re:act A Three-Way Communication Interactive Design System for School-Family Partnerships

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re:act
A Three-Way Communication Interactive Design System for School-Family Partnerships

Yoon Jin Lee

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Fine Arts in Visual Communication Design

School of Design
College of Imagining Arts and Sciences
Rochester Institute of Technology
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Thesis Title

re:act
A Three-Way Communication Interactive Design System for School-Family Partnerships

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Abstract

Using interaction design to create conversation to help create a personalized learning environment in and out of elementary classrooms for achieving students’ academic and mental success from a three-way communication between teachers, students, and parents.

Summary

Many elementary school teachers encounter problems interacting with each student individually. Also, many parents are losing chances to track their child’s development and achievement closely in both physical and mental perspectives because of their busy schedules. There are several web and mobile applications to assist with these issues, but most of those are too focused on grading students’ positive and negative behavior and two-way communication between teachers and parents.

The goal of this thesis is to provide a new interactive design system that focuses on three-way communication in real-time to promote interaction between groups of students, teachers, and parents, in-and-out the classrooms. This thesis investigated communication problems related to elementary education, such as lack of personalization and feedback for healthy child development. These issues were studied with elementary school communities through interviews and observations. The proposed solution supports personalized learning experiences and individual feedback for students to build their self-esteem and self-achievement for the foundation of success, both academically and mentally. The purpose of the design system was reinforcing the parent-school partnership to promote conversations with each other in and out of the classroom for positive child development.

Keywords

School-Family partnership, Personalized education, Personalization, Digital learning environment, Three-way communication, Parental involvement, Teacher working conditions, Student Engagement, Inquiry-based learning, Age responsive design, App design
1 Situation Analysis

Traditional education had considered the classroom a place that every student sits in a chair and follows all the same instructions. Based on teacher-centered instruction, students were taking the role of passive receiver in major parts of conversations in the traditional classroom.

To escape the “closed classroom” for teaching and learning, some pedagogists suggest a new student-driven educational model, other than only focusing delivering information by teachers. Therefore, personalization has been rising as a significant topic in the education field in recent years. Personalized learning can offer customized to students’ parents and guardians for knowledgeable decision making for each child’s healthy development. Teachers and students can create the collaborative classroom to achieve the personal educational goals for each student, to keep their interest, and to deeply engage in class activities by customized learning processes. There are diverse talents and multiple personalities in the classroom, so diverse teaching styles are often needed to address to each student. In addition, personalization of the classroom environment also plays a significant role on children’s self-esteem.

Individualized feedback from teacher and parents can support positive children’s socio-emotional development, and it becomes the foundation of healthy self-identity of students in early childhood education.

But the current situation makes that hard for school communities. First, increasing numbers of students per classroom makes it difficult for teachers to provide personalized contextual instruction\(^5\) to children. Current elementary classrooms in the United States are filled with average 21.5 students which is above the average of OECD countries\(^6\).

It is more than the number of 2014 which averaged 21.13 students fill the U.S. public school classroom, so now a single teacher should manage a larger group of children\(^7\). In addition, the findings of the 2013 UNICEF Child well-being in rich countries shows that United States was ranked 28th of 29 developed countries\(^8\). It is very below the average, which shows that participation rate is much lower than other countries. For increasing participation of students for higher education, it is greatly important to address this issue at the primary education level.

In addition, family involvement is rising as the key components of student success and the quality of education provided by schools to support building the better learning environment\(^9\). According to U.S. Department of Education’s Elementary and Secondary Education Act (ESEA), which is as known as “No Child Left Behind,” schools are required “to develop ways to get parents more involved in their child’s education and improving school.”\(^{10}\) It encourages all elementary schools in a local district to provide enough information about students to their parents to help them to have “informed educational choices” for students.

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7. Ibid. 384-396.

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Figure 1.1 User pain points
Problem Statement

Can an interactive design system be devised to support three-way communication for teachers, students, and parents to enhance the learning environment both in and out of the classroom?

This thesis aims to create special “bonds” between students, teachers, and parents at elementary education while using a digital communication design system by taking advantage of current technology anytime and anywhere. An interactive system needs to be made available to those who are dealing many students in the classroom. Using an interactive design system to build a digital media platform with integrated features to support three-way communication for teachers, students, and parents can improve students’ development with an enhanced learning environment in-and-out of the classroom.

Both design and education have similar power. Designers and educators are focusing on creating effective flow and plan to help users and students to digest the products and knowledge easily. The concept of this thesis’s proposed solution is based on that power to embrace diversity and enhance synergy from three-way communication between students, teachers, and parents.

This research will focus on the design solution to suggest a communication interface design to elementary school communities. It aims to provide an efficient communication system to students, teachers, and parents for bring more comfortable and integrated learning experiences and the bond from school-family partnership. Following topics included, but were not limited to: personalized education, interactive design, user experience design and usability.

Thesis Statement

The thesis research focuses on exploring interaction and product design to build comprehensive mobile and web platform to provide three-way communication to elementary school and family communities.
2 Survey of Literature

**Learning Personalized:**
The Evolution of the Contemporary Classroom
by Allison Zmuda, Greg Curtis, Diane Ullman
Jossey-Bass
February 2015

This book discusses personalized education based on student-driven learning model to create convenient and open learning environment in contemporary school. Zmuda et al. focus on how current classroom need to move to the new teaching approaches with taking advantages with digital media and global access beyond school walls of the traditional education model. The main goal of this book is to suggest the new models to evoke creativity and motivation of students to meet a challenge with strategies and for rethinking opportunities.

**The Influence of Personalization of Online Texts on Elementary School Students’ Reading Comprehension and Attitudes toward Reading**
by Ihsan Seyit Ertem
International Journal of Progressive Education, Volume 9, No. 3
2013

This journal focuses on the role and the benefits of personalized online texts on elementary school classroom. Ertem insists that utilizing personalized online text materials can bring more motivation and self-driven learning to elementary school classrooms.
Environmental Personalization and Elementary School Children’s Self-esteem
by Lorraine E. Maxwell, Emily J. Chmielewskib
Journal of Environmental Psychology, Volume 28, Issue 2
June 2008

This journal discusses about the importance of environmental personalization in elementary school classrooms. Maxwell et al. believe personalized environments support children to have healthy self-esteem.

The three P’s of Pedagogy for the Networked Society: Personalization, Participation, and Productivity
by Catherine McLoughlin and Mark J. W. Lee
International Journal of Teaching and Learning in Higher Education, Volume 28, no. 2
2008

This journal discusses about the contemporary education which bring current advantages of technology while using digital media in classroom.

