Summer 7-16-2021

Designing an Online Platform to Support Long-distance Romantic Relationships

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ABSTRACT

Nowadays, Long-Distance Relationships (LDRs) are increasingly popular and ubiquitous for many reasons, including travel for career, education, and parent care. Compared to geographically-close relationships; it seems LDRs face many challenges: difficulties in communication, time zone difference, temptations from others, and lack of physical engagement, among other things. While the rise of computer-mediated communication provide many channels for interaction for LDR partners, statistics show that many long-distance relationships still don't last. I focused on two important factors that can impact relationship satisfaction—self-disclosure and a caring response. I employed an online survey to understand how partners self-disclose and show a caring response with each other in long-distance romantic relationships versus in an in-person romantic relationship. I found that the best channel to support self-disclosure and care is video, but video is not as convenient as text. I also discovered that, for most participants, the favorite part of offline communication is being able to see facial expressions and body language, hear tone of voice and have physical contact. Inspired by this research and participant feedback through focus groups, I designed an app called LoveNotes. The app emphasizes facial expression and tone, and uses the connotation of love letters. This app has potential to encourage LDR partners to express emotion and thoughts in a stronger, more accurate, more detectable way.

keywords

Long-Distance Romantic Relationships, Online Communication, Self-Disclosure, Caring Responses, Non-Verbal Behavior
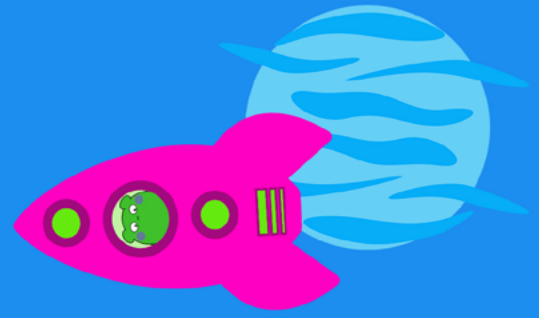
LoveNotes

Deep, private, intimate communication
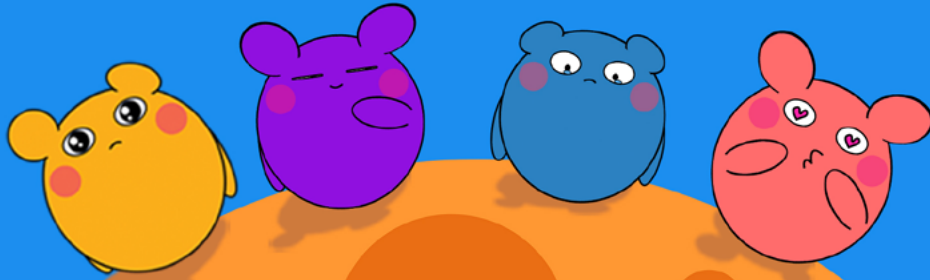
DESIGNING AN ONLINE PLATFORM TO SUPPORT LONG-DISTANCE ROMANTIC
RELATIONSHIPS

by

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B.A., Beihang University, 2012

Thesis

Submitted in partial fulfillment of the requirements for the degree of

Master of Fine Arts in Design.

Syracuse University

July 2021

ACKNOWLEDGMENTS

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INTRODUCTION

Long-Distance Relationships (LDRs) have become increasingly commonplace. Multiple factors, including (but not limited to) career, education, parent-care, and/or illness, contribute to the need for partners to carry out their relationships at a distance from one another. However, physical distance generally gives way to other challenges, such as, differences in time zone, difficulties in communication, the temptation of competing romantic interests, and a lack of physical contact. As such, LDRs may face greater threats to success than geographically close relationships. Yet, thanks to the rapid development of computer - mediated communication, people now have a number of ways to interact with remote partners via text, voice memo, phone-call, sharing of photos, video chatting, etc. Essentially, many online social platforms offer LDRs diverse communicative modalities. This thesis, therefore, explores how such online social platforms can help remote romantic partners to better support and maintain their LDRs. The present need for this study is all the more urgent given the extent to which the global Covid-19 pandemic has forced millions of people to remain physically isolated from family members, friends, and lovers.

