CSE 440 Fall 2013
Contextual Inquiry and Design Sketches

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## Problem and Solution Overview

Teaching a new class or student is often daunting and difficult. Oftentimes teaching styles and learning methods do not sync and for many students this becomes a major barrier in the learning process. In any type of learning environment whether it be in sports, academia or extracurricular there are disconnects between teachers and students. Recognizing that every student is different and learns through different means creates difficulty in designing lesson plans that engage, challenge and develop every type of student. Teachers are faced with the challenge of presenting and applying content to a class that most likely does not learn through one single methodology; this presents teachers with an overwhelmingly amount of pressure (to teach in a style they are not comfortable in) and a great deal of confusion (how to better reach students who don't learn in a certain way).Instructors often turn to group projects to empower and engage students not only with the content but with each other. This is a tactic used for empowering students and fostering individual learning through the collective effort of different learning styles. To help resolve the confusion and alleviate stress for teachers trying to reach their students in new ways, we are specifically focusing on learning through groups and designing a tool that will help instructors analyze their students learning styles (individually and as whole) and optimize groups depending upon their student' learning styles. Incorporating the 4MAT learning assessment into our application will provide a valuable framework for data feedback and ultimately act as a stepping stone for our applications true purpose; dividing classes into optimal groups for learning.

## Contextual Inquiry Customers

To better our understanding of the true problems and barriers we observed and interviewed four different teachers in different arenas who we thought would show interest in our application. These sections to follow describe the interview process, the participants and rationale.

### Participant 1 - Mary

Mary is a mathematics professor at the University of Washington. She teaches Linear Algebra and Differential Equations both upper division and lower division. She pursued teaching because she loves "getting the opportunity to share the content...it's beautiful." Further in our discussion she said she observed two types of students in her classes; those that engaged the content and came to class prepared and those that did not engage the content and were simply after a grade. In observing her class as well, we noticed several techniques used to engage different learning styles; thinking out loud, drawing pictures, re-phrasing, providing clues, asking for students to "ask questions!". After speaking with her as well, she noted how revealing students facial expressions can be as this "indicates whether they understand or not." After asking her to compare and contrast her love for teaching and frustrations with her job, she described a major problem in the disconnect between industry and academia. In terms of practical challenges she faces as a teacher she noted that there is no easy or efficient way to send math equations over email or through a digital space in addition to a lack of textbook resources on the web.

### Participant 2 - Callie

Callie is a High School Spanish teacher who works in the Kent Washington School District. When asked to describe her teaching style she noted that is "animated." She thinks one of the best methods for teaching students is what she called "learning groups. My goal is to create a safe environment where kids can learn together. This being said, the students are constantly working together to develop their peer-to-peer rapport and simultaneously their speaking skills." Callie observes three distinct learning styles in her classes, kinesthetic, auditory and visual and with these observations she tries to alter her lesson plans to incorporate certain elements for each learning style. Callie uses an array of tools; Powerpoint, handouts, textbook and online textbook resources, previous years handouts/quizzes. She also noted how much she has been using quizlet this year as well.

### Participant 3 - Ruth

Ruth is a computer science professor at the University of Washington. Her love for teaching overlaps her areas of research in computer science education, education technology, and computing for the developing world. Her teaching style tends towards exercises and group work. Among the aspects of learning she finds most important is that students have a voice. She believes in harvesting student feedback in order to cater to the learners. She often implements means of anonymous feedback through the quarter to help her decide any changes that the

students need.

## Participant 4 - Ellwood

Ellwood is a professor in Germanics and Comparative LIterature at the University of Washington. His passion for education comes from his love of "watching students make discoveries." He describes the learner styles that he has observed as two main types: those who are visual learners who like to watch and absorb, and those are verbal and interactive. He focuses on using multiple means of delivery in order to reach all of his students. However, he believes that the most important aspect of the learning process is in group work. Since his classes usually centralize on ideas and discussions, he tries to get class discussions going so that students can communicate thoughts and perspectives with one another, not only with the professor. He believe that true learning takes place when students lose their dependence on the instructor and realize that they themselves are in control of their own learning.

