Chapter

THE USER-CENTERED DESIGN PROCESS TO DEVELOP A MULTI-MODAL FAMILY NEEDS ASSESSMENT TOOL

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ABSTRACT

User-Centered design (UCD) is a set of processes utilized in the development of products, services, experiences, tools, models, frameworks, systems or other artifacts based on the needs, wants, goals and pain points of the end users.[1] UCD uses iterative cycles of prototype design and development—from low fidelity paper sketches to high fidelity prototypes—with rounds of end user testing between prototypes to ensure the products and services are designed with end user goals in mind at every stage [1, 2]. RyeCatcher has utilized a user-centered design process to build a multi-modal family needs assessment survey tool—a data collection instrument to gather data from parents, families or caregivers that support one or more student learners.

Keywords: user-center design, technology, data, support

INTRODUCTION

This chapter will begin by examining the set of techniques collectively termed user-centered design (UCD). It will then use a case study approach to demonstrate the application of the UCD process in the design and development of the RyeCatcher Family Needs

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[1] For the purposes of this chapter, we will reference and define key components of a set of different design processes that are collectively termed UCD, including, but not limited to User Experience, Goal-directed design, Service design, Interaction design, and Human-Computer Interaction Design. As there continue to be new formats, frameworks and design thinking systems in development, the methods identified in this chapter should not be considered to be exhaustive, but rather, a broad overview with key elements called out as they related to the design and development of the Needs Mapper tool in the case study.

Assessment tool. It will outline the goals of the project, key milestones, user-research and results, modifications, learnings, challenges, pivots and next steps in design and development. It will describe the theoretical framework, research base and key references that informed the initial development of the tool. It will describe the iterative cycles of design and development during the first school year of its utilization, including findings and recommendations from two rounds of usability testing, and the set of modifications made based on testing prior to the second year of implementation of the tool.

This chapter is not a formal articulation of any specific version of the UCD process, but shows how the mixture of methods that are collectively termed User-Centered Design can be effectively utilized as a framework for the design of next generation technology tools in the educational technology and social services sectors. Traditionally, products serving these fields do not have the financial and design resources of traditional consumer products, but serve similar size audiences. The UCD process is an effective, lightweight, and flexible process when employed in the design and development of educational tools and resources, while maintaining the fidelity of the implementation necessary for student learning.

USER-CENTERED DESIGN

The user-centered design (UCD) process is a framework for product development that preferences the user's needs, wants, behaviors, and feedback throughout the design process. UCD is comprised of a collection of research, design, and product development methods that are each informed by end user feedback to validate and verify assumptions, and provide feedback and insight on the product. UCD uses iterative cycles of prototype design and development—from low fidelity paper sketches to high fidelity prototypes—to build products, tools, designs, or other artifacts based on the needs, wants, goals and pain points of the end user. It is important to note that there are numerous variations of the process, and as with all processes of invention, the product inventor and/or design team will interpret and adapt the process to the specific needs of the particular inquiry [1, 2].
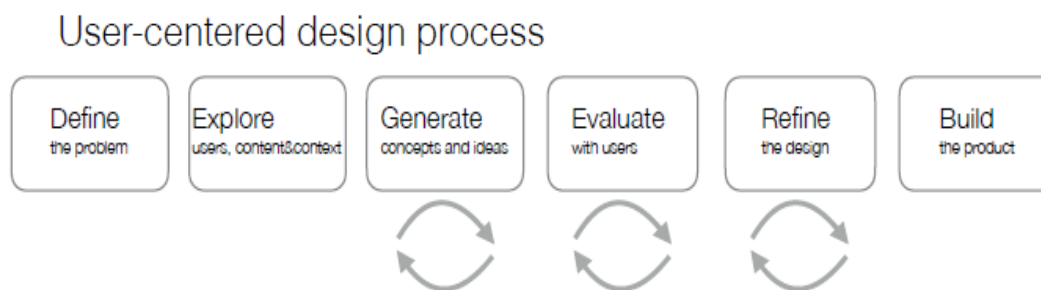
Adapted from Cooper, Deal/O'leary, Evenson.

Figure 1. The User-centered design process.

The UCD process is used to design and develop products in all media—online systems, off-line interactive systems, print artifacts, consumer and physical (industrial) products, and relies upon iterative cycles of prototype development and user testing. The process prioritizes

getting design artifacts into the hand of end users early and often, in order to reduce time spent on solutions that do not directly align with the end users' goals [3]. The process varies by project or implementation due to time, definition of requirements and other considerations. "The trick is to use these tools when appropriate and, more importantly, to use them at the depth appropriate for the immediate problem you're trying to solve for the business" [4].

Exploratory Research

Exploratory research is an expansive process with the goal of defining the problem and understating the end users [2]. It is a deep exploration of the problem space that broadens the possible frame of the design problem to enable effective problem definition. This phase occurs at the outset of a project, and features the exploration of user goals, scenarios, pain points, and needs [1, 2, 5]. Designers and researchers, more efficient and effective if they are the same person(s) [1], review the existing tools, resources, design artifacts, processes, user needs, and pain points, and identify a problem statement for the project centered around the user [2, 5, 6].

A number of key activities comprise this phase of UCD process. This list is not intended to be complete, but offers an overview of key elements from Cooper, Dubberly, Evenson, O'Leary/Deal, Hanington, IDEO, and others [1-6].