Hence, to conduct this study, I first focused on two factors that have a great impact on the quality of relationships: self-disclosure and a caring response. Having designed an online survey involving 62 participants, around these two factors, I then conducted an iterative design process to develop a new online platform. I refined and modified my designs based on feedback from focus group participants. My final concept is the Love Notes app where a messenger called Gugu carries emotion-packed information between partners. I introduce my design concept and the rest of my thesis project in the paper that follows.

RESEARCH PROBLEM

Dr Gregory Guldner, a frequently cited source on LDRs, noted that these relationships are very common: in 2019 "14 million couples define themselves as having a long distance relationship and 3.75 million married couples are in a long distance relationship in the US alone" ("Long Distance Relationship Statistics 2019"). The reasons they have to live apart vary from young couples transitioning from high school to college to married couples separated because of military deployment.

Thanks to the Internet, our ways of communicating have become more diversified and accessible. Especially in recent years, various kinds of social-networking software have been emerging in an endless flow, including Facebook, Instagram, Twitter, WhatsApp, Snapchat, WeChat, Skype, etc. These new programs have rapidly changed the way people interact. It seems modern long-distance romantic relationships have, subsequently, become easier to maintain. With the help of these online interfaces, one can connect with a partner in just a few seconds with the swipe of a finger.

The prevalence of computer-mediated communication has proven especially relevant since the rapid spread of various strands of the coronavirus that began threating the globe in 2020. Across the world, people have to stay at home and keep their distance. This may prove especially challenging for people who have been quarantined away from their lovers. As such, it's likely that more people have begun to rely on online-chat software to communicate with their romantic partners.

Given variation in the proximity or remoteness of partners and the rapid changes in our communicative modalities, we are led to ask: can computer-mediated communication

make things better for partners in an LDR? Research shows that 40% of LDRs fail and the average LDR ends after a mere 4.5 months (Kim). German research from 2010 further noted: "the average length of a long-distance relationship was 2.9 years, less than half the length of a proximal relationship, 7.3 years" (Smith). Transitioning in a relationship from being geographically close to long distance requires much effort. Such relationships take considerable compromise that not everyone can offer (Kim). Considering their odds for failure, simple chatting software may prove insufficient to fix the problems of long-distance relationships.

Problem as It Pertains to Self-Disclosure

In Close Relationships, author Pamela Regan (2011) introduces the core components of strong intimate relationships. A major factor is self-disclosure: "Individuals will get closer and more committed to each other as they increase both the depth (the extent to which the disclosed information is intimate or personal, emotional, and detailed) and breadth (the variety of dimensions about which information is revealed) of their self-disclosure" (Regan 94). A partner's responsiveness to self-disclosure is another important factor: "attentive, supportive responses that leave the partner feeling validated, understood, cared for" (Regan 94).

Yet, online connections lose many details of real-world interactions, which can include nonverbal behavior such as facial expressions like smiling, laughing, eye contact, frowning, pouting, and body language like touching, hair smoothing, head nodding, as well as feeling about physical distance, tone and volume of voice, etc. (Regan 95). These factors, together with verbal language, contribute to a full understanding of a partner's real wants, intentions, and feelings. Difficulty transmitting non-verbal indicators through online platforms can make it hard to communicate (self-disclosure), interpret, and respond to the partner (responsiveness to self-disclosure), which are major factors in strong intimate relationships.

