



Wisconsin School of Business

**General Business 740: Experiments and Causal Methods for Business Insights
Fall 2021
2-credits**

Instructor:	Justin Sydnor
Office:	5284B Grainger
Office Hours:	Wednesdays 1:30 – 3:00 pm in 5284B and by appointment.
Email:	justin.sydnor@wisc.edu
Course Title:	Experiments and Causal Methods for Business Insights– General Business 740
Instructional mode:	In person
Class Meetings:	In-person sessions Thursday 2:30 – 5:00 pm in Grainger 2339 and 5:40 – 8:10 pm in Grainger 2520. The second lecture section will also be provided via Zoom for a limited number of students who are taking the course in online format only. The Zoom session will be made available to any students who need to miss the course due to illness. The course is designed this semester to be in person and the Zoom option will not be the ideal course format, but is available to avoid disruptions due to illness.
Credit Hours:	This is a two credit class. We have one 150-minute in-person session each week. The in-person sessions will have a mix of lecture and application work time. In addition there will be around 90-minutes of pre-recorded lecture materials for each week. The expectation is that students will work on course learning activities for about 6 hours each week. The syllabus includes more information about meeting times and expectations for student work. See the UW-Madison Credit Hour Policy .
Course website:	https://canvas.wisc.edu/courses/272413
Course Description:	The ultimate goal of business analytics is to inform business decisions and one of the most important trends in business decision-making is the reliance on experiments. The use of experiments is particularly widespread in technology companies, where most aspects of web-design and user interfaces are “A/B” tested extensively. For example, Uber runs experiments to help determine how to price for peak hours and how to design tipping options. Marketers routinely run experiments to understand which messages are effective and for which segments of customers. Even governments have increasingly turned toward the use of experiments to better understand how to effectively provide services. Experiments can provide important insights to guide business decisions that cannot always be obtained through analyzing patterns in existing business data or by relying on the decision-making expertise of business leaders. In particular, experiments are an important way to understand causal relationships in business. The distinction between causality and correlation is crucial when an organization is deciding whether to change practices or invest new resources in products and processes.

This course provides an introduction to experimental and causal methods for driving business insights. In this course you will gain an understanding of how to design randomized-controlled experiments and how to analyze and present the data from those experiments. This course will also highlight that even when organizations do not conduct explicit randomized experiments, there are often versions of “natural experiments” that can be leveraged from business data. Through this course you will develop the experimental mindset needed to identify these opportunities and some important data analysis techniques for establishing causal relationships from existing data in business environments.

An important distinction for this course is that while we discuss a variety of cases from digital companies using experimentation on web-platforms, this is not a course in digital marketing or advanced website testing. There are many important business functions where experimentation can be important but where gathering data and implementing an experiment are much more challenging than in consumer-facing online platforms. In this course we will try to develop an ability to leverage experiments in these settings as well. The benefits of this focus are that it will give you an ability to provide value to a range of organizations and functional units. I also believe that a deep and thoughtful approach to experimentation can also be an asset within advanced digital organizations. The downside of this focus is that there are topics of relevance at firms with advanced experimentation techniques, such as Google and Microsoft, that we will not cover in this course. Where possible I will try to highlight some of these topics so that you can explore them some on your own if you have aspirations to work in some of these areas.

Requisites: General Business 704 (Data to Decisions) or {705 (Statistics and Programming for Business Analytis) and General Business 720 (Data Visualization for Business Analytics)}; or permission from the instructor.

The expectation is that students will come in with ability to visualize and summarize data at a basic level using R and will have some familiarity with basic regression analysis and hypothesis testing.

Learning Outcomes

When you successfully complete this course, you will be able to:

1. Identify statements and analytical reports that use correlational evidence to infer causal relationships. You will be able to articulate why correlation may not equate to causation due to factors such as selection bias.
2. Understand the value of randomization for establishing causal effects through experiments.
3. Demonstrate skills to develop a randomized experiment and analyze the results.
4. Identify potential “natural experiments” that allow for causal analysis from existing data in business environments and be able to implement analytic approaches to analyzing data in these situations.

Required Materials

- Laptop computer (Mac or Windows OK)
 - Microsoft Excel 2016 or later.
 - R and RStudio (instructions for installation on your computer will be distributed)

You must have your own working laptop computer throughout the entirety of the semester to succeed in this course.

- Harvard business case coursepack: You will need to purchase a course pack from Harvard Business Publishing with a few cases (and associated data) that we will cover in the course. **Purchase the course pack using this link:** <https://hbsp.harvard.edu/import/871878>
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- Additional required readings: All other required readings will be made available on the course website. You are not required to purchase a text book for the course.
- Recommended supplemental resource readings: Not required, but provide useful background reference.
 - Useful reference textbook: Gerber and Green’s *Field Experiments: Design, Analysis and Interpretation*

This Version: 10/5/2021, see course webpage for updates.