- Competitive analysis
- Field studies and ethnographic observations of end users with existing tools and technologies,
- Secondary research into related problems, issues, needs, and concerns
- Interviews with subject matter experts
- Participatory design sessions with end users
- Sketching and concept development
- Idea generation

Generative Research and Design

From problem definition, the research and design process turns to idea generation. The generative design phase is when the designer/researcher synthesizes the users' goals and needs into personas, scenarios and requirements, and transforms those building blocks into the product via sketches, wireframes, and prototypes [5, 1, 2].

This phase is where designer/researcher transforms the raw indeterminate material of the problem—the users' goals—into the product. Often there are an innumerable variety of solutions and problem definitions, and the designer must bring all the pieces together—from the indeterminate to the determinate. This relationship between determinacy and indeterminacy is a key characteristic of the problems that are the subject matter of design thinking [7].

There are a wide variety of artifacts created during this phase of the process. Idea generation is an individual process and is performed differently by each practitioner. The

research and design tools and methods are optimized to the specific elements of each design problem. The wide array of methods and variation has yielded the development of a number of toolkits, the most commonly referenced is IDEO's Method Cards.

Some key techniques used in the generative design/research phase of the process are:

- Sketching
- Personas
- Storyboards
- Wireframes
- Prototypes

Generative research and design yields successively higher fidelity prototypes and designs until the product is developed. In software development processes, later versions of the prototypes are often developed by engineers, rather than the design team, and may not be considered part of the design process [1, 2]. While the variability of software design from manufacturing is important to understand, for the purposes of this chapter, we will utilize a model that is a synthesis of physical and digital product design. Ultimately, the visual design team will hand off the product development to the software engineers, who build the product from the design specification.

Evaluative Research

Once the product is in development, the design and research activities focus on testing the product in action with real end users. The designer/researcher conducts user testing of the product—often in the format of usability, or think-aloud, testing. This method is based on ethnographic methods and is where an end user is asked to perform tasks that simulate real-world user scenarios, and provide immediate feedback on the product's content, architecture, design, functionality, and other aspects [5-7].

The goal of evaluative research is to refine and modify the product in order to optimize it for the end user. This type of testing can occur at any level of fidelity. It is effective for low-fidelity sketches, as well as fully functional software. Increasing fidelity enables less directed testing situations. Modern screen sharing technology has made remote testing a favored approach for live software to reduce cost of travel, and gain access to end users in their natural environment in a non-intrusive way [5-7].

Evaluative research findings inform product updates and modifications. If the changes required, updates to user needs, or systematic modifications are sufficiently large, an exploratory or generative design research activity may be initiated, and the iterative UCD cycle would begin again [1, 5-7].

CASE STUDY: FAMILY NEEDS ASSESSMENT

The Problem, Definitions, and Conditions in the Environment

This case study focuses the development of the RyeCatcher Family Needs Mapper. This tool was designed and developed as a response to needs identified by student support personnel at a charter network that provides wraparound services for its students and families.

The first step in product design is defining the problem. The 2014-15 school year was the second year of providing integrated or wraparound services to students in a middle-size charter network of about 3000 K-6 grade students in a mid-size southern city that serves primarily students of color, over 90% of whom were receiving free or reduced price lunches, a common indicator of poverty. To better support students and families in the community, the Student Support team at the school identified a need for a tool to capture information from students and families about their needs for supports and services during their initial contact with the school at registration.

The Question

How might a needs assessment tool be used when students register for school to capture a picture of the student/household's situation and begin populating the wraparound process?

After the question was posed by student support team members, the designers worked to determine the viability and launch plan for the tool. The entire process took approximately 60 days. The decision to create a needs assessment survey happened on the 01 June, and the product launched to users on the 31 of July.

Why Is UCD the Right Method for This Type of Project

Because of the nature of the data collected, the short timeline for the development of the tool, and the variety of perspectives necessary to develop the tool, the optimal product development process was that of user-centered design.

1. *Short time span for product design, development and launch.* UCD works for projects of all time spans—day-long data jams and hackathons, to many month or yearlong projects— but is particularly effective for short-cycle projects, as it uses iterative product design and development cycles that can be as short as a few hours. Because this project needed to be complete within a matter of weeks, the time for research, strategy, data modeling and iteration needed to occur quickly and in parallel.
2. *Low-fidelity sketches to begin the process.* In this case, there was no time to spend on high fidelity prototypes or concepts. The team needed to move from content to engineering as quickly as possible, and research, sketching, and prototype design occurred in rapid, iterative sequence over a period of two weeks. The process began

with a set of paper sketches and moved into engineering within a few days, as soon as the types of data entry were determined.

3. *Limit time on bad ideas.* Frequent user research, even for a short project, ensures that design and development effort are limited to items the user truly needs. On this project, the entire effort was to respond to an urgent user request, so frequent, almost daily, user feedback was an integral part of the process.

NEEDS MAPPER UCD PROCESS

Due to the highly compressed nature of the project, and lack of ability to adjust the deadline—the product had to be ready for registration—the process was condensed into the minimally necessary steps. The Needs Mapper design process followed the sequence—research synthesis, expert interviews, paper prototype design, user testing, digital prototype design and development, launch, user testing, adaptation and updates.

The product team researched, designed and developed the tool in 60 days. It used a short cycle design process, an amalgam of a variety of UCD methods—goal-directed design, lean UX, service design, Agile software design, to name a few of the sources—to create content, design the interface, and develop the software [1, 2, 4]. The process yielded a minimum viable product in less than 60 days, and the Family Needs Mapper launched to a first-day audience of over 300 families.

Theoretical Framework, Theory of Change, Research Base

Definitions

Wraparound Services: A school-based wraparound strategy promotes student academic achievement by developing, securing and coordinating support that targets the student's non-academic barriers to learning. It goes beyond typical mental health services by focusing on relationship building between the student and his/her family [8, 9]. Wraparound services have been operationalized in a variety of ways—integrated services, community schools, and others [10, 8, 11, 12]. In this chapter, we will refer to any and all operationalized forms as wraparound services.