Personalized Contextual Instruction
by Deborah L Voltz
Preventing School Failure, Volume 47, no. 3
2003

This journal describes that the personalized contextual instruction (PCI) which is a method to enhance the quality of learning with appropriate approach of each student’ needs.

Interaction Design and Science Discovery Learning in the Future Classroom
Anders Kluge
Nordic Journal of Digital Literacy
Volume 6, Issue 3, 2011

This journal focuses on technology-enhanced learning with personalized digital devices and computers based on interaction design theories.
UX Design

**Lean UX:**
*Applying Lean Principles to Improve User Experience*
by Jeff Gothelf
2013

This book integrates user experience design with a 5-step process to solve problems based on software development methodologies.

**The Elements of User Experience**
by Jesse James Garrett
New Riders, December, 2010

Garrett discusses how designer can approach to the design problems with a good framework for thinking about design strategy.

**The Design of Everyday Things**
by Don Norman
Basic Books, 2013

This book focus on presenting the concept of user experience design and usability in design. Norman insists that the good design decision can change users in positive way and bring successful user experience.

Usability

**Don’t Make Me Think:**
*A Common Sense Approach to Web Usability*
by Steve Krug
New Riders, January 2014

This book discusses valuable core concepts of usability and practices to evaluate web applications.
**Usability.gov**
https://www.usability.gov/
U.S. Department of Health & Human Services

This website focuses on user interface basics to ensure that the interface has simple, easy, and understandable elements.

**Tales of Creativity and Play**
by Tim Brown
https://www.ted.com/talks/tim_brown_on_creativity_and_play

In this TED Talk video, Tim Brown, a CEO and president of IDEO, describes that the role of playful culture to bring more and better creativity to the real world and work places.

**Bootcamp Bootleg**
by Stanford University Institute of Design
https://dschool.stanford.edu
2016

Stanford University Institute of Design presents diverse design thinking methods and skills with examples. “Why” and “how” questions which lets designers can approach to the user pain points with right directions.

**Visualization on Touch Enabled Platforms**
by Andrew Webb, Alyssa Valde John Stasko, Sebastian Gunther, Andy van Dam, Tim Kraska
Microsoft Research

This research suggests that a touch screen which can be used as a future presentation platform by using many digital assets.
Design Thinking for Educators
by IDEO
http://www.designthinkingforeducators.com/
April 2013

Published by IDEO, Design Thinking for Educators provides a mindset to teachers for designing class to enhance creativity for students.

A Digital Literacy App for Young Learners
by IDEO
https://www.ideo.com/case-study/digital-literacy-app-for-young-learners
September 2015

This article describes the process and outcome of Gatópolis, a digital literacy platform designed by IDEO for Lemann Foundation,

Microsoft: Productivity Future Vision
by Microsoft in Business
http://microsoft.com/productivityvision

This concept video contains future lifestyle with digital devices including at classroom to enhance learning experience for students.

Achieving Symbiosis and the Conversational User Interface (CUI)
Microsoft Design Expo 2016
https://www.microsoft.com/en-us/research/event/design-expo-2016/

This research shows how conversational user interface can help people to have better quality of life.
The Future Is Near: 13 Design Predictions for 2017
Chase Buckley
January 21, 2016
Buckley mentions Age-Responsive Design at this article. According to him, to design user interaction should focus on flexible layout, colors, and user interface for multiple age group. One product might be delivered as different way to children, adult, and elderly in the near future without installing multiple applications.

Why all designers need to understand color blindness
Alex Bigman
https://99designs.com/blog/tips/designers-need-to-understand-color-blindness/
2012
Bigman describes the point of view and tips for designers to design for color blindness. In this article, he mentions over 8% of target market are color blind, but many website and mobile applications are not designed for them. Some color combinations are not distinguished by color blindness, but those are used to many links, infographics and maps, such as transportation map.
Competitive Analysis

Classdojo
Web, iOS & Android
https://www.classdojo.com

*Classdojo* is a communication application to provide a service to share data between teachers and parents.

Google Classroom
Web, iOS & Android
https://www.classdojo.com

Developed by Google, *Google Classroom* is a learning management service to provide efficient way to distributing assignment.

Edmodo
Web, iOS & Android
https://www.edmodo.com/

*Edmodo* is a social learning network service for students, teachers, and parents to share assignments and grade.

i-Scream
by Sigong Media
http://www.i-scream.co.kr/

*Created by Sigong media, i-Scream* is a elementary e-curriculum library for educators. It provides educational contents of digital resources used daily in 99% of elementary schools in Korea.
3 Methodology

The methodology that was applied in this thesis project combined user experience approach based on user-centered methods to build a digital communication platform for elementary school teachers, students, and parents. For finding specific user desire and needs, this project was focusing on rapid usability testing with prototypes. Also, for providing flexible and responsive design for each different age group from K-12 students and adults, visual style samples were tested. For delivering a final design to be accessed everyone without any tackling, avoiding a color combination, which is hard to be recognized to color blindness, and combining a voice interface design into a mobile application design. A website and a mobile application with corresponding modules was created to encourage elementary classroom to improve their communication and feedback with each other. The interactive prototype shows the various functions of features of the interactivity and strong hierarchy information design system.
Target Audience

This thesis project is centered on elementary school community, especially for K-12 level. Three different groups, which are students, teachers, and parents, are main target user groups. Main goal is finding the intersection between three groups and enhancing the quality of communication between those.

For users of teacher and parents groups, the most representative age-range varies from 24 to 50 years old with basic knowledge and skills of computers and mobile. This group of teachers would learn about a new interactive communication system with clean design and strong hierarchy. For saving time due to busy schedule, the user interface should be simple and straightforward to use for theses user groups.

For elementary students, children can easily lose attention and hardly focus on uninteresting contents and design. Therefore, this project aims to deliver not only appealing design to students but also keep attention on learning materials.

The value that this thesis project will bring is smooth communication and strong engagement to school communities that try to give feedback to students instantly and share student achievements and knowledgeable information to parents in elementary schools with collaborative learning environments.

Figure 3.1 Venn Diagram of school-family community
User Persona

User 1

**Teacher**
Trisha Peterson
27 years | Washington, DC

Wendy has been working as an elementary school teacher for 5 years in DC area. Recently, the numbers of residents are rising nearby her school, she has the biggest size of class ever she has. Meeting many children in classroom is always happy to her, but also she is struggling with interact to each student. Sometimes, she feels bad because she thinks she misses some students’ work or words to react. If she can have a chance to solve this issue, she is very open to any new possibilities in any kind of platform.