Problem as It Pertains to a Caring Response

Further, there are two main ways a partner seeks support from their significant other. One way they seek support is through direct support-seeking behaviors, which require a direct verbal request for help (Regan 155). The other way is through indirect support-seeking behaviors, which generally constitute one verbally or nonverbally asking for help (Regan 155). As Regan explained:
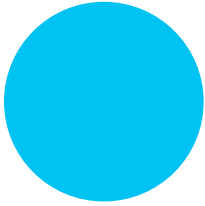
Indirect verbal tactics for activating caregiving include complaining about a situation or hinting that a problem exists without directly requesting assistance from the partner; indirect nonverbal strategies include subtly displaying negative affect or personal distress by sighing, sulking, or fidgeting. (Regan 155)

As one may perceive, if a person primarily uses indirect nonverbal strategies to express affect and need to a partner, that partner may have difficulty interpreting their cues or messages. For example, introverted partners tend to be less verbal when expressing their feelings than their extroverted counterparts; add to that the challenge of interpreting someone's nonverbal behaviors in an online setting, a partner's feelings can easily be missed or misunderstood. Additionally, people who possess insecure-attachment pattern generally communicate their thoughts and feelings to their partner in indirect and inefficient ways (Regan 148).

In addition, a study conducted by psychologist Nancy Collins (1996) shows that people with different attachment tendencies tend to view events in their ongoing relationships differently (Regan 148). Nancy Collins invited some participants in a romantic relationship to imagine some possible negative behaviors that their partners involved, such as failing to provide comfort and response when the participants were in urgent need of help, and the participants were then asked to explain the possible reason for the behavior (Regan 148). Those who displayed an insecure attachment style tend to explain the event in highly negative ways; they felt their partners were unresponsive, unloving, and untrustworthy. If we assume the same events happened in online settings between partners who

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live far away from each other, one partner's unresponsive behavior coupled with their physical remoteness could amplify the negative emotion.

Also, one of the major examples of online connections between people is text message. This is a good way to contact people when working or studying because they can help one to be productive, but basic text messages do not include sound, images and video, which means they are relatively inefficient in conveying emotional messages. Even with video chatting, the emotional elements conveyed through 2D flat screens are very limited, after all, we are three-dimensional creatures living in four-dimensional space. Essentially, saying "I love you" online is different from saying "I love you" in-person, which can produce different feelings and experiences (Suliveres) that impact a romantic relationship.

LITERATURE REVIEW

Before presenting the research question and the rest of my thesis project, this section introduces my literature review, which enabled me to examine core concepts of my thesis in detail. The first part discusses what a close relationship is, the second part explores a series of factors that affect relationship satisfaction, and the third part explores the inter-relationships between different factors that affect relationship satisfaction. This literature review is multidisciplinary, engaging scholarship from design, psychology, media communication, and technology.

What Is a Close Relationship?

"The key feature of a relationship is interaction, which provides two people with an opportunity to build mutual influence or interdependence" (Regan 4). Intimate interaction is defined as an individual showing more care and interaction with a partner, including more eye contact, quicker response, more active care, and a physical posture that is more prone to the partner's body position (Regan 95). Within close relationships, the behavior of each partner has more of an intense and lasting impact on the other than in casual friendships (Regan 11). It seems like GCRs have more opportunities to build mutual influence or interdependence than LDRs, as such, it is generally perceived that GCRs have better relationships than LDRs. Yet, there is research to suggest the contrary. One possible reason for the success of LDRs in comparison to GCRS is that individual partners often "set the bar" higher for what they are willing to do to ensure the success of their LDR. Another reason for their success is that people in LDRs tend to postpone or avoid

conflict. Not to mention, sometimes physical distance minimizes the kind of daily hassles that arise when couples are physically closer, which can aid in their ability to maintain a more positive overall image of their partner (Kelmer et al., 258). Of course, another reason for their success derives from what is often referred to as the "honeymoon effect." That is, geographical separation can heighten positive emotional and sexual responses when partners reunite (Kelmer et al., 259).

The next section will examine the important factors that can influence relationship satisfaction in romantic relationships, beginning with the most important factor.