Needs Assessment: Rouda and Kusy (1995) define "needs assessment" as a systematic exploration of the way things are and the way they should be [13]. Needs assessments can be delivered on paper, as interviews, digitally and in other forms.

Turnaround School: A turnaround school is one where the academic outcomes of the student body are well below the norms, and the administration of a public school is "turned over" to a new entity, often a charter or other alternative school structure. These environments generally feature a high rate of staff turnover, school culture fragmentation, lack of trust of the new staff, and transitional students as they decide whether to stay in the school or find an alternative school. Because of these factors, staff reported that it was hard to get to know families at the beginning of the school year.

THE RESEARCH BASE FOR THE PRODUCT:
LITERATURE REVIEW

Wraparound works for two reasons—it promotes a connection between needs, services and supports, and it empowers students and families [14]. Practitioner experience and a sound research base support that a school-based wraparound strategy, an emerging field of practice, promotes progress in attendance, math, ELA and reading achievement, among other key academic indicators [15]. It can be used for students with special needs, or those without support plans in place [16].

Though research has shown wraparound to be effective at improving student outcomes, it has a limited established theoretical framework, which yields a high degree of variability in its operationalized formats and procedural guidelines [17]. This lack of consistency is also present in the software, services, tools and resources available for the implementation of wraparound. This gap is particularly great in the area of social and emotional learning.

The Needs Mapper tool was developed to address the needs of the wraparound process, and the gaps in the existing software, tools and resources, beginning with the initial meeting with parents. This improvement in engagement and tailoring services to needs, has a profound impact on reducing no-shows of students and families at initial meetings with providers, a key issue in the provision of support services by out-of-school providers [14].

The broader RyeCatcher platform has been built to support the "positive change spiral" brought about by the wraparound process [14], and to address gaps in the education and social services software space, particularly related to engaging families and students in collaborative processes to improve retention at services [18, 19]. The overall functionality promotes shared decision making in order to improve adherence to goals [20]. The behavior planning tools rely shared goal-setting for interventions which improves outcomes and performance [20, 18, 14]. And the platform supports creating shared expectations between the providers of services and parents [19, 18, 21].

THE PRODUCT CONCEPT

Based on the research and the needs identified by the end users, the designers developed the concept of the Family Needs Mapper—a needs assessment survey tool where families provide information about their needs and the needs of their children in a digital or paper format. The designers envisioned a survey to be completed by the family or as an intake interview guide for initial meetings between support staff and families.

The tool would be developed based on a research base from social services, education, user-centered design and other fields. The tool facilitates the process of getting to know a student and family, connecting them to appropriate services a quick, easy, and secure process. This process of alignment promotes a perception of relevance by tailoring services to needs of family and student [22, 19, 18].

Families and schools would have a starting point for conversations, and positive forward movement would happen for families in the first few weeks of school—a critical time in the school year. Supporting and improving engagement promotes retention in services and supports [22, 19, 18].

While a survey is simple data collection instrument, the range of data that the team hoped to collect included sensitive and personal data about student needs, behaviors, skills, academic areas for improvement, high risk activities, family attributes, home and living conditions, English as a Second Language (ESL) status, college matriculation patterns, and family needs. Because the data being collected fell into a wide range of categories, and the type of information a family disclosed was to be personal and potentially sensitive, the design of the survey instrument, instructional content, support materials, and reports needed to reflect the privacy, security, and personal consideration that the information being gathered required. A lack of consideration for the implications of the data collected, the format of the tool, the language used in the tool, and the communications around the tool would impede adoption and yield a sense of uncertainty when using the tool.

Exploratory Research

The team conducted source research synthesis, card sorting, and subject-matter expert interviews during the research phase. Due to the compressed timeline, the research phase was confined to a 3-week period. Exploratory and generative research and design occurred in rapid sequence, with some overlap.

NEEDS ASSESSMENT DATA COLLECTION METHODS

For the Needs Mapper, the goal of the project was to create an online instrument that mapped to an existing set of paper-based processes, some of which captured over 100 data points about a student and families' needs. The project began with a content audit, and review of comparable tools and resources.

The design team worked with a wraparound services scholar and subject matter expert, to compile a broad set of sample needs assessment questions and inventories. Over 15 different needs assessment instruments were reviewed as a part of the process. The source materials took on a number of formats including a set of needs assessments, student support services referral process flows and forms, social service intake interview guides, behavior inventories, and social worker client intake forms.[2]

The team reviewed paper based tools, online/digital case management platforms, and any available online or software-based needs assessment tools. Product design relies upon input from end users, so alongside the research into assessment formats and tools, the designers conducted interviews with subject matter experts (SMEs)—school leaders, social workers, student support team members, behavior interventionists, psychologists, researchers, designers of learning tools, and others—to develop an understanding of the content, context, and process of needs assessments. Among the questions asked to the subject matter experts, the team reviewed the initial set of content buckets with each of the subject experts to

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[2] A sample of selected, representative source materials: School referral forms for parents, student support services; external agency services, behavior plans, FBA forms, and many others School Needs Assessment tools from regions and cities with comparable demographic populations. UCLA Mental Health In-School Needs Assessment Template; Social Services Needs Assessment; Social Services Intake interview questions; ACES survey.

determine if any needed to be modified, updated or removed from the list. The experts also provided insight into the relative benefits and drawbacks of the needs assessments references and formats.

