TEACHING STATEMENT

STEPHEN MACNEIL

PHD STUDENT, COMPUTER SCIENCE DEPARTMENT
CURRENT AS OF SPRING 2017
Motivation

Education is something that should be facilitated by instructors not enforced by them.

General Philosophy

Although active and constructivist learning philosophies are becoming mainstream, they were once more popular than didactic lecture-based teaching which has been a mainstay for decades. Experiential learning, communities of practice, and team-based learning are relics from a time when apprenticeships were the standard form of education. People “learned by doing” under the supervision of a master craftsman. Learning was scaffolded - the apprentice completed easy low-stress tasks until they proved competency and moved on to complicated tasks.

In keeping with the industrial revolution, there was a shift; education became something to measure and regulate. This focus on assessment encouraged teachers to enforce standards, rather than facilitate learning. Students sat quietly and consumed information delivered by an instructor with an intimate knowledge of the material. At best, students learn the material, but at the cost of critical thinking. These students are expected to be effective self-learners without being taught the necessary metacognitive skills. With the rise of YouTube and MOOCs, high-quality lectures are now available for free online. This drastically reduces the importance of the traditional lecturer. As a result, it is now more important than ever to teach students to teach themselves and each other. Teachers fulfill a new role as guides with the responsibility of cultivating learning environments in which students can thrive.

Creating modern learning environments in which all students can succeed is very challenging. Developing curriculum in an unprincipled way can have dramatically negative repercussions. As Jane Margolis points out in her book “Stuck in the Shallow End”, unintended design decisions in education reinforce systemic inequities that exist in society. And so, educators must adopt dual roles as guide and designer. It is our responsibility to stay current with education research and social issues, but also to understand each of our student’s unique needs. Only then can we create an inclusive learning environment that allows students to succeed based on their unique abilities.

Solution

The bad news is that there is no one solution. Only by combining what works and constantly trying to improve can we move forward. Here are some things that I think help

- Active teaching via flipped classroom models of education.
- Foster social interaction and support via team-based collaborative learning opportunities.
- Teachers must act as a guide - keep students on track, create scaffolded activities, and provide goals.
- Assessment is inherently biased and seldom fully captures the strengths and weaknesses of students.
- Students are different and it is our moral duty as teachers to support their unique learning styles and needs.
- There is a corpus of work related to education. Most problems aren’t new, read about how others handle them.

The goal is to show students that they are in control of their education and that by fully taking charge of their education they can become lifelong learners and continually learn the things necessary to follow their passions.
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1 Highlights and Accomplishments

During my short teaching career I have had many diverse experiences that are owed to my many mentors, the GAANN Fellowship, and opportunities to attend high-quality talks both at UNC Charlotte and at well-respected CS education conferences such as SIGCSE and ICER. Below I describe some of my proudest accomplishments and describe how they’ve shaped my outlook on teaching and learning.

1.1 GAANN FELLOWSHIP

In Fall 2014 I was awarded the GAANN Fellowship to develop my skills as a teacher. This fellowship paired me with a teaching mentor and provided opportunities to interact with education theory through discussions and presentations. This fellowship afforded me the opportunity to present my research and interact with other education researchers at conferences. These interactions drastically changed my perspective about how social, cultural, and economic factors affect students. It helped me to see how in my own life and experiences, endemic systemic inequalities can lead to, as Jane Margolis describes, “virtual segregation.” It reinforced the idea that opportunity begets opportunity and that differences in ability are not innate but reinforced by inequitable learning environments and disproportionate opportunities. As a result, I often reflect on how fair my teaching environment is for students with different backgrounds, learning styles, communication styles, and world views. It has taught me to be much more inclusive so that all students have opportunities to succeed.

1.2 RESEARCH IN COMPUTER SCIENCE (CS) EDUCATION

My research in computer science education spans many topics from automated graded systems, to learning support tools, to methods for fostering low-stress learning environments. In my first year at UNC Charlotte, I created an automatic grading system for Media Computation. Media Computation is a style of teaching where students use media, such as songs and images, in their programming assignments to improve engagement. The AutoGrader, allowed students to receive rapid feedback on these projects to either reinforce learning or correct misconceptions. In a second project, NSF BRIDGES, I developed a system that visualized students’ assignments. It allowed students to see and interact with the data-structure that they were using visually. This project was compelling for visual learners, but students could also use personally relevant data, such as their favorite movies or twitter stream, to make it more meaningful. Finally, I have been heavily involved in the Lightweight Teams initiative at UNC Charlotte. This idea is predicated on the fact most CS courses focus on assessment, which can be stressful for students. Low-stress learning; however, focuses on the learning process rather than the assessment. I have published multiple papers on this style of learning and its effectiveness.