Factors That Affect Relationship Satisfaction

Self-Disclosure

As noted earlier, self-disclosure is the most effective strategy for maintaining intimate relationships. In one study, 57% of the sample identified that the open and honest communication of thoughts and feelings is an effective way to maintain romantic relationships (Regan 94). How to self-disclose such thoughts and feelings is also crucial. The increase of the depth and breadth of self-disclosure is positively correlated with the increase of intimacy and loyalty between individuals (Regan 94). Furthermore, Hammonds et al. (2) note that Maguire and Kinney's research found that most participants felt as though the uncertainty of their relationships contributed directly to the stress of their long-distance relationship. When high levels of uncertainty are reported, individuals will typically solicit and engage in more in-depth disclosure, one possible explanation is a negative correlation between self-disclosure and uncertainty and a positive correlation between self-disclosure and trust in LDRs. As such, self-disclosure can reduce the uncertainty within a relationship. While opening up and exposing true feelings is difficult for many, once couples start to reveal themselves it often leads to more regular and constructive exchanges, which ultimately helps to increase each partner's sense of security about the nature and future of their relationship (Hammonds et al., 6). Still, in contrast to GCRs, the physical

distance in LDRs can present unique challenges to their ability to communicate, self-disclose, and interact regularly with their partners (Hammonds et al., 2). In such cases, various technologies can encourage and support more frequent and in-depth interactions (Hammonds et al., 9).

Non-Verbal Behavior

In general, when partners need support, they may attempt indirect nonverbal strategies like sighing, sulking, or fidgeting to convey a message subtly (Regan 155). Nonverbal communication includes three nonverbal behaviors: facial behaviors, body language and movement behaviors, and vocalic behaviors. Facial behaviors include stretching and contracting facial muscles to show emotions such as smile or disgust, as well as eye contact and nodding (Guerrero and Floyd 87). Body language and movement behaviors include body posture, gestures, touch, proximity, and distance, etc. Among them, kissing, hugging, touching the arms, legs, and faces of others, and sexual intercourse are typical body language and movement behaviors (Guerrero and Floyd 88). Both men and women say they also often use nonverbal language like emojis or emoticons to express their attraction to others online, therefore, whether their interaction is face-to-face or online, non-verbal behaviors are essential for establishing associations and maintaining romantic relationships (Regan 81).

Caring Response

When addressing care and support in a romantic relationship, one common approach is called person-centered supportive communication. This method focuses primarily on "expressing care and compassion" in order to "relieve negative emotions" (Jones and Bodie 372). In addition, intimacy theory, developed by psychologist Harry Reis and his colleagues, explains that how people respond to their partner's disclosure is very important, a supportive and careful response can help one's partner to feel understood and supported (Regan 94).

Equal Relationship

The theory of social exchange provides another explanation about how people achieve satisfaction in their romantic relationships. This theory centers on:

> The exchange of rewards and costs that occur between partners in ongoing relationships…Exchange frameworks propose that people will be most satisfied with (and most likely to remain in) a relationship when they view it as equitable, that means when the ratio between the benefits derived from the relationship and the contributions (costs or investments) made to the relationship is similar for both partners. (Regan 96-97)

Sex

We have deduced a positive correlation between sexual satisfaction and relationship satisfaction. The following are some factors associated with sexual satisfaction. Online sex such as sending pornographic images or phone sex can produce positive effects and sexual satisfaction in LDRs; Longer relationship length and more frequent visits are associated with a lower degree of sexual satisfaction; And sexual interaction quality is more important than quantity (Jimenez 67). Because of the difficulty of cybersex, many companies are developing products that simulate real-world intimate experience: "Kissenger is an interactive device that provides a physical interface for transmitting a kiss between two remotely connected people" (Saadatian 736). Many participants see this product as a new way to build a connection with their partners and to enjoy a shared experience (Saadatian 744).

Attachment Style

Bowlby (1969/1982) proposed attachment theory to explain "the emotional bonds that an individual forms to specific and non-replaceable persons including best friends, special teachers, counselors, supervisors and romantic partners" (Bloom 14). Attachment styles help to explain how people self-disclose and respond. Compared with other types of attachment styles (e.g., fearful-avoidant attachment style, preoccupied attachment style, and dismissing avoidant attachment style), people with secure attachment style tend to

express more when they self-disclose, respond more actively to others' disclosures, pro-

vide more emotional support, and can directly and precisely express their needs with their

partner when they need support (Regan 147).