## Contextual Inquiry Results

Throughout our observations and interviews we noticed several common themes. Despite the fact that all of the teachers teach different content and have a different focus, there was a common goal of engaging the students and empowering them to come to their own conclusions. All of the teachers noted the important role that student groups play in reaching a class as a whole as well, this was evident in most if not all of the observations/interviews that took place throughout our contextual inquiry. In observing classes and following up with professors there was an intentional and visible relationship between students that the teachers themselves attempted to foster. These group formations take place through two distinct methods. There was the improv method in which the teacher intuitively breaks up groups or numbers off the class to form groups which was evident in Callie's high school class and the more methodical method which takes much more time. This methodical approach involves surveys, student feedback and a process of analyzing outside of the classroom to form the groups later. This was a more common practice in the university sector in which the groups that were being formed were quarter-long projects and thus required more attention. In our perception, both are powerful and effective for different reasons.

All the teachers observed various learning styles in their classes. It was especially interesting how every teacher noted the importance of visual elements in their lesson planning. Visual elements play an important role where written or audio elements can not. Additionally, our contextual inquiry points us to this idea of empowerment. Teachers strive to provide clues and guide their students without simply giving answers but rather allowing the students to arrive at those answers themselves. A contributing factor in our interviews in regards to empowerment, is group forming. All the teachers we observed and interviewed used groups as a way to empower their students and reach a broad range of learning styles.

Besides the common characteristics to teaching and forming groups, each of the customers we interviewed displayed a unique perspective.

In asking Mary how she believes students discover their learning styles she noted that most students find out what their learning style is on their own. She observed that many of the non-math related students need to break down problems in other ways; through visuals, diagrams, graphs or even write the problem out in layman's terms. She noted the importance of defining vocabulary in her class and that in many cases this is where the disconnect takes place.

In suggesting a tool for development, Mary would like to see a tool that efficiently allows students to voice their confusion and break down barriers between student and teacher or even student-to-student. Oftentimes in her class she would ask her students if they needed help, many of whom did indeed need help but would not voice their needs, making it exponentially harder to help those who need it.

Callie is a new teacher, this year being her second year. She brings a lot of energy to her classes and is very comfortable deviating from the lesson plan and content if this is the direction the class wants to pursue. In interviewing her she provided specific ways in which she implements her teaching style again reinforcing the idea of empowerment through groups. She often relies on group participation as way of allowing students to learn through their peers not just with their peers.

When discussing the process of motivating group work with Ruth, she is often doing what she can to get as much feedback from her students as possible in order to discover the appropriate changes to make to her classroom. The biggest challenge is finding ways to make changes and encourage group work so that these things appeal to everyone.

Ellwood recently taught a course for comparative literature and divided his class into ten teams. These teams worked together for the entire quarter and submitted all of their work as a group. This method, called team teaching, is one solution to the growing issue of having larger classes and fewer instructors. His concern is that of creating teams that can work together well, since they spend the entire quarter together. He expressed that ideally he would like to know that the teams are balanced in terms of learner styles, since this balance fosters diverse approaches and perspective and creates a richer learning experience for all students.

Each educator expressed the desire to make group work more beneficial, the common challenge was being able to efficiently determine who should be grouped with whom in order to create some optimal balance.

## Existing and New Tasks

*Easy Task* - *Analyze learner styles in a class*

In the process of studying, workloads tend to increase over time, and our research shows that teachers recognize the power of learning in groups. It is much easier for educators to control the

class and reduce the amount of work by checking groups progress and additionally synthesize feedback from a single source as opposed to every student, and yet before teachers can accept group feedback or begin to form groups the teacher must decide how a group is formed. This is easier said when a class can be observed as a collective with the ability to see specific data but also the grand picture. As of now there are no easy tools to quickly and efficiently curate a class profile. Currently teachers go about this many ways whether it be simply raising of hands, electing a class representative, sending out surveys or providing in-class surveys. How does a teacher know and use these techniques? Many of our interviewees rely on their past experience as students and teachers. Many realize that their methods may be convoluted but it is simply what they are comfortable with and trust it's outcomes, nevertheless such sentiments indicate potential for new and improved services