From the source materials, the team developed an inventory of all of the data points collected on the various assessment forms, and conducted a card sorting exercise—putting content items into subject specific buckets— to develop a draft set of consolidated content buckets which the assessment questions and wraparound supports could fall into. The team developed a content inventory from compilation of source materials and research into the needs, behaviors, questions, themes, and patterns that could possibly be identified with a needs assessment instrument. This initial compilation included well over 100 questions, far too many for the limited time and attention span of a parent on registration day [23].

Initial list of buckets:

- Tutoring and mentoring services
- Mental health and substance abuse services
- Case management
- Parent support and education
- Transportation and financial support
- Health services
- Food, clothing, housing, and employment assistance
- Individual, group, and community activities and services
- Gang diversion
- Extended learning and enrichment

A major factor in evaluating a student's needs is asking the right questions in the right context during student intake. Feedback and insights from the experts enabled reducing the initial set of questions based on the themes required to explore, the level of personal information that would be appropriate for this type of initial outreach to a family, time constraints, and applicability of school-based services to the needs identified.

SYNTHESIS OD DATA

After the source research and interviews with subject matter experts, the team synthesized findings into a draft set of questions, and a set of design strategies that guided the design and development of the application.

There were over 30 questions in the initial draft that fell into original set of buckets. As the survey or interview needed to be completed at the time of registration, the time for completion was intended to be under 5 minutes, and the target number of questions was to be in the range of Miller's cognitive processing magic number of 5+/- 2 [24]. The challenge was to reduce the number of overall questions, while capturing all of the data required.

The key buckets that needed to be captured included academics, motivation, family needs, conditions at home and exposure to Adverse Childhood Experiences [25]. The ACEs framework has been among the most researched frameworks in wraparound, and has been used at the statewide level in Washington State to drive its wraparound approach [25]. The basic theory is that the more ACEs a child is exposed to, academic and socio-emotional issues increase. While the ACES survey was used as a guiding framework, the Mapper reworked all of the questions to avoid overly sensitive questions, which the team determined were not appropriate to include in a needs assessment for Registration Day. The approach was that the clearer the survey can identify the presence of ACEs in a child's life (especially more than one), the more effective interventions and preventative efforts can be.

The team used a variety of guiding questions to create the draft list from the source list of questions:

- Which data points, at a minimum, need to be collected to gather effective information?
- How many questions can parent or families be expected to answer within 5 or 10 minutes?
- What information will parents/families feel uncertain about providing?
- How can the question framing, format or language minimize errors, misinterpretation, or bad data?
- What data can we collect that is based on sound research and tied to positive outcomes?
- Does this data enable measuring baselines and outcomes?

Upon realizing the challenge of time, question number and data, the team reverse engineered the questions by compiling a list of all of the required data points, and reverse engineering the minimum number of questions needed to gather the data. The initial draft list of questions was reduced to a shorter set of 12 questions prior to beginning the design phase. These questions captured 60 data points, and could be answered in between 5-10 minutes in informal testing with subject matter experts.

Beyond the survey questions, the project needed to develop a set of communications for the school staff that would be administering the survey, and the parents and families that would be completing the survey. Clear framing of the goals and benefits of the survey would be important steps to gain buy-in and support for the tool and its usage [18]. The survey was designed to be entirely opt-in, so the instructions and explanations had to be clear, effective and promote the value to the parents, families and students of completing the survey.

Finally, as the product launch date neared and communications were to go to families and school staff, the tool needed a name. The tool was named the Needs Mapper as it was determined to be descriptive and evocative.

GENERATIVE RESEARCH, DESIGN AND DEVELOPMENT

The design strategy for the needs assessment application was based on the secondary research base, and exploratory research activities. The main themes that informed the design strategy were to:

- enable capturing a lot of data in a clear and simple way,
- optimize usability for a varied set of audiences to minimize data entry errors, and
- design for a limited attention span and question fatigue during a registration process already filled with forms.
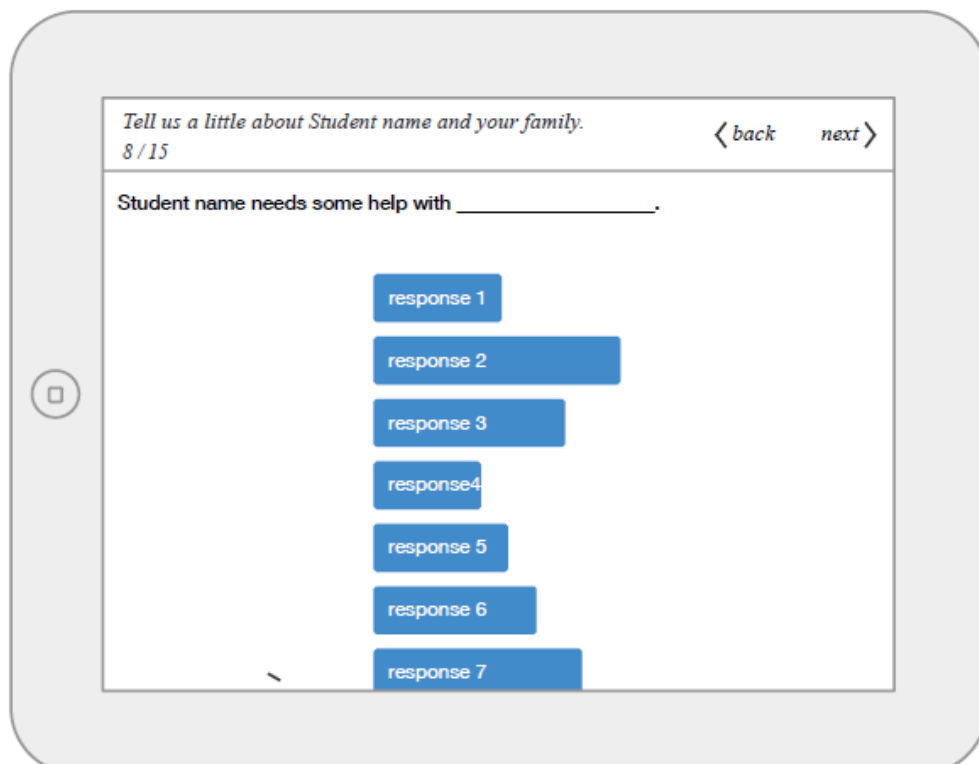
Multiple-choice questions