User 2

**Teacher**
James Martin
53 years | San Jose, CA

James feels that traditional education model is not working anymore because of a huge changes of environments of children these days than 10 years ago. Therefore, he is willing to use new technologies of digital media to meet students’ need. Most of parents are using smartphone in her school district, so he wants to find a good communication system on online and mobile to offer enough information for supporting children’s development out of the classroom.
User 2

**Parents**

Brad Kirkland

28 years | Rochester, NY

Brad is a single father who has a 8 years daughter. Because of his tense work schedule, he feels hard to follow up his daughter’s status of assignment and activities at school. She brings many papers from class, but do not have time to organize those, so just made a pile of those in his garage. He thinks if he can check those on mobile during his break time, it would be much easier to understand his kid’s development status.

User 3

**Parents**

Mina Nakamura

31 years | Seattle, WA

Mina just moved to Seattle from Tokyo, Japan 6 months ago. Her sons are starting going to local elementary school, and they seems enjoy new learning system. However, when they bring newsletter or assignment from class, it is a little hard to her to understand to support her children. She also feel nervous to have conversation with the homeroom teacher due to of barrier of language. She wants more easy and instant way to have communication with school community.

User 4

**Student**

Lena Kim

8 years | Los Angeles, CA

Lena is a 3rd grade student who loves drawing and reading. She is a little bit introvert, so she feels embarrassed to raise her hand to show the result of activities in classroom. Also, she wants to know her mother’s feedback about her work, but she cannot share her work at class, and usually forgets to show it to her mother. She wish her mother can see her work lively at home and give her compliments.
User Interview

Target Groups

Before designing user experience flow and layouts, interviewing target audience group was conducted for clarifying current user need and pain points. Fifteen elementary school teachers, four mothers and guardians, and thirty 3rd grade students were participated in the interview for this thesis project.

Teachers

15 Elementary school teachers
Online survey | Email interview

9 out of 15 teachers answered that they felt hard to keep a strong School-Family partnership.

For their biggest challenge for communicating with students, busy teaching curriculum was the major reason for 6 teachers. Other three teachers answered high student-teacher ratio blocked them to have conversation to each students. The most popular subject they communicate to students’ parents was students’ development status. 14 out of 15 teachers said they need a new interactive way to communicate with students and their families. For future communication platform, they expected features to share immediate feedback to students and parents, to send newsletters or checklists paperless, and to help build a strong bonds for a healthy school-family communication.

Parents

4 Parents and Guardians
Online survey | Email interview | Observation

4 out of 4 parents and guardians picked their busy work schedule was the biggest challenge for them to keep track on their children’s development status. All of them also felt hard to find a specific part of assignment from many piles of papers from school. A mother of 3rd grade girl mentioned that she wants to have translator function for the future communication services because she is afraid of having questions and conversation with her daughter’s teacher due to lack of her
English. Also, a father of a first grade boy shared his experience to use mobile application without hands. He wants to have better feature to help users to access and manage conversation easily, so this thesis aims to enhance accessibility options for every users. Many of them also were been experienced to use mobile application to communicate with teachers, but they said those are focusing on only behavior report and only two-way communication between teachers and parents, not students.

**30 Third Grade Students**

Observation

Most of students are very fluent to use mobile devices for typing, drawing, and even searching information what they want find. What they felt hard to using education application was losing concentration and interest easily. To know what kind of visual design was appealing to them, three different illustration samples were suggested to them and collect the opinion with support of their homeroom teacher. The most popular character design was well rendered 3D character. However, students easily attracted to the character and forgot about learning material, the main goal of the application. Another sample was a monster with ninja costume, but the teacher worried about focusing on a specific culture which can be accepted aggressive to some users since ninja culture related to sabotage, infiltration, and assassination. The last sample was a character based on flat design illustration. 18 out 30 students liked the style, and it did not distract students so much from class activities.

Value Discovery

After interviewing and observing three target groups, following points were block their communication as user pain points.

**Teacher**

High student-teacher ratio, busy curriculum

**Parents**

Too many papers for tracking students’ status, First generation desire for better communication on mobile devices, Accessibility

**Students**

Lose interest in not only boring material but also too fancy character design
The main goal of this thesis is to integrate user experience methods with profits of personalization of elementary education from overlapping spheres of influence interaction into three-way communication that provides an interactive design system to react to students’ accomplishment and to enhance better development. During ideation phase, integrating three different perspective, which are from students, teachers, and parents, was very significant. Following is a collection of ideation to find possible solutions to synergy from collaboration of diverse fields to offer more user-centered communication to help users feel better through their usages of this system.
Exploration

**Brainstorming**

![Brainstorming Diagram]

*Figure 4.2 Design concept ideation*

Concept

**Instant Feedback using digital platform**

Three different groups will be connected through the result of a corresponding design system under a strong hierarchy structure. Teachers can check students’ work in class easily with real-time previews. It will give them more chances to offer appropriate feedback, assistance, and extra materials to support students’ ability to digest that class activity. Teachers also can share students’ progress to their parents to help them track their child’s each development. In addition, some students need to do extra learning or reinforcing behavior, teachers can send various options of activities to the parents to help them to know the current situation of their child and try to solve it together. Students can feel being connected with their families even in the classroom, and their self-identity will be raised by good feedback from teachers and families. Also, parents can get messages and updates in various ways based on their preference. For example, if they feel tired of installing too many application on their smartphone and check notifications from those, they can choose an option for receiving communications, including e-mail, text message, or etc.
Three-Way Communication Overlapping Spheres of Influence
for bring best user experience to each user group

- Get feedbacks from teacher(s) quickly
- Feel comfortable by being connected
- Can use diverse presentation platforms
- Track their child’s development and progress
- React to their child’s accomplishment directly
- Find their child’s interests and talent

<table>
<thead>
<tr>
<th>Children</th>
<th>Teacher</th>
<th>Parents</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Joyful UI design to make them want to use it</td>
<td>• Strong hierarchy for managing information</td>
<td>• Convenient interface to use regardless of their mobile technology skills</td>
</tr>
<tr>
<td>• Fun activities to participate in class and conversation</td>
<td>• Features for analyzing and summarizing</td>
<td>• Easy to send their reaction to their child</td>
</tr>
<tr>
<td>• Reward &amp; complementation</td>
<td>• Share it to parents easily and check the progression</td>
<td>• Being protected for privacy</td>
</tr>
</tbody>
</table>

Feel being engaged in school-family partnership
Structure

Figure 4.4 System structure
Devices & Operating System

For this thesis project, kinds of devices should be considered as a major point since wide range of age group will be the target audience for the final design system. For sharing instant feedback and status of development of students, mobile and web application will be synthesized into the comprehensive and interactive design system.