1.3 CEI AND FOUNDING THE LEARNING SCIENCES READING GROUP

In Fall 2014 I founded a reading group, where CS faculty members and students could discuss education research. With the support of my advisor and the chair of my department, we hosted 11 official meetings twice per month, each with a different theme. This brought together many educators who had previously designed their courses in relative isolation and gave them a forum to exchange ideas. Furthermore, it introduced new pedagogical techniques based in literature which faculty members could adopt in their own classrooms. For
example, we discussed using Bloom’s Taxonomy to create questions and activities that go beyond simple memorization to encourage higher-order cognitive processes. Through this reading group, I became very involved with the CEI (Center for Education Innovation) initiative in our department and attended many of their sessions. This was a unique opportunity for me to see how curriculums are developed and evaluated in our department.

1.4 STRIVING FOR LOW-STRESS, INCLUSIVE, AND EQUITABLE LEARNING ENVIRONMENTS

As the result of each of these experiences and teaching a service learning course, I became a strong proponent of inclusive learning environments that support diversity of learning styles, cultures, experiences, and communication styles. My initial contributions to this area, along with my advisor, were lightweight teams. In these teams, students learn collaboratively without the stress of team performance affecting their grade. In face-to-face settings, this technique was shown to be preferred by students and lead to higher learning gains than students who learned individually. However, the work of Scott Klemmer, Chinmay Kulkarni, Niral Shah, and Colleen Lewis has shown that while social learning is important it may have unequal benefits for students with different communication ability. This insight has motivated me to find ways to support students who are less comfortable in social settings so that they too can benefit equally from low-stress learning environments. More broadly, when reflecting on these insights in the context of my outreach teaching experiences with k-12 students and my service learning course, it became apparent to me the many ways in which each student is advantaged and disadvantaged. As a teacher, it is our responsibility to create learning environments where all students can succeed and leverage uniqueness.

2 Teaching Experience

2.1 INSTRUCTOR OF RECORD

STARS Leadership Course (11 students)                     Spring 2015
- Unsupervised full instructor role, designed and implemented the curriculum
- Service learning class taught as a startup incubator. Each team was expected to develop a product that addressed a problem of societal relevance. Students were from Psychology, CS, and Management. Material included topics from psychology, marketing, management theory, history, and design. It was taught in a flipped class environment with activities in class and videos at home.
- Course website: [http://stevemacn.github.io/service-learning-course](http://stevemacn.github.io/service-learning-course)

2.2 TEACHING ASSISTANT

ITCS 2214 Data-structures and Algorithms (50 students)    Spring 2017
- Responsible for co-designing labs and quiz questions
- Guide students through lab activities and host two weekly programming workshops
- Responsible for all grading, attendance, and assignments
- Supervised by Dr. Celine Latulipe and Dr. Manuel Perez-Quinones

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MacNeil  | Teaching Statement

ITCS 2214 Data-structures and Algorithms (80 students)  
- Lab Assistant with two instructors team-teaching the course
- Responsible for co-designing labs and quiz questions
- Tested each of the assignments before lab
- Guide students through lab activities and host two weekly programming workshops
- Supervised by Dr. Celine Latulipe and Dr. Manuel Perez-Quinones

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2.3 VOLUNTEER TEACHING ASSISTANT

ITIS 1213 Introduction to Media Programming  (50 students)  
- Participated in formative and summative material sessions
- Hosted G+ tutoring sessions to help students prepare for tests
- Supervised by Dr. Celine Latulipe and Dr. Bruce Long

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ITCS 3182 Computer Organization and Architecture (65 students)  
- Unsupervised lab instructor for 1 section of 65 students
- Guided students to build and simulate computer architecture such as ALUs
- Instructor: Dr. Taghi Mostafavi

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2.4 OUTREACH TEACHING

NC Science and Technology Expo  
- Co-organized 2 tables teaching Scratch, 3D printing, and Makey Makey
- Recruited and acted as liaison to the Makerspace at UNC Charlotte.
- Taught students about how 3D printers work and helped students make banana controlled pianos.

