

## Experiment Design

### Metric Choice

Invariant metric :

Number of cookies,

Number of clicks on "Start free trial",

Click-through-probability on "Start free trial"

Invariant metric is the metric not affected by the change during the experiment

In the explanation, we are going to notify students who are enrolling the class that they need to spend significant time for the class. It means the notification message will trigger after clicking enrolling the class. So, Number of cookies, which is number of unique cookies to view the course overview page would not be affected. Also, Number of clicks, which is a number of unique cookies clicking the "Start free trial" not affected by the notification. Same as the click through probability. It is the process before the notification message. So, they would be a good metrics for invariant metrics.

Variant metric :

Gross conversion,

Net conversion

Variant metric is affected by the change and our purpose as I understood is to increase the quality of students who enrolled the class. So, I could think like this way. Compare the number of student probability of enrolled the free trial and made a first payment. Then, I could figure out how could the notification message (how much time user could devote) affect the positive effect on the purpose, which could increase the quality. For these reason, Gross conversion, which is enrolled the class divided by a unique user who clicked free start, and Net conversion, which is made a first payment divided by a unique user who clicked free start button.

As a result, less students will enroll the class after considering the time they needed to spend for the class. As the number of students who enroll the class decrease, the number of students who pay their first period might decrease or increase. but I think the rate(payment/enroll) would be increased.

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.

## Measuring Standard Deviation

Calculated standard deviation:

Gross conversion = 0.0202

Net conversion = 0.0156

Analytic estimate comparable to empirical variability

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

Gross conversion = Enrolled the class/ unique users clicked "Free trial"

Unit of diversion: cookie that clicked "Free trial"

Unit of analysis: cookie

Net conversion = Made a first payment / unique users clicked "Free trial"

Unit of diversion: cookie that clicked "Free trial"

Unit of analysis: cookie

Both evaluation metrics have the same unit, which is cookie. Analytic estimate is comparable to the empirical variability in both cases.

## Sizing

### Number of Samples vs. Power

No, not using Bonferroni correction.

Expected the metric significantly affected by the change, which is display announcement.

Both will be decreased.

685325 number of page view needed

### Duration vs. Exposure

I decided to use 1 fraction of traffic for the experiment.

Then, length of days needed 18 days. Almost a half month.

It could be the shortest length of days for the test but it couldn't get as many information as needed because it took 14days to monitor the change for an anonymous person to make their first payment.

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.)

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

## 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.)

Number of cookies → LB: 0.4988, UB: 0.5012, Observed: 0.5006, Passed

Number of clicks on start free trial → LB: 0.4959, UB: 0.5041, Observed: 0.5005, Passed

Passed all

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.**

### Result Analysis

#### Effect Size Tests

Gross conversion → LB: -0.0291, UB: -0.0120, statistical, practical significance

Net conversion → LB: -0.0116, UB: 0.0019, None of them

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.)

#### Sign Tests

Gross conversion → P-value: 0.0026, statistical significance

Net conversion → P-value: 0.6776, None

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.)

Didn't use Bonferroni correction as I explained above both of them are affected by the change. It had the same result for both effect size test and sign test. Gross conversion was significantly affected by the change but the net conversion wasn't

## Recommendation

Make a recommendation and briefly describe your reasoning.

Not launch the change yet. Needed more test for net conversion.

Net conversion needed more test I think. The result for the net conversion presented not that much affected by the 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.

Current Null hypothesis: Added checkout process will decrease the number of students frustrated due to their lack of time (so that makes the quality of education for the students and instructors)

Currently, the pop up message would result in significant number of decrease taking "Free trial" But couldn't prove the effectiveness that the number of student who paying their first class would affected by, whether increase or decrease.

"Enroll/free trial" decreased, "payment/free trial" increase or decrease couldn't assure.

Enroll(decrease)/cookie free trial(invariant)

Payment(??)/cookie free trial(invariant)

How to prove that the effectiveness really would increase. Needed to prove that the effectiveness

students who took the class (before vs after)

students who paid their first class after trial (before vs after)

This metric, [Made a first payment / Enrolled the class] could evaluate the effectiveness of the change, which was adding checkout process,