Computer-Mediated Communication

People typically use different kinds of computer-mediated communication (CMC) to

connect with their partners, each type meets different needs (Neustaedter and Greenberg

3).

Text:

When people send text messages to each other, how you reply and the speed of re-

ply will have a positive or negative impact on others. A quick and appropriate response

may deepen feelings of goodwill (Regan 81). But sometimes, responding slowly also has

advantages. Some types of CMC like email and text messages allow senders to carefully

construct the messages or images they send (Walther 29). Hampton et al. also posited

that in such kinds of CMC, senders have greater control over the communication process

(173). Additionally, the asynchronicity of CMC can relieve the pressure of sending an im-

mediate response (Walther 28). Texts also have other advantages, especially since they

can be sent anytime, anywhere with little restriction.

Video:

Janning et al. found that "video provides the most intimacy among the 4 formats (vid-

eo, audio, digital, and paper)" (1295). Hampton et al. also supports this point of view, giv-

en that video affords people the opportunity to not only hear each other's voices but also

to see each other's faces and other non-verbal behaviors, video communication facili-

tates richer, deeper partner interaction (174). Other research found that participants were

able to build and maintain intimate connections in LDRs because video can provide them

with a sense of each other's presence enabling partners to more accurately interpret and

respond to one another (Neustaedter and Greenberg 9). The downside to video chatting

is that both partners must have the time to build a connection (Neustaedter and Green-

berg, 4). Sometimes partners are in different time zones, so partners have to change their schedules to chat with each other at a time when they have access to a private space. (Neustaedter and Greenberg 4).

Virtual Reality + Augmented Reality:

Virtual-reality technology allows people to break away from the real world and enter a totally virtual environment made by computers (Huang and Bailenson 53). Users can socialize with others in the virtual world by creating virtual characters; so, virtual reality can be seen as a medium for relationship construction and maintenance (Huang and Bailenson 59). Augmented reality (AR) is a new technology that seamlessly integrates information from the real world with information from the virtual world. It has also become a popular trend, the research shows that smart glasses are more immersive than the smart phone (Mazouzi 56). Imagine placing a virtual avatar into a user's surroundings, it can bring a more real-world experience.

Onlne Platforms:

"Facebook has become one of the most preferred platforms for conducting intimate communication between transnational couples" (Acedera and Yeoh 4132). One reason is that Facebook is a relatively public social platform, so people can show off their relationship status to their chosen public with status settings like "single" or "in a relationship." They can also post intimate photos on Facebook, so partners can restate and strengthen their relationship in front of their families and friends, which can help to prevent infidelity (Acedera and Yeoh 4134).

In addition to studying mainstream social platforms, in order to better understand the platforms that are currently on the market that are specifically aimed at helping long-distance couples, I did a market survey in which I selected 11 platforms. These 11 platforms focus on different functions and features but their goals are the same, which is to directly or indirectly support and solidify long-distance romantic relationships. For example, some platforms can play games together to increase intimacy, some platforms keep asking

questions to promote communication, and some platforms provide a large number of sticker emoticons in private communication channels, etc. Since there are too many platforms with similar functions in this market, I chose the most representative of them. There are many platforms or apps that support geographically close romantic relationships instead of specifically targeting long-distance romantic relationships, and these platforms will not be mentioned here. Given that the 11 platforms that will be explained below have unique and different characteristics, it is difficult to make quantitative analysis, so I focused on explaining the unique style and characteristics of each platform in Figure 1-4.