UNC AT CHARLOTTE
Julia Robinson Math and Science Festival 3/19/2016
- Co-organized 3 tables teaching middle school girls Scratch, LEGO Mindstorm, and Lightbot
- Personally taught Lightbot to students

Github Workshop Presented to STARS Organization 2/18/2016
- 50+ attendees, taught the fundamentals of git in an interactive tutorial

Demonstration for STARS Computing Corps 10/19/2015
- Presented some of my research and discussed the goals of Human Computer Interaction (HCI)

- Informal club that fostered a community of practice around functional programming
- Consisted of weekly presentations and programming workshops (Clojure and Haskell)
- https://github.com/stevemacn/learn-haskell

- Provided ideas that guided the project throughout development.
- The project supported a data structures and algorithms class at UNCC by providing real-time personally relevant data sources for student’s class projects and visualized the results.

### 3 Teaching Development

#### 3.1 TEACHING OBSERVATIONS

**Dr. Mary Lou Maher - Human Computer Interaction** Spring 2015
- Attended 1 class session (3 hours)
- Style: each student is in two teams (one is used for clicker quizzes / discussing online videos and the other is for their project), design based, scaffolded assignments.

**Dr. Michael Whitney - Usable Security** Spring 2015
- Attended 1 class session (90 minutes)
- Style: discussion-based, focus on including all members of the class. Survey style course.

**Dr. Coral Wayland - Western Cultural and Historical Awareness** Spring 2015
- Attended 1 class session (90 minutes)
- Style: course time is split between summary discussions and active peer-learning. I was the only male in the classroom and moved from group to group observing team interactions as they discussed a reading about the ways that laws discriminate by gender and race.

**Dr. Alberto Gonzalez - Rapid Prototyping** Fall 2015
- Attended one class session (90 minutes)
- Style: Uses unique ability to connect with students and low-stress activities to alleviate design inhibitions in students.
Dr. Khai Truong - Ubiquitous Computing  Fall 2014

• Attended multiple course meetings (2 hours)
• Style: discussion-based learning, grounded in research, a survey class

Dr. Jamie Payton - Software System Design  Fall 2014

• Attended one course meeting (90 minutes)
• Style: project-based, focuses on connecting real world problems and solutions to work that is done in classes. Strong focus on optimal team formation.

Dr. Celine Latulipe - Introduction to Media Programming  Spring 2013

• Attended 3 lab sessions, 2 Friday team workshops
• Style: collaborative learning, fun/creative coding, and stress free environment (lightweight teams)

3.2 TEACHING AND LEARNING SEMINARS

The What, Why, and How of Integrating Service Learning Into your Course  3/22/2016

• Speaker: Kim Buch talked about her experiences with Service Learning.
• Highlights: Development of the Niner-pantry and STARS organization

How Students Learn (Dr. Todd Zakrajsek presenting)  10/30/2015

• Metacognition and attentional limits were really highlighted.
• His teaching style was great - his personality and examples were relatable and energetic.

Connected Learner Sessions  Summer 2015

• Attended sessions about Service Learning, Assessment, and Organizational Change in CS ed.
• Unique perspective into curriculum development and new guidelines for teaching in our dept.

Making Assessment Meaningful (Elizabeth Wemlinger @ CTL)  4/7/2015

• Analyzing SLO’s to develop better courses and curriculum
• Thinking short-term and longitudinally about SLO’s and presenting curriculum maps

Active Learning in a Traditional Classroom (Coral Wayland @ CTL)  4/7/2015

• Explained active learning via active learning exercises.
• Talked about scaffolding tasks, teacher transparency, personal accountability, and assessment

Data driven education: (Presented by Jaesoon An @ CTL)  11/19/2014

• How current research is leveraging education data to provide insights
• Gave some concrete examples from Moodle to highlight what data might be relevant

E-Portfolios (Presented by Jessica Kapota @ CTL)  11/13/2014

• Incorporating portfolio-based assignments into course design.
• There were many parallels between how students create github portfolios
4 Computer Science (CS) Education Research

4.1 CS EDUCATION CONFERENCES

SIGCSE (Special Interest Group: CS Education) - Memphis, TN, USA 8/2015
- Presented my work on distributed low-stakes teams in a classroom
- Attended sessions about assessment, open source, hackathons, service learning, and the maker movement

ICER (International Computing Education Research) - Omaha, NE, USA 8/2015
- Presented my work on distributed low-stakes teams
- Attended sessions about policy, distributed cognition, and equity