Tell us a little about Student name and your family.
8 / 15   ⟨ back   next ⟩

Student name needs some help with _____.

response 1
response 2
response 3
response4
response 5
response 6
response 7

Figure 3. Multiple-choice question.

Enable Capturing a Lot of Data in a Clear and Simple Way

There were two main aspects to implementing this strategy—engineering flexibility and design simplicity. Because of the volume of data being captured, the system needed to be designed and engineered to be flexible to support an expanding set of users and use cases. From an engineering perspective, the needs assessment was to be built as a survey that exported data into any type of receiving application—data visualization, analysis,

presentation, and others. It was also built to be able to add and remove questions and responses, modify the data entry mechanisms, and add new data entry mechanisms over time, as needed. While there was a lot of flexibility from the engineering perspective, the end user should experience a simple and easy interface while entering the data, or would abandon the experience.

Once the initial draft of questions was developed, it was determined that there were 3 potential types of data entry—multiple-choice questions, single or multi-select, and frequency scale questions. Multiple-choice questions do not offer a great deal of design variability so the end user has little cognitive load when faced with that question type. A slider control was implemented for the entry of frequency data to present the users with a more fun and engaging way to enter the data, while being a familiar data-entry mechanism. Users are also increasingly comfortable with the online form functionality of radio buttons, where the user must choose only one option, and check-boxes, where multiple selections are possible. The design of the data entry was to be clear and easy to read, to minimize distractions and visual load.

Once the data entry mechanisms were identified and form elements designed, the team reviewed the prototype with the subject matter experts. There were no major issues identified, and the prototype moved directly to the engineers. The short timeline demanded that design and engineering occur together in a live application development environment. Because the interface was simple, this was the most effective and efficient way to develop this application.

Optimize Usability for a Varied Set of Audiences

Parents, families and school staff have varied levels of technical proficiency and reading comprehension. As such, the system needed to be designed to optimize usability to support the wide range of end user audiences. There were a number of key objectives from a usability perspective. The readability of the interface was paramount as some questions had over 15 possible responses, despite the team's best efforts to minimize the number of questions. The instructions had to be simple and embedded into the form itself to avoid clicking through many additional screens. The typography needed to be the appropriate size and style for legibility and readability on laptop, tablet or phone.

Beyond the visual design of the page, the design of the survey, itself, needed to help to minimize errors and provide the end user with a feeling of confidence that his/her data has been captured properly, and to fix any errors. To reduce errors and provide immediate feedback to the end user, a summary screen that showed all responses in a single list was designed to be the second to last page of the survey. Users could modify responses to any of the questions, and to ensure accuracy prior to submission.

To make it simple for a wide variety of audiences, the Needs Mapper was to be completed by one family-at-a-time. It was to be completed by parents and families who did not have accounts on the platform, but were given access to a one-time survey workflow. At the end of the survey, the user was thanked for his/her time and asked to return the computer to the administrator. The parent/family user was unable to get back to the platform without knowing the one-time URL that the admin had access to.

Design for a Limited Attention Span and Question Fatigue during a Registration Process Already Filled with Forms

The final consideration was that users have limited attention spans, and do not like to fill out forms [23]. To exacerbate this issue, one use case for this form was that it would be filled out during registration day for school. Registration day is when families come to register the student for school, and is already filled with many forms to fill out. The families often have to go to the session during lunch or another short time period, so they have limited time for the activity. The Needs Mapper was designed to be an optional part of the registration day, so it had to be short, easy, and engaging, or users would not spend the time.