For classroom activities, using both web application on computer and tablet devices will be comfortable to teachers to move to each students for giving proper feedback. Parents will have chances to check updated information on mobile devices, such as smartphone, at work and home for maximize time-saving. In this situation, devices for K-12 students should be chosen very carefully because young children might not used to handle delicate digital device. Also, smartphone will be hard to use for classroom activities due to small keyboards and screens. Therefore, this thesis project will utilize digital tablets which are surrounded by bumper rubber cases for safety.

For mobile operating system, iOS, Android, Windows, and Fire were considered for final delivered design.
4. Process

Wireframes

Low Fidelity Wireframe

For a core design concept of this thesis, the project focused on sharing data and information between three different groups for efficient communication. During class, the role of teacher for this thesis is very significant to organize lists of classes, to publish notification, to manage types of information to share, and to make a digital database for frequency of communication and children’s development for the goal of this thesis, enhancing the quality of three-way communication to support to create personalized learning environment. For convenient sharing and managing multimedia files during class on mobile devices on timeline screen of the mobile application of the final design.

Figure 4.5 Low fidelity wireframe and user flow
Figure 4.6 Close up of low-fidelity wireframe and user flow
Grid System

16 x 16 pt grid increments with a baseline of 8 pt

The type scale and UI elements are based on multiples of 4

20pt caps headers, 24 x 24 pt icons
Wireframes

High Fidelity Wireframe

Log in / Sign in

After user testing to three different groups of students, teachers, and parents, the way to manage authority to see information on web and mobile application. For protecting privacy, this application asks the status of users. When user choose parents and students, the notification will be sent to teachers’ application and teachers can approve only certified users for allowing to see information and materials about students’ development and the timeline of the class.
Timeline

When user open the mobile application, the launch screen will be Home tab, which is timeline. All updated information, checklists, photography and videos will be uploaded here. The role of teachers is editor for this tab menu.

List

Teachers can manage lists of students for efficient management for communication. This tab will help teachers to create sub-categories from the entire list of class. Teachers can send specific notification for each groups and update data.

Graph

This feature helps teachers and parents to check students’ development, communication and academic achievement as data visualization per day, week, month, and year.

Figure 4.9 High fidelity wireframe-features
The message tab menu can help to share advices and tips for teacher to parents. Instead of papers, teacher can realize if parents check messages or not easily. Also, parents will not miss the most updated news from their children’s school. For accessibility, voice message feature acts as a major function in this tab menu. Using translator API will help users who feel difficult to use English as a main language, especially for first generation parents. The goal of this function is make them not afraid of trying conversation and questions about their children to teachers and school community to understand them each other more.

Figure 4.10 High fidelity wireframe–messenger
User Testing & Revision

Color Tags
15 school teachers tried to use two rapid prototype based on wireframes. Two users mentioned that they worried which information for whom on timeline. Some activities are published for students and specific contents, like checklists for field trips, are prepared for parents. However, according to wireframes, all activities has same shape of tag in front of its title. To support to users can easily recognize the type of activities on timeline tab, final design was decided to use three different color codes, which is green, purple, and pink.

Color Blindness
Three user groups were tested with color tags samples.

Each color presented each user groups, students, parents, and teacher to help them filtered what they want to open from mass information on timeline. However, a teacher mentioned she has a student who has green-red color blindness. From multiple options for designing for color blindness, this project decided to avoid color combination which can not be recognized by users who have color blindness. As a result, red color was replaced to pink. In addition, using texture on solid color dots can help a better understanding.

Hierarchy
For data visualization screen, many teachers and parents answered that the most important section they think is students’ healthy mental development than academic achieving. After asking the questionnaire to establish a priority, the order of data screen is decided as development, communication, and grade.
5

Style Guide

Three primary colors are main palette for this project. Each color represent a specific group with its meaning for this project.

Color Palette

Green
Student Growth
#00B359

Purple
Teacher Ignite, Creative
#7F47DD

Pink
Parents & Families Supportive, Peaceful
#FFC8C7

Gilroy Extra bold

SF Text UI Regular (iOS)
Roboto Regular (Android)
5. Implementation

Brand Design

Logomark will be provided as two different types. The first one is for students to give more playful and positive feeling while using this design system. Another one is more modern and simple for adults.

Figure 5.1 Final identity design

This project has a plan to using logomark variations as positive feedback to user for the result of their activities. The goal of this project is reacting to each other’s message and make those healthy and strong. Using speech bubble shape with encouraging words will help users to keep staying on this product and also it will make positive and friendly brand image.

Figure 5.2 Brand identity variation
Mobile Application

Log in / Sign up

Figure 5.3 Mobile prototype-Sign in/Log in

When the user opens the application, they need to sign in or sign up for this service. Parents and students will be confirmed by the teacher after they register for protecting privacy from strangers.
This is the main screen when user log in on mobile application. All updated news and information are up on the mainboard with color tags, which are green, purple, and pink for students, teachers, and parents.
The UI navigation bar will be smaller when user scrolled down the timeline screen. User and class name appear on the top. Available features on the mainboard can be divided into 3 groups. The first one is multimedia files including photography and videos from classes. Not only parents and students can remind of their achievements out of classroom to feel proud of themselves and get more motivation for learning. The checklist feature is for parents and teacher. When teacher published the checklist, parents can participate to check and understand what they need to prepare for next class or activities. When parents check all boxes, only teacher can see how many parents completed this list. Parents can see if they checked all or not yet. Another feature is newsletter. Teachers can bring the entire school paper here and also publish their own news from their classroom.
User can slide left on a row to see more multimedia files.

When more than five pictures on timeline, user can go to see more photography by touching the last photo with the number of entire files for user feedback and also select “See All” on the top of the post.

For entire post, teachers can include description of the activities for help parents’ understanding what their children achieve from school.
When user select a specific file, they can see another description about the specific situation. Then parents can prepare and start a better conversation with their kids when they come home from school.

For parents who want save the moment, the application provide options to save directly to their mobile devices, and also they can make positive comments to this post to share with this class communities if they want. In addition, parents can share the picture to their social network service accounts directly from this application.
The list will be helpful to manage communication efficiently. User can save time to find other users to contact. Instead of that, they can create subgroups from the entire list.