- A very nice companion book to the course with extra examples: “[The Power of Experiments: Decision Making in a Data-Driven World](#)” by Michael Luca and Max H. Bazerman.
- Introduction to R: https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf

Grading & Assessment

Category	Weight
Participation & Participation Assignments	25%
Homework assignments (often using R)	25%
Group randomized experiment proposal	25%
Take home final exam	25%

Grades will be based on the following grade cuts.

Over 92%: A
87%-92%: AB
79%-86%: B
73%-78%: BC
65%-72% C
50%-65% D
Below 50% F

Participation Assignments

Each week there will be a series of assigned engaged learning activities on canvas. The participation assignments will be scored based on participation/effort and not “correctness”. However, we will monitor and review these submissions and assignments submitted without appropriate effort may be downgraded.

Individual Homework and R Analysis Assignments

We will have 5 homework assignments designed primarily to give you practical experience analyzing the outcomes of experiments using R. You are allowed to work with others as you go through these assignments, but I expect that you will write your own R code, run the analysis yourself on your own computer and write your own interpretations of the results (per assignment prompts) in your own words. Any indications that you have directly copied or used code written by others or taken the output of their analysis without running things yourself will be treated as academic dishonesty and will result in failure of the course.

Tentative assignment due dates (subject to change – check course site for most recent information):

Homework 1: Basic analysis using Clinic Sales Case	Monday October 25 th
Homework 2: Multiple groups analysis using Rocket Fuel Case	Monday November 1 st
Homework 3: Power and continuous monitoring using Vungle Case	Monday November 8 nd
Homework 4: Field experiments	Monday November 15 th
Homework 5: Exploiting natural experiments	Monday December 13 th

Group Randomized Experiment Proposal (Presentation and Memo)

You will work in groups of 3 to identify an organization and propose a potential randomized experiment that would be worth testing at the firm. Your group will upload a pre-recorded 5-minute presentation about the planned experiment. You will also submit a memo detailing your proposed experiment after your presentation that will incorporate class feedback. More details will be distributed on the course website.

Group video presentation upload	Monday December 6 th
Group memo due	Wednesday December 15 th

Final exam

There will be an essay-based open notes take-home final exam. You must work on the final exam independently. Final exam will be posted in the morning on Thursday December 16th and will be due by Sunday December 19th at 5pm.

Late Work and Other Special Circumstances

Assignments (including Engaged Learning Assignments and Homework) submitted online after the due date will be automatically penalized from the total possible points as follows:

10% if submitted less than 24 hours late.

50% if submitted between 24 hours and 3 days late.

No points will be awarded for work submitted more than 3 days late. Please contact me if there are unusual circumstances or illnesses that require special consideration. When in doubt, submit what you have with explanations by the due date and follow up with me.

Academic Dishonesty

All incidents of academic dishonesty may result in failure in the course and may be referred to the Dean of Students for disciplinary action. More information can be found online at <http://www.students.wisc.edu/doso/students/>. If there is any question as to whether an activity is or is not permissible (in this class), consult me prior to undertaking the activity.

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/.

Accommodations for students with disabilities:

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility.

Students are expected to inform me of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. I will work either directly with you or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

Wisconsin School of Business Commitment to Diversity:

Diversity and inclusion are core values of the Wisconsin School of Business. We believe in the importance of learning from others whose experiences and perspectives differ from our own. Students, faculty and staff are expected to embody inclusive behaviors that create an exemplary learning community for all.

If you would like to learn more, or have suggestions for how we can improve the climate for learning, please contact your instructor or TA directly or the Director of Diversity and Inclusion, Binu Hill at binu.palta.hill@wisc.edu, 263-3462, 4250 Grainger Hall.

Course Schedule

Week 1 (10/11): Distinguishing correlation and causation; Causal vs. Prediction problems.

First Engaged Learning Assignments Due; Install R if you don't already have it.

Week 2 (10/18): Basics of RCTs and A/B tests; randomization, treatment effects, confidence intervals.

Engaged Learning 3 on Causal vs. Correlation Due 10/18

Week 3 (10/25): Experiments with multiple sub-groups; Analyzing experiments with regressions.

HW 1 Due 10/25

Week 4 (11/1): What can you conclude? Sample size, variance and power.

HW 2 Due 11/1

This Version: 10/5/2021, see course webpage for updates.

Week 5 (11/8): Field experiments; Non-compliance, attrition and spillovers.

HW3 Due 11/8

Week 6 (11/15): Ethics, perception and buy-in for experiments

HW 4 Due 11/15

Week 7 (11/22): Group project presentation video due; **No Lecture Section Thanksgiving break**

Group Project Experiment Basics Submission Due 11/22

Week 8 (11/29): Introduction to natural experiments; **Lecture on Zoom this week due to Justin Conference Travel**

Nothing due, but work on material and group projects

Week 9 (12/6): Natural experiments; Regression discontinuities and Difference in Differences

Group Project Video Presentation Upload Due 12/6

Group Project Peer Review Evaluation Due Friday 12/10

Week 10 (12/13): Wrapping up week (no new material, but deadlines)

HW 5 Due Monday 12/13

Group Project Memo Due Wednesday 12/15

Take-home final exam posted Thursday 12/16 due Sunday 12/19 by 5pm