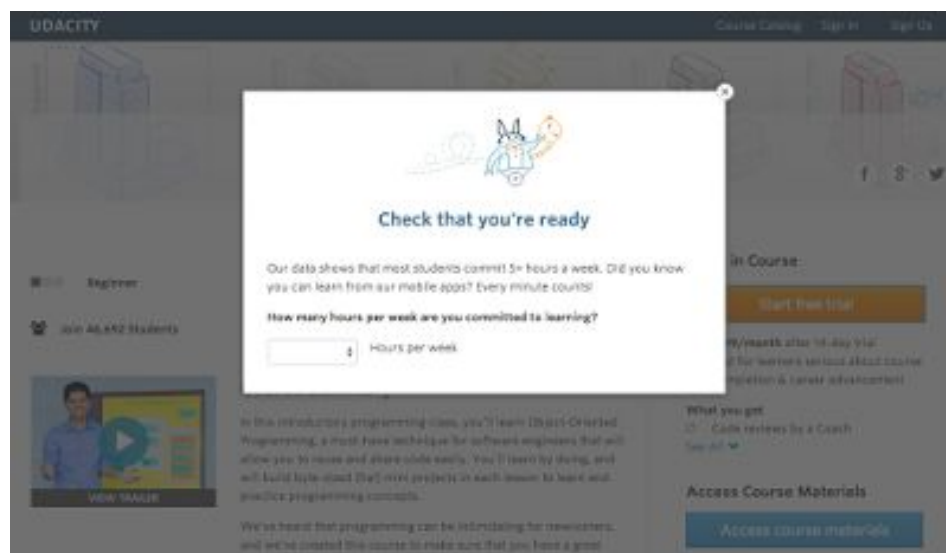
The hypothesis was that this might set clearer expectations for students upfront, thus reducing the number of frustrated students who left the free trial because they didn't have enough time—without significantly reducing the number of students to continue past the free trial and eventually complete the course. If this hypothesis held true, Udacity could improve the overall student experience and improve coaches' capacity to support students who are likely to complete the course.

The unit of diversion is a cookie, although if the student enrolls in the free trial, they are tracked by user-id from that point forward. The same user-id cannot enroll in the free trial twice. For users that do not enroll, their user-id is not tracked in the experiment, even if they were signed in when they visited the course overview page.

Experiment Design

Metric Choice

List which metrics you will use as invariant metrics and evaluation metrics here. (These should be the same metrics you chose in the "Choosing Invariant Metrics" and "Choosing Evaluation Metrics" quizzes.)

Invariant Metrics
- Number of Cookies
- Number of Clicks
- Click-through-probability

Evaluation metrics
- Gross Conversion
- Retention
- Net Conversion

For each metric, explain both why you did or did not use it as an invariant metric and why you did or did not use it as an evaluation metric. Also, state what results you will look for in your evaluation metrics in order to launch the experiment.

	Invariant Metric	Evaluation Metric	Expected Value
Number of cookies Number of unique cookies to view the course overview page. (d_{min}=3000)	Yes - used as unit of diversion, is assigned equally between control and experimental groups once visiting the page, before launching the experiment.	No - it won't change between control and experimental groups.	N/A
Number of user-ids Number of users who enroll in the free trial. (d_{min}=50)	No - it can change between two study groups. This metric depends on users who enroll by clicking "Start free trial" button.	No - as it can change, it can be used evaluation metric, but there are other metrics better to use, dependent of this metric with more information.	N/A

(*) All the calculations are available at the "Final Project Data" spreadsheet in the same folder

Number of clicks Number of unique cookies to click the "Start free trial" button (which happens before the free trial screener is trigger). (d_{min}=240)	Yes - it won't change between the two groups because it happens when the user clicks the button, before starting the experiment.	No - it's an invariant metric, and it won't change.	N/A
Click-through-proba bility Number of unique cookies to click the "Start free trial" button divided by number of unique cookies to view the course overview page. (d_{min}=0.01)	Yes - same as Number of cookies and Number of clicks. It won't change independently of the group who click the button.	No - it's an invariant metric, and it won't change.	N/A
Gross Conversion Number of user-ids to complete checkout and enroll in the free trial divided by number of unique cookies to click the "Start free trial" button. (d_{min}= 0.01)	No - it depends on user-ids, so it can change between two groups.	Yes - it can show the effects of the experiment, showing different values on the study groups.	Lower in the experiment group.
Retention Number of user-ids to remain enrolled past the 14-day boundary (and thus make at least one payment) divided by number of user-ids to complete checkout. (d_{min}=0.01)	No - it depends on user-ids, so it can change between two groups.	Yes - it can show the effects of the experiment, showing different values on the study groups.	Higher in the experiment group.
Net Conversion Number of user-ids to remain enrolled past the 14-day boundary (and thus make at least one payment) divided by the number of unique cookies to click the "Start free trial" button. (d_{min}= 0.0075)	No - it depends on user-ids, so it can change between two groups.	Yes - it can show the effects of the experiment, showing different values on the study groups.	Unchanged between control and experiment groups.

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Measuring Standard Deviation

List the standard deviation of each of your evaluation metrics. (These should be the answers from the "Calculating standard deviation" quiz.)