**Moderate Task** - *Divide a class into groups such that each group has an optimal learning experience.*

A distinct challenge for educators is grasping the various learning styles in their student body and creating groups based on those learning styles. In attempting to understand the learning styles in their class, it often takes time which instructors would rather spend actually teaching. Although saving time is an important aspect in any given profession, many professors don't place this factor as the most crucial element in their day-to-day routine. Teachers are more concerned with their students and introducing optimal learning environments to them. Like Ellwood's experience, faculty may be short and dividing students into groups seems like a viable solution given the circumstances. Questions that typically follow a teachers thinking would include: How can I better engage students and get them to participate in class? Who should be grouped with who? What strengths feed into anothers weaknesses? How many groups should I have? Should I group students who share common learning styles or shuffle it up? These are all questions that go through an educators mind and this process is often confusing complex and subjective. Other than simple surveys, educators don't possess the means of assessing students learning styles, and strengths/weaknesses and also form groups depending on that data. Teachers often do this by simple paper/pencil or online surveys asking students to give their name, some general information and maybe their own self-perceived learning style. This can help the teachers familiarize themselves with their cohort yet it's fragmented and requires a lot of time in gathering and analyzing data from various sources. After data regarding the students is gathered it is difficult to synthesize and hard to deem any foundational insights that they can then use the rest of the quarter/year/class.
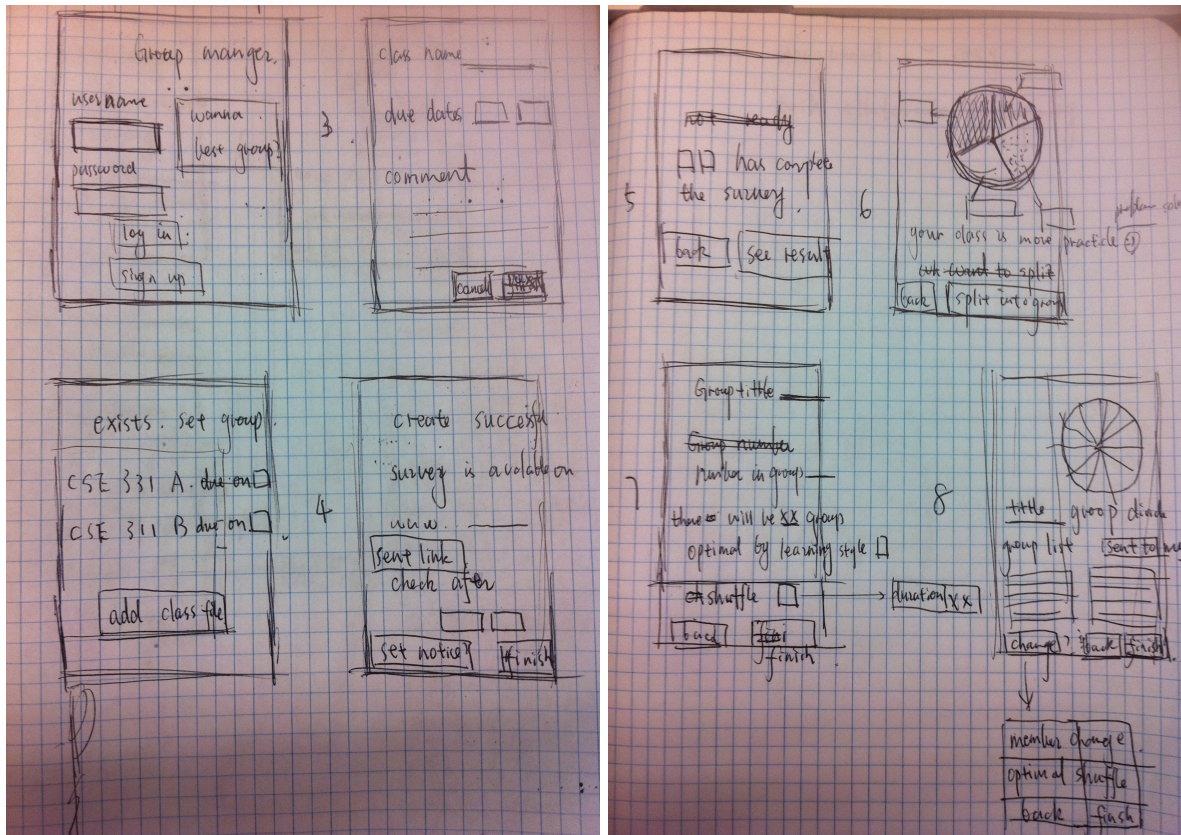
**Difficult Task** - *Create a set of groups for each week over the course of the quarter that optimally distributes students depending upon their learning styles.*