Learning @ Scale - Vancouver, BC, CA 5/2015
- Analyzing student behaviors in MOOCs
- Item response theory and grading at scale
- Distributed cognition in groups and equitable learning

CSCW - Vancouver, BC, CA 5/2015
- Attended collaboration in the classroom session
- Attended motivation and dynamics of the open classroom session

4.2 CS-EDUCATION PUBLICATIONS


4.3 LEARNING SCIENCE READING GROUP SESSIONS (FOUNDER AND ORGANIZER)

The learning sciences reading group was a group that I founded in my department where we could discuss education research. I organized two meetings per week, decided on the theme for each week, and facilitated the presentations. We consistently had about 5 members consisting primarily of faculty members from my department (CCI).

Learning at Scale (Presented by Stephen MacNeil) 4/24/2015
- What I learned at L@S - summary of the education research at L@S and CSCW

Bloom’s Taxonomy (Stephen MacNeil and Dr. Maher) 4/13/2015
- A research project involving bloom’s taxonomy and an introduction to bloom.

SICSE 2015 (Presented by Dr. Maher, Stephen MacNeil, and Dr. Latulipe) 3/9/2015
- A recap of the papers that stood out to each of us at the SIGCSE conference

Sketching in CS1 and CS2 (Presented by Celine Latulipe) 2/16/2015
- A paper and discussion about how sketches are used in the design process

Ordinal Grading (Presented by Stephen MacNeil) 1/26/2015
- Focused on new grading methods, including bayesian grading and peer grading.

Learning Sciences Reading Group (Presented by Dr. Mary Lou Maher) 12/5/2014
- Learning Circles: focused on how learning circles and communities of practice

Social online communities (Presented by Stephen MacNeil) 10/24/2014
- Presented the work of Sasha Barab

Pasteurizing education (Presented by Chuck Lane) 10/10/2015
- Presents paper that describes the progeny of education research

Communication patterns in Education (Presented by Matthew Campbell) 9/26/2014
- Discourse and communication patterns in teaching and learning

Learning Sciences Reading Group (Presented by Stephen MacNeil) 9/12/2014
- Empirical teaching: talked about research evaluating active learning techniques

Challenge-based learning (Presented by Stephen MacNeil) 8/29/2014
- Summarizing research on CBL: focused on designs and learning outcomes
5 Future Teaching Goals

My goal is to continue teaching both at the University level but also expand the amount of outreach teaching that I am doing. My experience teaching K-12 has been extremely rewarding and it is an unrivaled opportunity to communicate to young students that CS is a potential career path for them. By appealing to students early and encouraging them to have early positive experiences with computing it is much more likely that they will be confident in choosing to explore the field further. I think the most important part of working with young students is to show them the many ways in which computing can be connected to their own personal interests. An example might be using a 3D printers, e-textiles, and embroidery machines to create their own clothes. There are many such examples and a future goal of mine is to create multiple such curriculum and teach the curriculum so that students have an opportunity to experience CS in a way that may be new and personally relevant for them.

6 Department Evaluation

In Spring 2016, I taught ITCS 3610 Service Learning course. I was responsible for all aspects of this course. I designed the course as a startup incubator where students created their own non-profit organizations. Through these organizations, they were responsible for designing a product (both teams chose to create and administer a curriculum for K-12 outreach). The teams were responsible for contacting the schools, setting up the outreach, and then attending the outreach to teach the students. The material in class ranged from management theory, to design thinking, to marketing. The course traditionally had aspects of career building, and so activities such as analyzing resumes using gestalt principles of psychology and usability heuristics were included during class time. Students were asked to evaluate their outreach using empirical data and designed fun “surveys” such as having their class put their thumbs up or thumbs down at the end of the class.
MacNeil | Teaching Statement

Spring 2016 Summary Report
STEPHEN MACNEIL

Course Sections

<table>
<thead>
<tr>
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<th>Enrolled Students</th>
<th>Responded Students</th>
<th>Response Rate</th>
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<td>1</td>
<td>100%</td>
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<tr>
<td><strong>Overall</strong></td>
<td><strong>13</strong></td>
<td><strong>6</strong></td>
<td><strong>46.15%</strong></td>
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Overall, I learned a lot in this course.

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<th>Disagree</th>
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Mean: 4.4
SD: 0.8

Did Not Answer: 0
Total Responses: 5

My instructor displays a clear understanding of course topics.