Evaluation metric	StdDev
Gross Conversion	0.0202
Retention	0.0549
Net Conversion	0.0156

*

For each of your evaluation metrics, indicate whether you think the analytic estimate would be comparable to the the empirical variability, or whether you expect them to be different (in which case it might be worth doing an empirical estimate if there is time). Briefly give your reasoning in each case.

Since unit of diversion and unit of analysis are the same (cookie) for Gross and Net conversion, the analytic estimate would be comparable to the empirical variability. On the other hand, Retention uses different unit of analysis (user-id), so I expect that analytic estimate would be different to the empirical variability.

Sizing

Number of Samples vs. Power

Indicate whether you will use the Bonferroni correction during your analysis phase, and give the number of pageviews you will need to power you experiment appropriately. (These should be the answers from the "Calculating Number of Pageviews" quiz.)

Metric	Baseline conversion rate	Minimum Detectable Effect	Pageviews	Total pageviews
Gross Conversion	0.20625	0.01	25835	645875
Retention	0.53	0.01	39115	4741212
Net Conversion	0.109135	0.0075	27413	685325

*

Duration vs. Exposure

Indicate what fraction of traffic you would divert to this experiment and, given this, how many days you would need to run the experiment. (These should be the answers from the "Choosing Duration and Exposure" quiz.)

Traffic	100%
Days	18

*

Give your reasoning for the fraction you chose to divert. How risky do you think this experiment would be for Udacity?

I decided to use 100% of the traffic, because we can obtain results in only 18 days regarding that there is no other experiments in parallel. This experiment don't seems to be risky for udacity, unless a bug (code) in the experiment, but technically, it's easy to implement. The pop-up question has no ethical implications and no sensitive data is collected.

Experiment Analysis

Sanity Checks

For each of your invariant metrics, give the 95% confidence interval for the value you expect to observe, the actual observed value, and whether the metric passes your sanity check. (These should be the answers from the "Sanity Checks" quiz.)

*	Lower Bound	Upper Bound	Observed	Passes
Number of cookies	0.4988	0.5012	0.5006	YES
Number of clicks	0.4959	0.5041	0.5005	YES
CTP	0.0812	0.0830	0.0821	YES

For any sanity check that did not pass, explain your best guess as to what went wrong based on the day-by-day data. Do not proceed to the rest of the analysis unless all sanity checks pass.

All the invariant metrics passed the sanity check.

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Result Analysis

Effect Size Tests

For each of your evaluation metrics, give a 95% confidence interval around the difference between the experiment and control groups. Indicate whether each metric is statistically and practically significant. (These should be the answers from the "Effect Size Tests" quiz.)

*	Lower Bound	Upper Bound	Statistical	Practical
Gross Conversion	-0.0291	-0.0120	YES	YES
Net Conversion	-0.0116	0.0019	NO	NO

Sign Tests

For each of your evaluation metrics, do a sign test using the day-by-day data, and report the p-value of the sign test and whether the result is statistically significant. (These should be the answers from the "Sign Tests" quiz.)

*	Two tail P	Statistical
Gross Conversion	0.0026	YES
Net Conversion	0.6776	NO

Summary

State whether you used the Bonferroni correction, and explain why or why not. If there are any discrepancies between the effect size hypothesis tests and the sign tests, describe the discrepancy and why you think it arose.

As learned in the course, Bonferroni correction is very conservative, and in the case of tracking metrics that are correlated and all tend to move at the same time, this method is too conservative. The evaluation metrics selected here, Gross and Net conversion, are probably highly correlated, so Bonferroni correction is not the best option because that will lead Udacity to launch fewer experiments.

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Recommendation

Make a recommendation and briefly describe your reasoning.

The initial expectations for the evaluation metrics were that Gross conversion rates will be lower and the Net conversion will stay unchanged. After the analysis, I can say that Gross conversion decreases in a practical significant rate, while Net conversion decreases too, but is not statistically significant. This lead me to conclude that the experiment help the students to decide more consciously but there is a risk to lose a portion of students that in normal conditions would start the free trial period and maybe pay after that, so the impact on the business revenue could be negative.

So, taking into account this conclusions and having a serious risk to decrease Udacity's incomes, I would **not recommend** to launch this change.

Follow-Up Experiment

Give a high-level description of the follow up experiment you would run, what your hypothesis would be, what metrics you would want to measure, what your unit of diversion would be, and your reasoning for these choices.

Challenge

Reducing the number of frustrated students who left the free trial

Experiment

The basic idea of the experiment is to motivate the users by extending the free trial period based on their achievements on the first 14 days. If a student progress is in certain predefined interval (i.e. 70-80% of the estimated 100% in 14 days) arriving to the final 2 days of the trial period, give a 14 days extension of the period. We'll need extra notifications, to motivate the students and inform them about their progress and benefits if they stay working.

Hypothesis

By giving extra time, the students may have less pressure and more time to try udacity's courses, and reward users can increase the motivation and the sensation of winning prizes.

Unit of diversion

- User-ids, because the experiment runs after free trial enrollment

Invariant Metrics

- Number of user-ids: Number of users who enroll in the free trial. user-id is assigned once the user creates an account, so this metric won't change during the experiment.

Evaluation Metrics

- Retention**:** Number of user-ids to remain enrolled past the 14-day boundary (and thus make at least one payment) divided by number of user-ids to complete checkout. This is exactly what we want to increase. I expect that retention will be higher in the experiment group than in the control group.