Anecdotal and consumer research on survey response behavior indicates that asking single questions is a more conversational tone is an effective method for engaging users in longer personal interest surveys. As the Mapper fit into this category, it was determined that each question would be presented individually. This had the additional benefit of reducing visual distractions and cognitive load for each question. The team leveraged the repetitive activity of answering the questions by grouping similar types of questions together.
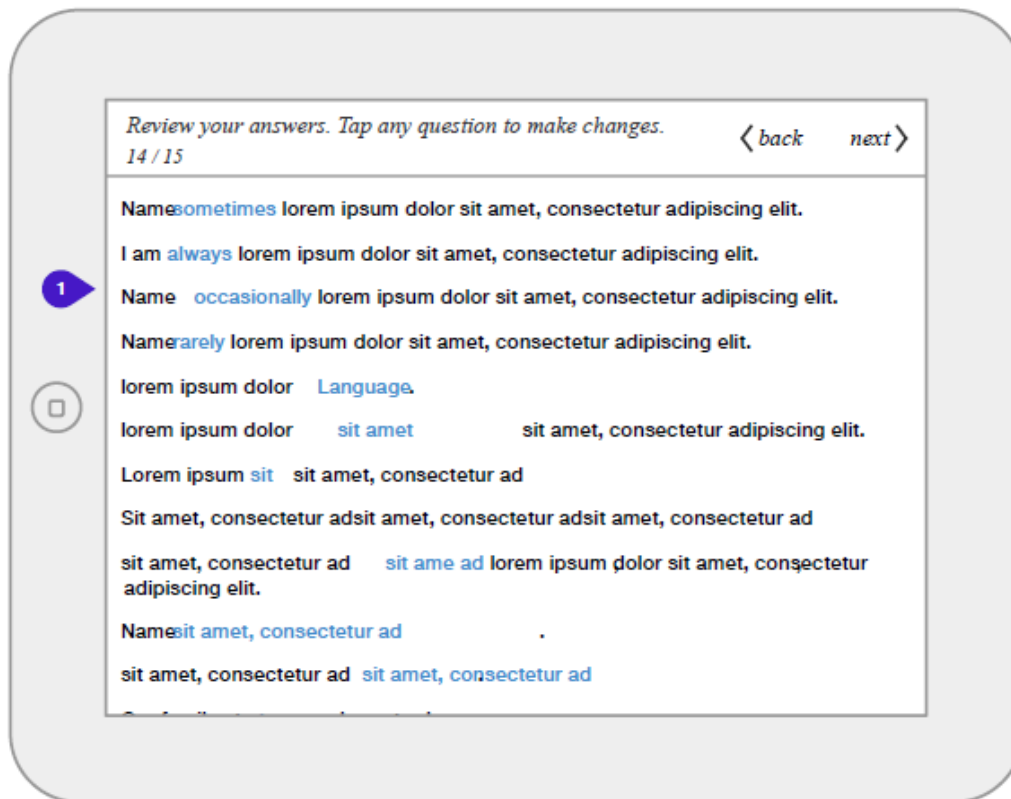

Figure 4. Answer summary page.

The final additions to the survey were a question that asked parents' families to identify their own needs, and a page where parents/families could provide email or phone to opt-in to receive information based on their responses. The parent contact information page would be displayed after the submission of the survey itself, to allow the end user to submit the Needs Mapper data anonymously. All design strategies came together in a fully developed application the day before launch.

LAUNCH: SYSTEM IMPLEMENTATION

Day One: Launch: Rocky Takeoff, Smooth Once Airborne

The Needs Mapper launched on the School District's registration day, July 29, 2014. The launch was a success resulting in over 350 submissions on registration day. The critical factor in the success of the launch was having support—both from the engineers to ensure the tool was working as intended and on the ground for end users. As it turned out, both forms of support were necessary for the launch to be a success.

On launch day, the engineers monitored the application by watching the database entries, user activity, and server logs. Within a few minutes of launch, the engineers identified a data saving error, which was impacting a few questions in the middle of the survey. On-site support developed an alternate form of the survey in case the data saving issue could not be corrected. On-site support also developed a printed version of the form to capture data for the fields that were not saving. Within 30 minutes, the problem was identified and a fix for the bug had been deployed. While there was a minimal amount of data loss, the issue was remedied quickly, and during the remainder of the day over 350 submissions were collected without error.

Beyond the technical issues, on-site school staff identified that some users were skipping the questions that had many responses or the ones that had responses more complicated than the frequency rating scales. Staff performed sensitive observations and support activities, determined that reading comprehension was the main issue, and decided to conduct intake interviews using the Mapper as a guide. This practice had the additional unintended benefit of enabling the support staff to get to know the student and family quickly and personally during the registration day, which was one of the main purposes and goals of developing the Needs Mapper. The support staff and on-site team had conducted the interviews with participant families in between 3-5 minutes. Together, technical support from the software engineers and on-site support from the implementation team are the two components of a successful product launch.

METHOD

User-Testing

The team conducted two rounds of think aloud user testing. The first round of testing was on launch day. The second round was mid-semester to prepare modified version for second

semester new pilots. The first round of testing focused on critical issues—ones that would impede data collection or usage—and the second on operational and administrative issues.

User Testing 1: Findings and Recommendations/Product Modifications

The team used feedback from lightweight usability sessions on the launch day to make a limited number of design, format, process, content, and software modifications and improvements. Limiting the number of changes after each round of testing ensures the updates and modifications are the most critical, and that the impact of the changes will be clear [7].

Optional Questions

All of the questions on the Needs Mapper are optional. The survey was designed to be a non-threatening tool, so requiring any question to be answered, and requiring a name of the person filling out the survey could create anxiety or impede adoption or question completion. Thus, the decision was made to have all of the questions be optional. After the initial implementation of the Mapper, the team conducted an analysis of the response patterns. Most users answered most questions—over 80% of questions had some response. The questions with the most missing responses were those that related to attendance and truancy—how often is your child late, how often does he/she miss school, and for what reasons. During user testing, researchers probed about why questions were skipped, and the reason given by the vast majority of participants was fear of disciplinary action for the child. After testing, a set of simple instructions were added to the beginning of the Mapper that clearly state that the responses will not be used for disciplinary purposes. The optional indication was also made visibly stronger—larger type size and in red.