<table>
<thead>
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Mean: 4.8
SD: 0.4

Did Not Answer: 0
Total Responses: 5

My instructor has an effective style of presentation.

<table>
<thead>
<tr>
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<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
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Mean: 4.8
SD: 0.8

Did Not Answer: 0
Total Responses: 5

My instructor seems well-prepared for class.

<table>
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<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
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Mean: 5
SD: 0

Did Not Answer: 0
Total Responses: 1

Was this course in your major?

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<th>No</th>
<th>Did Not Answer</th>
<th>Total Responses</th>
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<tbody>
<tr>
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<table>
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<th>Total Responses</th>
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Why did you take this course?

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<th>Convenient</th>
<th>Interested</th>
<th>Instructor</th>
<th>Other</th>
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<th>Expected</th>
<th>Interested</th>
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Please indicate what best describes you as a student:

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<th>Total Responses</th>
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<table>
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<table>
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<th>Female</th>
<th>Male</th>
<th>Did Not Answer</th>
<th>Total Responses</th>
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<tr>
<td>100%</td>
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Gender: Female | Male

My instructor displays a clear understanding of course topics.

<table>
<thead>
<tr>
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Mean: 4.8
SD: 0.6

Did Not Answer: 0
Total Responses: 5

My instructor has an effective style of presentation.

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SD: 0.8

Did Not Answer: 0
Total Responses: 5

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<td>100% (1)</td>
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Mean: 5
SD: 0

Did Not Answer: 0
Total Responses: 1
These materials come from the service learning course that I taught in Spring 2016. The course was originally taught as a way to organize outreach opportunities for CS students. The original course didn’t feature much content but was experiential in nature with students reflecting on their outreach each week. These reflections were graded and a final presentation and poster accounted for all of the assessment in this course. When I began teaching the course I created entirely new materials for the course. I chose topics that would be relevant for service learning. We had discussions about the pros and cons of volunteerism. We talked about how good outreach overcomes the savior complex and empowers those who are being helped to help themselves. Students were asked to watch curated playlists along a variety of topics and integrate the insights into class discussions and their outreach projects. This was a substantial overhaul from the way that the course was taught previously and it focused on sustainability and co-designing outreach with the local community that is being helped.

In class, the first hour was an interactive lecture in which students had frequent break-out activities or class discussions about topics being presented. Students already were familiar with the ideas from the curated videos, but class time gave them a space to explore their own and others’ thoughts about the topics. The second hour was a longer activity that mirrored their project work, an opportunity for them to work on their projects with guidance, or
7.1 SYLLABUS

The syllabus, like the videos, and schedule were all hosted on a course website. Students were encouraged to share course material outside of the course and even to contribute by uploading videos or fixing mistakes through github (where the website was hosted). In this way, the course was co-designed with and by the students.

7.2 SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>In Class Activity</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 15</td>
<td>Introduction to the Course and Service Learning</td>
<td>Group remixes</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Jan 22</td>
<td>No Class - Snow day</td>
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<tr>
<td>3</td>
<td>Jan 29</td>
<td>Introduction to Management: how the industrial revolution shaped modern management theory</td>
<td>Sandwich shop scenario</td>
<td>Preliminary Project Proposals</td>
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<td></td>
<td></td>
<td></td>
<td>Discuss team products</td>
<td>Watch 2 Videos from Management Section</td>
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<tr>
<td>4</td>
<td>Feb 05</td>
<td>Workshop Day: each team member in a workshop.</td>
<td>Proposal writing workshop</td>
<td>Bring workshop materials to class</td>
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<td>Project lifecycle workshop</td>
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<td>Product development workshop</td>
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<td>Organizational technology workshop</td>
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<td>Leadership workshop</td>
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<tr>
<td>5</td>
<td>Feb 12</td>
<td>Marketing and Community Development (Communities of Practice, Crowdfunding, and Crowdsourcing)</td>
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<td></td>
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</tbody>
</table>
7.3 FLIPPED CLASSROOM VIDEOS

A custom viewer was created for the class so that curated YouTube playlists could be shared with the class. Students were expected to watch these videos on their own time and then discuss the content in class.

7.4 SAMPLE SLIDES (EXPERIMENTAL DESIGN CLASS)

Below are two sample slides from the class on experimental design. Most slides were images or contained primarily images. In this way, they acted as talking points that could be interpreted in many different ways. This encouraged creativity and discussions that could meander in ways that addressed students interests.