Logo			
Platform Name	Agapé	Tinkovu	Desire - Couples Game
Introduction	Agapé is a relationship wellness app that makes it easy for you to feel and show love! You start your day with a daily question that sparks either meaningful conversation or insightful self reflection with personalized feedback.	Tinkovu is an application designed for folks who can not always be together. A tink is a notification that will be sent to your your friends when you think of them.	Desire is a fun game to play with your loved one. Make date night a sexy adventure. The game challenges your creativity and pushes, you both, to sexy new limits and adventures.
Medium	Mobile App	Mobile App	Mobile App
Functionality	Users can discuss and communicate around the questions given by the system everyday. Most questions are about emotions, relationships, the future, and long-distance relationships. The system encourages couples to engage in meaningful conversation and self-reflection by constantly asking questions	By clicking the button in the app, you can constantly send sounds and vibrations to his or her phone to remind your partner that you are thinking of him or her. Built-in puzzle games also can increase intimacy. This app does a very good job of protecting users' privacy, you can start using the app with your partner without any personal information.	You can send daily challenges to your partner and get points for completing them. For example, one of the tasks is to quietly walk behind her or him and say how much you love him or her, the score for this challenge is 10 points.
Price	Free, In-App Purchases, Premium Monthly Subscription $14.99 Premium Annual Subscription $99.99 Premium Lifetime $199.99	Free	Free, In-App Purchases, Platinum Account $15.49 115 magic coins $4.99 20 magic coins $0.99
User Interface	Simple design language, the overall user interface is dominated by light colors, and there is not much graphic design.	The user interface design of this app is great, very clean and refreshing, mainly in light colors, with beautiful illustrations, easy to use, and very eye-catching interface design	The user interface design of this app is relatively simple, and the overall hot red tone makes the app look very energetic. Graphic designs are very common icons or graphics, which are relatively unattractive.
App Store Rating	ios: 4.9 Android: 3.3	ios: 4.2 Android: 4.4	ios: 4.3 Android: 4.3
Relevance and Conclusion	This app accurately connect with the target user group, the main functions are very relvant to the needs of the target group, and there are no redundant unrelated functions. This app can indeed help and support long-distance couples to communicate and connect more.	Almost all functions are relevant to the target audience (long-distance romantic partners). This app can indeed help and support long-distance partner to feel a sense of care and presence of their partner at anytime anywhere.	Some of tasks from game can be done by the long-distance romantic partners, some not. Long-distance rmoantic partners can pick the tasks they can do with each other. Some tasks is really fun and full of adventure, which can bring a feeling of freshness and increase the intamacy in the relationship.

Figure 1 Online platforms that support LDRs 1

	Logo		
Platform Name	TouchNote	Between	Couple Game: Relationship Quiz
Introduction	Now you can send personalized, high-quality photo cards with a message straight from your phone to the people you love.	Between is a couples-only app where you can communicate more romantically and store precious memories easily with your loved one.	Couple Game is a quiz app that allows you to test each other. This is a great way to find out just how well you know your partner, then get to know them even better.
Medium	Mobile App	Mobile App	Mobile App
Functionality	This app brings the postcard industry to a new dimension. You can instantly send your photos and wishes on postcards to all parts of the world by simply tapping on your phone. There are some graphics designed by artists that can be used for free.	The app focuses on a private space for couples to communicate and provides a large number of stickers inside the app for couples to use.	In the quiz, the questions are common questions, but they are really interesting. Partners can better understand each other's behavior patterns and way of thinking, and deepen mutual understanding. Quiz is very easy to play. First, you answer some questions. Then, you wait for your partner to answer the same questions. Next, you guess each other's answers!
Price	Two free cards during trial. Silver Membership: 2 cards a month $4.99 Gold Membership: 6 cards a month $9.99	Free, In-App Purchases, Between Plus (1month) $2.99 150 Hearts $2.99	Free, In-App Purchases, All packs $9.99 Premium, monthly $7.99 Sex & Intimacy 2 $1.99
User Interface	The deesign language of user interface is refreshing and great, mainly in light colors, with attractive illustrations and clearly instructions. The overall user experience is very relaxed and pleasant.	The user interface design is refreshing, cartoonish, and cute, the app mainly use light colors, with many cute and beautiful stickers.	The overall design style of the app is very young, and the interface color is mainly orange, which is very vibrant! The user interface is simple and clear, so it is very friendly to first-time users.
App Store Rating	ios: 4.8 Android: 4.6	ios: 4.8 Android: 4.6	ios: 4.5 Android: 3.9
Relevance and Conclusion	This app can serve a variety of relationships such as family, friends, colleagues, etc. Its audience is very broad. Of course, it can also serve long-distance couples well. Simply tap the screen and you can create beautiful romance and surprises without spending much time and money.	The concept of private communication channel and tons of stickers are provding the Long-distance relationship a great opportunity to express inner feeling and thoughts.	The target audience of Couple Game is the group of people who are involving in a intimacy relationship. And the game mode give long-distance romantic partners a great way to learn new insights from each other and spend time together.