Language

During the first day of the tool being used in schools, the student support teams at the schools identified a variation in the level of completion of the forms between families. Some parents completed the survey quickly, but did not spend much time on each individual question. Other families spent a longer time on the survey. Some families had difficulty with the technology of the survey. RyeCatcher made a number of on-site adaptations with the help of the student support team insights. Families had widely varying reading abilities. To avoid comprehension issues, the survey was used as an interview guide with counselors, social workers or other school staff conducting interviews. The time for completing the survey went down from 5 mins. to 3 mins. when used as an interview guide.
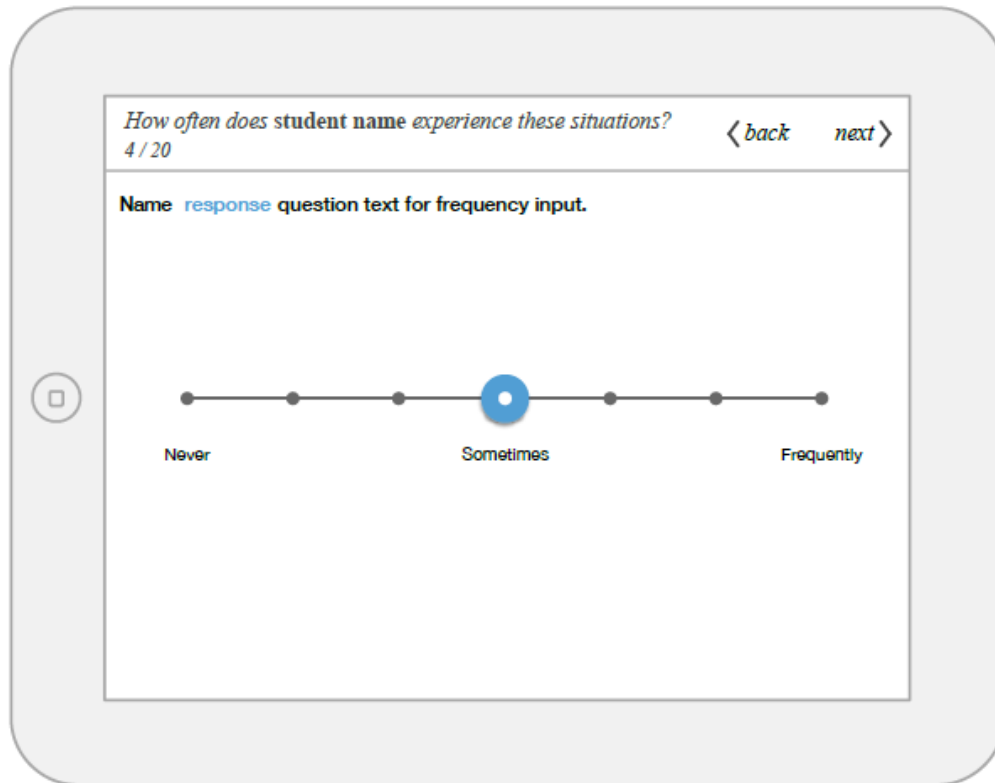
Frequency: slider data entry

How often does **student name** *experience these situations?*
4 / 20

⟨ *back*   *next* ⟩

Name response **question text for frequency input.**

Never   Sometimes   Frequently

Figure 5. Frequency Slider.

Usability

Two major usability difficulties were identified on the first day of usage—the touchpad mouse was difficult for end users, and the slider scale for frequency responses, while engaging for end users, was not easy to use as a data entry mechanism. Each issue was addressed with a modification to the system. A standalone, wired mouse was made available for every laptop used in the Needs Mapper data collection process, and the frequency scale slider was replaced with a traditional set of buttons to indicate response.

Paper Version

Some families were not able to complete the survey during an interview or at the computer station during registration. These families needed to be able to complete the survey at a later time, so the one-page paper Mapper was developed. It was critical to make the survey a single page, front-and-back, to avoid extra paper usage and loss of pages during transit to and from school.

Content

There were 3 major modification to content in the first round of updates—changing school to college, changing the sequence and presentation of the absent from school question, and making it clearer that all questions were optional. When the initial reporting of the data occurred, the team realized that the question about first to attend had been worded first in family to go to school rather than college. This was fixed as soon as the error was identified. Data from prior to the fix was removed from further analysis for that one question. Staff at the schools impacted were made aware of the issue, and worked to correct it manually. The second change was to change the sequence and presentation of the absent from school question to be a twostep question rather than a single question with a conditional second step that made that one question seem different and more serious than all of the others. Due to the perceived disciplinary association of the question, users reported being worried about the consequences of answering the question, and did not respond.

CSV Download

The final modification based on launch day usability was adding an aggregate data download option. Because the engineers were monitoring the data, they had already built a rudimentary version of a data download. School staff provided some requirements and use cases for the data from the Mapper, and a download to a csv, comma-separated value file, was developed. The file contained every response, for every student, with a time and date stamp and parent/family contact information, if provided.

The school teams were able to download and create reports from the data immediately. The implementation team developed a summary report from the raw data, and presented it to school leaders. Feedback on the format was incorporated, and the report was delivered to school leaders each month during the school year.

User Testing 2: Operational Improvements

The second round of testing occurred in November, and results informed changes that were designed and developed between semesters. These updates were mostly focused on making the tool accessible to larger audiences, and as such, were largely operational.

Email to Parents: Individual and in Bulk

While the first version of the Mapper was designed to be completed one-at-a-time, school users at the existing pilot schools and potential new sites, asked for the tool to be delivered in flexible formats—by email, to multiple families at the same time, and on mobile and tablet devices. Each of these updates was developed between semesters and launched to the pilot audiences. The text of the email to be sent alongside the Mapper was preset with legally required and introductory text, with the ability to add an additional note in an open text field.

Create New Student or Use an Existing Student

The original survey required that the student already be a part of the platform database or the student had to be added from a separate section prior to be able to complete a survey. This additional step impeded access for users, so a simple one page, 8 field form was developed to enable adding the student to the database. To keep the process simple, a single landing page enables the user to select from all options—search for and update the record of an existing student, add a new student, or send an email survey.

Paper Survey Design Improvements

The initial version of the paper survey was completed by over 100 families in its first month of implementation. Themes emerged when entering data from the forms about the usability and design affordances of the paper survey.