For easy navigation to save time, the user can select list view and groups list on navigation bar. Also, filter system help to see only each group’s list.
People (con’t)

When users try to search with a specific keyword, they can touch search icon on the top of the navigation bar, and this screen will be popped up. From the list, users can select profiles and also can make a subgroup of those.
People (con’t) When users create subgroups, they can customize its title, profile picture, and description for the group. This function will help users to contact to specific group for personalized feedback for appropriate target audience. For example, teacher can save time to send message to “Art Group” students instead of finding and selecting students of the group from the entire students and parents list.

Figure 5.10 Mobile prototype-Creating a group from a list
People (con’t)

When the user selects a profile, they can see the visualized data for the student’s development, frequency of communication with teacher and parents, and academic achievement. Instead of piles of paper, users can check digital archive and status of students.

Figure 5.11 Mobile prototype-Profile and data visualization
Messenger is a tool of this thesis project for users to have customized conversation and feedback to each other beyond timeline on Home tab.
5. Implementation

Teachers easily contact to students’ parents to discuss or notify important news or information. Teacher and parents do not need to spend time to find out e-mails or messages in mixture of other their private, business, or spam mails. For accessibility and more convenient communication, voice message function is also available for message tab.

Figure 5.13 Mobile prototype-Message features
There are many parents who has international background. Some of them pretend to use their first language than English. For support them to feel more comfortable to have a conversation with their children’s teachers, translator option will be provided to users.
Message (con’t) Using Translator API, parents can check the realtime based translation of conversation from English to their first language. It will bring more understanding about class and development of children for parents without a barrier of language. Also, parents can easily turn on/off for this translator function with toggle button in the message box.

Figure 5.15 Mobile prototype-Message screen in English and using translation in Korean
5. Implementation

Users can forward the message and set a notification for customization easily. This is helpful to handle messages through multiple digital devices not only smartphone but also tablet and computer.
Sets of activities are provided to users like a library. Teachers can choose one or also create and customized activities for their own class. Teacher can use these activities in class and also share these to parents through messenger.
Web Application

Log in / Sign up

Figure 5.18 Web prototype-Sign in / Log in
5. Implementation

When the user opens the web application after logging in, they can see the mainboard which is same content as their mobile application. Teachers can easily publish news and multimedia post on the wall.
Teachers can manage activities for their classes on this application. Recommendation will be curated for the user based on their past activity history and interests they input in the settings. In addition, the user can save interesting activities for easy access.

Figure 5.21 Web prototype-Activities main screen

Figure 5.22 Web prototype-Activities (Hover)
5. Implementation

User can change settings for numbers of students who will participate in the activity and options to share it with parents and families.
Teachers can customize settings before starting activities with students.
Activity

When teacher share activities with students, teacher’s view has real-time based previews of students’ tablet screen. Teachers can check quickly who need help or who did a great achievement.

Pink tag means their parents are participating as a observer. Teacher can decide to invite them to this live session or not.
Activity (con’t)

When students need help a red notification dot will popped up on the preview of students’ work. When a student write a wrong stroke order during cursive writing practice, teacher can find the student to give feedback to correct that.

Pink tag means their parents are participating as a observer. Teacher can decide to invite them to this live session or not.
Activity (con’t)

Teacher can show the right stroke directly on the screen (which is appearing as a purple stroke in this example), then students can have a better understanding about a right stroke order for this cursive letter.

Teacher can share extra activities to parents and students.
Tablet Application

Figure 5.31 Tablet prototype-Log in and welcome screen
Log in (con’t)  

Student version application has more playful mood than other groups’ application based on Age-Responsive design concept. When the system approve a user as a students, it will provide different user interface with logomark with facial expression to approach the user more friendly to help them keep staying the application to learn and share.

Home  

The main home screen is same contents as the mobile application. Users can see the timeline for updated news and information about class. User interface of student version is more playful with bigger text than teacher and parents versions. One special feature for student version is assistant button.

Figure 5.32 Tablet prototype-Design system for mobile and tablet devices
5. Implementation

Assistant

Students can get help from re:act assistant by touching the button “Need Help.” For students who are not used to write sentence, voice interface will be help them. The logomark is the face of this interface to ease students’ tension from confusion or afraid of failure.

Figure 5.33 Tablet prototype-Assistant
Student can meet much more simple version of activities screen than teachers. Teachers, as an editor, need to curate many settings, but student version interface should help them to focus on only learning material with positive feedback from teachers and parents.
Activity (con’t) Using a stylus tablet pencil, students can write and draw for classes to share the status with teachers. Depends on teacher’s decision, parents can see the live preview, too.

Figure 5.36 Tablet prototype-Activities screen

Student can meet much more simple version of activities screen than teachers. Teachers, as a editor, need to curate many settings, but student version interface should help them to focus on only learning material with positive feedback from teachers and parents.
5. Implementation

Teachers and parents can give feedback to students about their achievement. This will help students keep their motivation for learning and have positive self-esteem from feeling to be connected in school-family community.

Feedback
Feedback (con’t)

After completing assignment, students can see the feedback from teachers and parents. The logomark of assistant changes depends on the feedback, so students also can feel be engaging to this learning even they are doing this out of classroom by themselves.
Prototype

Using inVision application, mobile, web, and tablet prototypes with interactive links to simulate behavioral pattern of the project on mocked up screens was provided to user groups.

Figure 5.40 InVision screens
5. Implementation

Promotional Design

**Posters**

![Posters](image1)

*Figure 5.41 Posters*

**Stickers**

![Stickers](image2)

*Figure 5.42 Stickers*
Can an interactive design system be devised to support three-way communication for teachers, students, and parents to enhance the learning environment both in and out of the classroom?

Three-way Communication

- Overlapping Systems of Influence

- Teachers:
  - Check student performance instantly
  - Monitor group progress
  - Develop and discuss
  - Appeal to various student interests

- Children:
  - Check their work
  - View updates

- Parents:
  - Discuss family development and progress
  - Receive updates
  - See their children's progress

Figure 5.43 Brochure
6 Evaluations

Teachers Group

Sixteen elementary school teachers participated in using the final prototype and sending feedbacks and their opinion. The link of interactive prototype was provided to this user group, and questionnaires to evaluate readability, efficiency, accessibility, and visual style were answered by them. All participants answered they liked visual style of the final design and also readability for adult and student version’s user interface. Fourteen out of sixteen participants selected the checklist function on “Home” timeline because they can see how many parents completed the list and prepare for emergencies.