Figure 2 Online platforms that support LDRs 2

Logo			
Platform Name	Rave	We-Connect	Twig
Introduction	Watch Netflix, Disney+, YouTube, Prime Video and more with friends while chatting in perfect sync!	You can Use the We-Connect App to remotely control vibrations and intensity of the vibrator, you also can create your own individual vibes that suit you and your desires.	Twig makes it easy to document even the smallest of sweet moments. You can share your memories with your partner in private place, just for the two of you. And look back at your best moments together.
Medium	Mobile App	Mobile App + Vibrator	Mobile App
Functionality	You can instantly share the movie you are watching or the music you are listening to your partner in a private space, and you can chat while watching.	With the We-Connect app you can control your We-Vibe products from anywhere in the world, whether you are in another room, in another city or on the other side of the world. That way you create special intimate moments, even when you are currently miles apart.	You can add photo and notes in your big moments or the smallest sweet moments in this private space.
Price	Free	App Free, Vibrator $74-149	Free
User Interface	The user interface design is interesting and dynamic. Graphich design and icon design is relatively common.	The user interface design is very dynamic and special.	The user interface design is simple and clear, easy to use.
App Store Rating	ios: 4.4 Android: 4.4	ios: 3.9 Android: 3.2	ios: 4.8
Relevance and Conclusion	Watching movies and listening to songs while chatting is a good way for long-distance romantic partners to feel each other's presence.	The app is designed for long-distance couples and allows them a way to incorporate a form of tangible cyber sex behaviour when being intimate remotely. Great app for long-distance couples to keep the joy and intimacy physically and emotionally.	It is a great app for the long-distance couples, because the app like a shared journal you and your patner could easily share all of favorite moments and relive them anytime anywhere.

Figure 3 Online platforms that support LDRs 3

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Logo		
Platform Name	LoveBox	Bond Touch
Introduction	Lovebox is a connected, messaging device that pairs with an app to go beyond regular communication and deliver special expressions of affection.	Bond Touch is the app that supports the Bond Touch bracelet - the bracelet that keeps loved ones connected through touch.
Medium	Mobile App + Physical LoveBox	Mobile App + Touch Bracelet
Functionality	You can send photos, love notes, drawings or stickers to the LoveBox with the app. The heart outside of LoveBox will spins when your loved one receives a message. When opening the box's lid, a magic mirror will display the love note you just received.	With a simple tap in the Bond Touch app, your lover feels a gentle vibration and sees a light through their Bond Touch bracelet. You also can share text messages, secrets, and pictures with your partner.
Price	App Free, LoveBox $119	App Free, Two Touch Bracelet $108
User Interface	The user interface of app is very cartoonish and cute. The Lovebox is made out of beech wood.	The user interface design looks a bit dated and old-fashioned.
App Store Rating	ios: 4.8 Android: 4.7	ios: 4.4 Android: 4.6
Relevance and Conclusion	For long-distance couples, LoveBox is a small magic box full of charm. Common words can also exude a warm atmosphere through the LoveBox.	With a simple tap can let long-distance partners feel vibration and know their boyfriend or girlfriend are thinking of them. It is so easy to use and incorparted cyber touch into the online communication may bring much more fun and multisensory pleasure.