A number of families did not complete the student name field. It was on the top of the front of the form where the field label, student name, was built into the instructions by being on the blank line that the parent was to fill out.

As is clear in the illustration, the label was not prominent or clear. The form was updated to include a clearly defined box around the student name field, and the field appears on both sides of the page. Instructions were too light when copied or printed on some printers. In the update, instructions were called out as white text on a dark background.

The second round of usability testing improved key operational aspects of the Needs Mapper critical to wider adoption of the application. The major improvements were bulk email delivery to enable the survey to be shared with larger audiences, simplifying the creation of new student profiles a part of the Needs Mapping process, and improving the usability of the paper survey.

"Student Name "

Figure 6. Student Name Field.

CONCLUSION

Refinement: What We Learned

The final phase of the user centered design process is incorporating feedback into the product, refining the product, and beginning the process all over again. New feature requests are a constant from end users. It is the designer's role to prioritize the features to maximize the impact of any change or update.

By the end of the first year of its use, the Mapper had been completed by over 650 families in the pilot district. The first year of implementation surfaced many insights for the product development team. A number of major themes emerged related to content, design and

functionality of the experience. The high-level findings are summarized below with references to articles and secondary research that supports the conclusions.

CONTENT

Engagement and Access

The content of the questionnaire was based on research with end users and subject-matter experts. Beyond a sound research base, engagement and empowerment of parents and families is critical to student success [26]. Making the tool available in multiple formats to support access by all families is critical to that engagement and access. To promote alignment of needs and services, it is important to capture information from families early and often so the tool may need to be delivered more than once per year [14].

Spanish Language Translation

To support equitable access, the Mapper will be translated into native Spanish. The translation will be immediately available to the end user, i.e. not a request for alternate format. The translation, as the English Language version, must be reviewed for readability and comprehensibility by a linguistic expert. The complexity of some of the language for non-native speakers may demand additional supports [27].

High School Needs Mapper

The mapper was designed for families to complete on behalf of themselves and their students. For older students in high school, there is a need to empower self-efficacy in goal-setting and planning behavior to improve outcomes and adherence to plans [14]. To promote high school student self-efficacy and engagement, student support teams requested a version of the Mapper specifically designed for high school students.

Question Modules

End users from schools that were not demographically similar to the pilot district were invited to provide feedback on the tool. As the questions had been tailored to the specific needs of an at-risk community, there were some questions that were not applicable in other settings. Those end users asked for variations in questions based on demographics. The design solution would be to develop modules of questions for different types of schools that aligned to grades served, regional patterns, and demographic characteristics.

DESIGN

Paper survey

The design of the paper version of the survey needed to be improved, in particular, the information hierarchy and prominence/contrast of key elements in the form design needed to promote the completion of important data, e.g. name, phone, email, format.

Smart Defaults

The ability to customize and modify the Mapper aligns with end user needs and usage patterns, but too many choices can yield decision paralysis [23]. To support usage and data integrity, the system should suggest optimal length and format of questions alongside the ability to modify and adapt the standard survey instrument. The smart default setting of the survey is optimized for the 3-minute interview, 60 data points, and data entry via paper, browser-based web site, or phone/tablet application to enable the widest, most equitable access.

FUNCTIONALITY

Actionable Data

Users wanted to see actionable data displayed instantly upon data entry or completion of the survey. They also requested user-specific dashboards for families, students, and schools to promote next steps, and connecting with service providers aligned with needs.

Customization: Choice without Overload

Users requested flexibility in the content of the questionnaire. The solution would be to enable users to customize the order and sequence of the questions. The design of the interface would be optimized to minimize choice overload [23]. Question customization options will enable end user control of total amount of data being collected, and different audiences have the tolerance and ability to answer different lengths and complexities of surveys. End users know their audiences and are in the best position to optimize the experience within a framework of what is recommended.

Self-Service On-Boarding for New Schools

As is the case with many new products, the first iteration relies on manual processing to implement the tool. Upon interacting with the system, end users requested there be a self-

service on-boarding process for new schools to send the Mapper to families. They wanted the process to require no support from the Mapper platform provider.

Alternate Formats

Users requested that the tool be delivered in SMS and mobile app to promote utilization and access by a broader range of end users.

FUTURE RESEARCH: NEXT STEPS IN DESIGN AND DEVELOPMENT

For the 2015-16 school year, the survey was distributed more broadly, expanding to over 2000 families. The Mapper continued to be developed through a user-centered design process. Feedback from the field informed every update. Designers worked closely with engineers and end users to ensure changes, modifications and updates in the second year of design and development were an extension of features based on requests from usability testing and observational research throughout the first year of implementation.

Key updates based on first-year user feedback included:

- In-application descriptive reporting for students, cohort, and schools,
- A mobile version for iPhone and Android,
- updates to the content of questions—more subjects, simplifying language, adding question about format for communication, and
- SMS notifications to improve access and engagement with families.

The Needs Mapper survey tool and associated RyeCatcher functionality supports the goals, operationalization, and implementation of the wraparound process. The designers will utilize the UCD process to identify additional user needs, pain points, and opportunities that can be addressed by the Needs Mapper, and will work with subject-matter experts to align the product with research from the social services and education fields.

The UCD process allows tools and resources to evolve and change shape, while the core goals and models stay in place. As evidenced in this chapter, UCD is an excellent process for gathering large amounts of data, in order to best support at-risk students and families in the applied educational setting. Continued work with the UCD process is needed in order to determine its outreach capabilities and to monitor and measure outcomes for users.

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