The difficulty in developing new and different groups according to a specified frequency is the ultimately rooted in the process itself. Teachers currently have to create new groups every time they want new groups formed. For example a teacher must send out a new survey every week or month depending on how often they want new groups formed. In addition to problem with
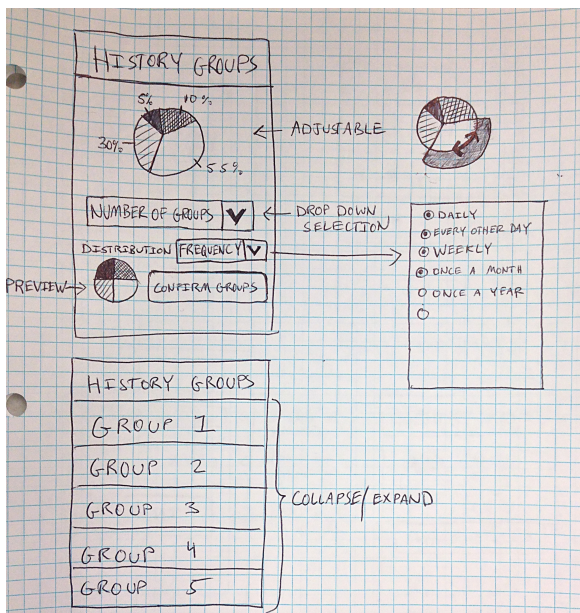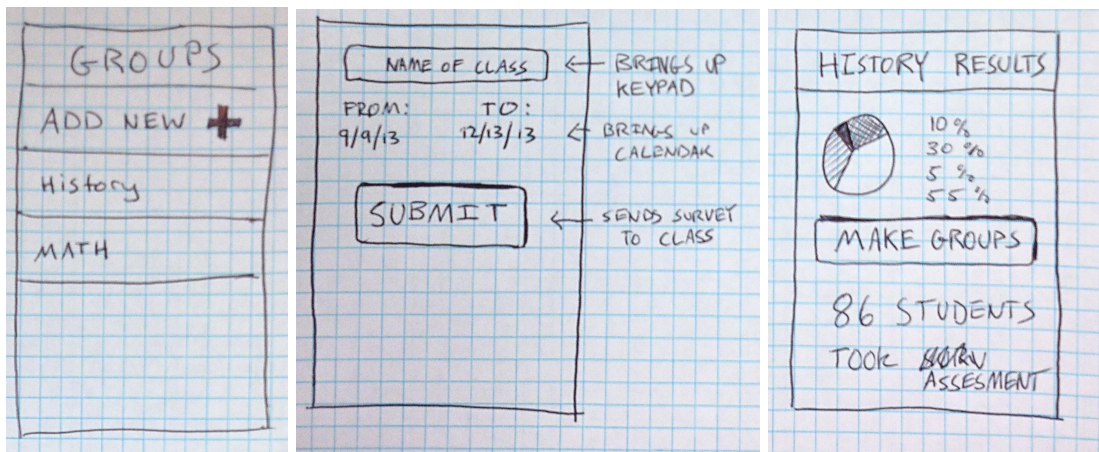
frequency, there is still no cataloging system that allows them to revisit previous groups to see who was in each group or the learning style percentages for that specified group. The challenge is also ensuring that all groups are different than the previous set of groups while also maintaining optimal learning styles. The value in creating new groups is broadening student interaction and giving them the ability to engage other students they wouldn't normally engage with.

## Sketches

Sketch 1

Sketch 2



**GROUPS**

ADD NEW ✚

History

MATH



NAME OF CLASS ← BRINGS UP KEYPAD

FROM:          TO:        ← BRINGS UP
9/9/13        12/13/13        CALENDAR

SUBMIT  ← SENDS SURVEY TO CLASS



**HISTORY RESULTS**

10 %
30 %
5 %
55 %

MAKE GROUPS

86 STUDENTS

TOOK ~~BORN~~ ASSESMENT



**HISTORY GROUPS**

5%    10%
30%
55%          ← ADJUSTABLE

NUMBER OF GROUPS ⌄ ← DROP DOWN SELECTION

DISTRIBUTION FREQUENCY ⌄

PREVIEW → CONFIRM GROUPS

◉ DAILY
◉ EVERY OTHER DAY
◉ WEEKLY
◉ ONCE A MONTH
○ ONCE A YEAR
○

HISTORY GROUPS

GROUP 1

GROUP 2

GROUP 3          } COLLAPSE/EXPAND

GROUP 4

GROUP 5

Sketch 3