Parents Group

Five people who have children as elementary school students participate in this usability test as parents. Three users of this group used the final prototype on mobile device, and two users tried web application version. All participants liked the idea of paperless archive of students’ activities from class. Three out of five people chose the checklist as their favorite feature from this design. In addition, all five participants select the best idea that to send instant feedback with positive message. One participants mentioned the importance of following the flow. She said if she can observe the live classroom like student tablet design example, she could understand more her child’s status and what she need to help her child for

Students Group

A second year students, three third year students, two fourth year students joined to use the student version prototype. All of users were trying to use the final prototype with tablet device. The evaluation was conducted via observation and interviewing instead of writing on paper because some users felt hard to writing alphabet. The most appealing feature to students group was the assistant with facial expression on logomark. During test readability, all six participants had not any problem to recognize letters and understanding meanings of those.
7 Conclusion

This thesis project provides a mobile and web application services that enhance the three-way communication and offers real-time feedback opportunities. This thesis has a potential by designing an interactive design system to solve teacher’s burden due to tense teaching curriculum and handle a large number of students in one classroom. Parents can understand their children’s development from digital data visualization while giving warm comments. Students can feel being connected to parents in their classroom and to teachers at home while using simple and joyful user interface of this system.

This thesis was concentrated to find real user pain points and to find a best solution by design. The analysis of usability testing helped that this thesis project stronger than the rough idea sketch. As the result, this thesis project was designed for all teachers, parents, and students including color blindness, first generation, and considering accessibility. To provide appropriate and adaptable design based on age responsive design for each different age group users are also a part of the result of intense research.

In conclusion, this thesis project was help people in school-family communities to react each other without accessibility, language, time barrier for supporting every students’ personalized development. This project was started from the belief that design has a power to make the world in better place. Education and design is very similar in terms of that. Both needs to understand communities who participate in for getting the best result. For that educators designing their digestible curriculum for students, and designers trying to learn user patterns and create the best flow for using the product and service. This re:act project found the intersection of that idea and embrace the chance to expand the opportunity to bring more healthy communication and development to elementary school communities for personalized education.
Appendixes

Thesis Proposal

THESIS PROPOSAL

RE:ACT

How A Three-Way Communication Interactive Design System Can Improve School-Family Partnerships

Yoon Jin Sol Lee
November 10, 2016

Master of Fine Arts Degree
Visual Communication Design
School of Design
College of Imaging Arts & Sciences
Rochester Institute of Technology
# Thesis Committee Approval

<table>
<thead>
<tr>
<th>Title</th>
<th>Re:Act: How A Three-Way Communication Interactive Design System Can Affect School-Family Partnerships</th>
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<tr>
<td>Submitted by</td>
<td>Yoon Jin Sol Lee</td>
</tr>
<tr>
<td>Date</td>
<td>November 10, 2016</td>
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</tbody>
</table>

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Abstract

Using interaction design to create conversation to help create a personalized learning environment in and out of elementary classrooms for achieving students’ academic and mental success from a three-way communication between teachers, students, and parents.

Summary

Many elementary school teachers encounter problems interacting with each student individually. Also, many parents are losing chances to track their child’s development and achievement closely in both physical and mental perspectives because of their busy schedules. There are several web and mobile applications to assist with these issues, but most of those are too focused on grading students’ positive and negative behavior and two-way communication between teachers and parents.

To solve this problem, this thesis project will introduce a new interactive system that focuses on three-way communication in real-time to promote interaction between groups of students, teachers, and parents, in-and-out the classrooms. This thesis aims to create special “bonds” between students, teachers, and parents while using a digital communication design system by taking advantage of current technology anytime and anywhere. The strength of this interactive design is reinforcing the parent-school partnership to promote conversations with each other in and out of the classroom for positive child development. It will support personalized learning experiences and individual feedback for students to build their self-esteem and self-achievement for the foundation of success, both academically and mentally.

Keywords

Classroom, Conversation, School-Family partnership, Personalized education, Personalization, Interaction design, Learning experience, Elementary education, Three-way communication, Individual feedbacks, Child development, Parental involvement, Participation, Attainment, Learning environment, Teacher working conditions, Class size, Student-teacher ratio, Student Engagement, Inquiry-based learning

Project Blog

yoonjinsolleec2017.tumblr.com
Problem Statement

Thesis Statement
An interactive system needs to be made available to those who are dealing many students in the classroom. Using an interactive design system to develop a comprehensive mobile application and website with integrated features to support three-way communication for teachers, students, and parents can improve students’ development with an enhanced learning environment in and out of the classroom.

Situation Analysis
Traditional education had considered the classroom a place that every student sits in a chair and follows all the same instructions. Based on teacher-centered instruction, students were taking the role of passive receiver in major parts of conversations in the traditional classroom. To escape the “closed classroom” for teaching and learning, some pedagogists suggest a new student-driven educational model, other than only focusing delivering information by teachers. Therefore, personalization has been rising as a significant topic in the education field in recent years. Personalized learning can offer customized to students’ parents and guardians for knowledgeable decision making for each child’s healthy development. Teachers and students can create the collaborative classroom to achieve the personal educational goals for each student, to keep their interest, and to deeply engage in class activities by customized learning processes. There are diverse talents and multiple personalities in the classroom, so diverse teaching styles are often needed to address each student. In addition, personalization of the classroom environment also plays a significant role on children’s self-esteem.

Individualized feedback from teacher and parents can support positive children’s socio-emotional development, and it becomes the foundation of healthy self-identity of students in early childhood education.

But the current situation makes that hard for school communities. First, increasing numbers of students per classroom makes it difficult for teachers to provide personalized contextual instruction to children. Current elementary classrooms in the United States are filled with average 21.5 students which is above the average of OECD countries.

It is more than the number of 2014 which averaged 21.13 students fill the U.S. public school classroom, so now a single teacher should manage a larger group of children. In addition, the findings of the 2013 UNICEF Child well-being in rich countries shows that United States was ranked 28th of 29 developed countries. It is very below the average, which shows that participation rate is much lower than other countries. For increasing participation of students for higher education, it is greatly important to address this issue at the primary education level.

In addition, family involvement is rising as the key components of student success and the quality of education provided by schools to support building the better learning environment. According to U.S. Department of Education’s Elementary and Secondary Education Act (ESEA), which is as known as “No Child Left Behind,” schools are required “to develop ways to get parents more involved in their child’s education and improving school.” It encourages all elementary schools in a local district to provide enough information about students to their parents to help them to have “informed educational choices” for students.

5. Deborah L. Voltz, "Personalized Contextual Instruction, Preventing School Failure 47, no. 3 (Spring, 2003): 138, ProQuest: 228455656
7. Ibid. 384-396.
Effective communications between parents and teachers can help this issue by promoting interaction to increase the quality of children’s learning and development\(^5\). Teachers can learn more about students’ interests and needs from conversations with parents.

However, many parents do not have enough time for communication with school and their children these days because of career demands and busy schedules. Even when they want to participate, there are not many chances to track their child’s development during working hours. These situations can cause the lack of communication between children and parents, and also they might miss an important phase of their development. Teachers are facing a dilemma of this kind of communication, so a new system is needed to offer more convenient and interactive opportunities to communicate each with other.

Therefore, we need to promote positive communications between families and schools, building partnerships can set the foundation of involvement in education. To bring benefits and synergy in and out of classrooms for students’ success and positive development, new interactive design might be the key to essential and efficient threeway communications. The new communication platform can reduce failure of students to learn the required subjects and to provide a forum of conversation to bring more students to their academic success and positive behavior.

\(^5\) Deborah L. Volta, “Personalized Contextual Instruction,” Preventing School Failure 47, no. 3 (Spring, 2003): 138, ProQuest: 228435836
\(^7\) Ibid. 384-396.
Survey of Literature

This research will focus on the design solution to suggest a communication interface design to elementary school communities. It aims to provide an efficient communication system to students, teachers, and parents for bring more comfortable and integrated learning experiences and the bond from school-family partnership. Following topics included, but were not limited to: personalized education, interactive design, design thinking, user experience design and usability.

**Personalized Education**

**Learning Personalized:**

*The Evolution of the Contemporary Classroom*

by Allison Zmuda, Greg Curtis, Diane Ullman

Jossey-Boss

February 2015

This book discusses personalized education based on student-driven learning model to create convenient and open learning environment in contemporary school. Zmuda et al. focuses on how current classroom need to move to the new teaching approaches with taking advantages with digital media and global access beyond school walls of the traditional education model. The main goal of this book is to suggest the new models to evoke creativity and motivation of students to meet a challenge with strategies and for rethinking opportunities.

**The Influence of Personalization of Online Texts on Elementary School Students' Reading Comprehension and Attitudes toward Reading**

by Ihsan Seyit Ertem

*International Journal of Progressive Education, Volume 9, No. 3*

2013

This journal focuses on the role and the benefits of personalized online texts on elementary school classroom. Ertem insists that utilizing personalized online text materials can bring more motivation and self-driven learning.
Environmental Personalization and Elementary School Children's Self-esteem
by Lorraine E. Maxwell, Emily J. Chmielewski
Journal of Environmental Psychology, Volume 28, Issue 2
June 2008

This journal discusses about the importance of environmental personalization in elementary school classrooms. Maxwell et al. believes personalized environments support children to have healthy self-esteem.

The three P's of Pedagogy for the Networked Society: Personalization, Participation, and Productivity
by Catherine McLoughlin and Mark J. W. Lee
International Journal of Teaching and Learning in Higher Education, Volume 28, no. 2
2008

This journal discusses about the contemporary education which bring current advantages of technology while using digital media in classroom.

Personalized Contextual Instruction
by Deborah L. Voltz
Preventing School Failure, Volume 47, no. 3
2003

This journal describes that the personalized contextual instruction (PCI) which is a method to enhance the quality of learning with appropriate approach of each student’s needs.

Interactive Design

ClassDojo
https://www.classdojo.com
Web Browser, IOS Devices

Class Dojo is an online and mobile behavior management system. This system focuses on reinforcing students’ behavior by adapting reward system like games. Teachers can send photos and messages to parents of students.
Tales of Creativity and Play
by Tim Brown
https://www.ted.com/talks/tim_brown_on_creativity_and_play

In this TED Talk video, Tim Brown, a CEO and president of IDEO, describes that the role of playful culture to bring more and better creativity to the real world and work places.

Bootcamp Bootleg
by Stanford University Institute of Design
https://dschool.stanford.edu
2016

Stanford University Institute of Design presents diverse design thinking methods and skills with examples. “Why” and “how” questions which lets designers can approach to the user pain points with right directions.

Visualization on Touch Enabled Platforms
by Andrew Webb, Alyssa Valde John Stasko, Sebastian Gunther, Andy van Dam, Tim Kraska
Microsoft Research

This research suggests that a touch screen which can be used as a future presentation platform by using many digital assets.

UX Design
Lean UX:
Applying Lean Principles to Improve User Experience
by Jeff Gothelf
2013

This book integrates user experience design with a 5-step process to solve problems based on software development methodologies.
The Elements of User Experience
by Jesse James Garrett
New Riders
December, 2010

Garrett discusses how designer can approach to the design problems with a good framework for thinking about design strategy.

The Design of Everyday Things
by Don Norman
Basic Books
2013

This book focus on presenting the concept of user experience design and usability in design. Norman insists that the good design decision can change users in positive way and bring successful user experience.

Usability

Don't Make Me Think:
A Common Sense Approach to Web Usability
by Steve Krug
New Riders
January 2014

This book discusses valuable core concepts of usability and practices to evaluate web applications.

Usability.gov
https://www.usability.gov/
U.S. Department of Health & Human Services

This website focuses on user interface basics to ensure that the interface has simple, easy, and understandable elements.
Design Ideation

Following is a collection of ideation to find possible solutions to synergy from collaboration of diverse fields to offer more user-centered communication to help users feel better through their usages of this system. From this ideation session, brainstorming was conducted to explore how to enhance easy and efficient communication and feedback system in and out of elementary classrooms in United States, and this research focused on its contents, technology and the way to design it as an interactive system.

This system will be used by three different groups in a wide range of ages. Contents, language, layout, and visual elements will be adapted differently by their age range because user experiences of 8 years old and 32 years old should be different.

Instant Feedback

Three different groups will be connected through a mobile and web communication system. Teachers can check students’ work in class easily with real-time previews. It will give them more chances to offer appropriate feedback, assistance, and extra materials to support students’ ability to digest that class activity. Teachers also can share students’ progress to their parents to help them track their child’s each development. In addition, some students need to do extra learning or reinforcing behavior, teachers can send various options of activities to the parents to help them to know the current situation of their child and try to solve it together. Students can feel being connected with their families even in the classroom, and their self-identity will be raised by good feedback from teachers and families. Also, parents can get messages and updates in various ways based on their preference. For example, if they feel tired of installing too many application on their smartphone, they can choose an option for receiving communications, including e-mail, SMS, or etc.
Methodology

**Project**

The methodology that will be applied in this thesis project will combine user experience approach with interaction design based on user-centered methods to build a digital communication platform for elementary school teachers, students, and parents. In addition, an identity of this design system will be designed in order to enhance brand image and loyalty to increase engagements.

A website and a mobile application with corresponding modules will be created to encourage elementary classroom to improve their communication and feedback with each other. The interactive prototype will show the various functions of features of the interactivity and strong hierarchy information design system. The final user demo would be created to show general user navigation flow and user interface motion.

**Target Audience**

This thesis project will be centered on elementary school teachers, especially for K4 level. The most representative age-range varies from 24 to 40 years old with basic knowledge and skills of computers and mobile. This group of teachers would learn about a new interactive communication system with clean design and strong hierarchy.

The value that this thesis project will bring is smooth communication and strong engagement to school communities that try to give feedback to students instantly and share student achievements and knowledgeable information to parents in elementary schools with collaborative learning environments.
Persona

USER 1
Yu-na Kim

Age 27 years
Occupation Elementary school teacher
Area Washington, DC
Feeling Overwhelmed
Skills Communication, Counseling

Yoon-mi has been working as an elementary school teacher for 5 years in DC area. Recently, the numbers of residents are rising nearby her school, she has the biggest size of class ever she has. Meeting many children in classroom is always happy to her, but also she is struggling with interact to each student. Sometimes, she feels bad because she thinks she misses some students’ work or words to react. If she can have a chance to solve this issue, she is very open to any new possibilities in any kind of platform.

USER 2
Cindy Kirkland

Age 35 years
Occupation Elementary school teacher
Area Seattle, WA
Feeling Needs a new teaching approach
Skills Visualizing, Analyzing

Cindy feels that traditional education model is not working anymore because of a huge changes of environments of children these days than 10 years ago. Therefore, she is willing to use new technologies of digital media to meet students’ need. Most of parents are using smartphone in her school district, so she wants to find a good communication system on online and mobile to offer enough information for supporting children’s development out of the classroom.
USER 3

James Lopez

Age 30 years
Occupation Elementary school teacher
Area Topeka, KS
Feeling Passionate
Skills Communication, Organizing

James is a fresh new elementary school teacher in Kansas state. He wants to share students’ achievement to their families every day, so tries to find an efficient platform which can allow he and his students’ families easily access and use it. However, the level of skills to use mobile devices is very different between each families, so he is struggling to decide to use one service.
Anticipated Software

This thesis project will utilize the following software:

Adobe Photoshop
Adobe Illustrator
Adobe After Effects
Adobe Dreamweaver
Adobe InDesign
Cinema 4D

Final Deliverables

Branding Logo, Brand Style Guide
Interaction Design UI screens, UX flow, Web & Mobile Design
Final Prototype Interactive Prototype
User Demo Reel Videos in mp4 format

This thesis project will have a webpage and a mobile system with user interface screens, a user demo, and an interactive prototype. Webpage will be coded with HTML, CSS, and JQuery pages. Open source will be used.

Mobile application will have all exported as image files in 300dpi for final pages. An interactive prototype will be developed on mobile prototyping software programs, and a user demo with user interface motion flow will be designed with Adobe After Effects.

This thesis project will have a mobile application and webpage containing the following aspects;

- Log in
- Main board
- Age-responsive design12
- Real-time based Previews of Students’ Works
- Various Presentation Tools
- Messenger
- Graph / Charts for Progress
- Notification
- Links to Mobile / Web / E-mail / Text Messages and etc.
- Profile
- Filtering / Sorting
- Manage Time Schedule

Implementation Strategies

The process of implementation of this thesis project will be discovering, strategizing, defining, and designing. First step will be discovering which includes research, find design problems, competitive analysis, and user research. On strategy step, user flow and the information structure of this system will be designed for strong hierarchy. Next, defining will be completed through creating sketches, rapid prototype, grid system, wireframe and user testing. On the design stage, all visual elements for final user interface screens and websites will be designed based on entire brand visual style guide.

Process

1. Study research about analyzing user behaviors in classrooms and finding user pain points
2. Research competitive products, including mobile application, website, and design concepts about supporting communication in and out of classrooms
3. Expanding ideas from the brain by mind mapping, sketches, and other ideation skills
4. Set a persona, user flow, and user journey map to build a corresponding design system under a strong hierarchy structure
5. Create wireframes and paper prototype and conduct revisions based on feedbacks from user tests.
6. Develop visual, UI design and revise those with usability testing.
Dissemination

This dissemination plan will be for future audience interaction and showcased into the world.

- Thesis Show 2017, Rochester Institute of Technology
- RIT Imagine 2017, Rochester Institute of Technology
- Behance Student Show, Online portfolio
- Adobe Design Achievement Awards 2017
- Core77 Design Awards
Evaluation Plan

The evaluation plan will consist of three rounds of prototype testing focused on usability and emotional aspects. The first step will be conducted with the rapid prototype on paper in order to improve a core structure based on user suggestions. Other steps are about testing a lo-fi wireframe and final hi-fidelity prototype.

The interactivity of website and mobile application will be tested on elementary teachers, prospective teachers, students, and parents and families of elementary school students.

Those will be both qualitative and quantitative analysis to enhance design for better physical and emotional user flow. All user feedback will be recorded in video format or on papers.

After getting feedback from users, those will be implemented to revise stages of development of structure and visual design.
Pragmatic Considerations

Transportation
Taxi fare: $60

Design
Adobe Creative Cloud
$191.88/yr

Camera
$100
Timelines

FALL 2016

START

- Ideation
- Problem Finding
- Research
- Survey of Lit.
- User Research
- Proposal
- Review Presentation
- Design Solution
- Paper Prototype
- Usability Testing
- HI-Fidelity Prototype
- Thesis Documentation
- Final Presentation
- FINAL

Lee 21
Bibliography


Bibliography


Sources for Imagery

For creating prototype screens, images of profiles, Home screen cover, activities covers, and multimedia examples are used. All these images are provided from Unsplash, Pixabay and Wikimedia, which allows all photos can be used for free for any purpose.

Figure 5.4-5.29, 5.32

Figure 5.4-5.7, 5-19, 5.32

Figure 5.5
Figure 5.6

Figure 5.8-5.10

Figure 5.8-5.9

Figure 5.9

Figure 5.10

Figure 5.11-5.12

Figure 5.12

Figure 5.15
Hershey, Peter. Unsplash. https://unsplash.com/photos/6Z2aJrzw3zI
Figure 5.17, 5-20

Figure 5.20

Figure 5.25-5.26, 5.36, 5.37

Figure 5.30

Figure 5.34-5.39
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And this thesis is dedicated to

Dad, Mom, Hyunjoon, and Grandma, who always believe in me.