Figure 4 Online platforms that support LDRs 4

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Non Computer-Mediated Communication
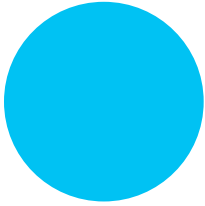
Letter:

Janning et al. found "it may be that people assign a particular romantic meaningfulness to paper communication formats precisely because they are dwindling in frequency of use, their rarity may enhance their definition as sacred, special, and therefore more meaningful" (1296). Inefficiency is yet another feature of paper communication, but the delays caused by such inefficiency may be why the writing of love letters is more meaningful, as it requires deliberation and patience (Janning et al. 1297).

Interactions between Factors

The following section discusses the interaction between parts of this literature review. From the second part we learned that self-disclosure contributes to relationship satisfaction. In LDRs, non-verbal behaviors are more difficult to detect when people try to self-disclose via text. Even with video chatting, non-verbal behavior may be compromised, which leads to misunderstanding. We can see in this situation that self-disclosure, non-verbal behavior, and different types of CMC are all interrelated. If people want to achieve a satisfied romantic relationship, they also need to establish equity between partners, however, both partners must be willing to express their inner thoughts in order to deepen their mutual understanding. As such, self-disclosure also plays an important role in relationship equity. People sometimes not only self-disclose to their partners, but also express their thoughts and feelings to the public. Facebook is a public space where LDR partners can express their thoughts about the relationship, share experiences, and demonstrate commitment to their partners in front of their friends and family, which can increase mutual trust and intimacy. We can see that self-disclosure is arguably the most important factor in maintaining a relationship. It is interrelated with different factors and affects the development of the relationship.

Reflection on the Literature Review

In this literature review, I have referenced and studied major factors that can affect relationship satisfaction, which makes my thesis richer and provides sufficient nutrients for my prototype design. We know from the literature review that among all the factors that can affect relationship satisfaction, self-disclosure and caring responses are quite important, so I decided to start with these two factors. We also know that the lack of details such as nonverbal behavior in online communication affects the quality of communication for self-disclosure and caring responses. Therefore, in the prototype design, I mainly consider how to strengthen non-verbal behaviors to help people better self-disclose and show caring responses online. As for the form of communication, I am greatly inspired by the unique advantages of letters in the literature review.

RESEARCH QUESTION AND OBJECTIVES

Question:

How can online platforms better support self-disclosure and caring responses in long-distance romantic relationships?

Objectives:

1. Understand how partners self-disclose and show a caring response with each other in a long-distance romantic relationship as opposed to an in-person romantic relationship, focusing on things that are most meaningful and helpful to build a strong romantic relationship and what are missed in the online communication environment.

2. Identify and understand what online platforms do a good job of supporting self-disclosure/caring responses and which do not and why, so that I can identify which features are especially helpful.

3. Develop a design prototype that will facilitate an online environment or space to encourage people involved in a long-distance romantic relationship to self-disclose/ and show caring responses to their partners.
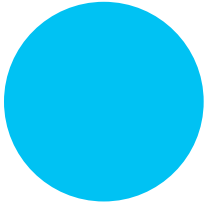
METHODOLOGY

The research strategy is 'research for design' (Frayling, 1993). It is a method of studying knowledge and theory at first and then translating it into design. I employed online surveys and focus groups in response to Objectives 1, 2 and 3. My participants were adults over 18 that were involved in a long-distance relationship for more than 1 month or had been in a long-distance relationship, within the past 7 years, that lasted longer than 1 month.

Online surveys responded to my research needs because it provides me the essential data and insights about how people involved in LDRs behave and react in an online and offline communication environment. I believe everyone has their own special skills or ways to maintain intimacy in their relationship, so the surveys explored what participants thought were the most meaningful and helpful ways to help them build a strong, intimate LDR, and how they self-disclose and show a caring response with their partners (Objective 1). Looking for pertinent details that we may have missed or forgotten, I also asked what aspects of online platforms they thought can help to self-disclose and show a caring response in their relationships (Objective 2).

I Invited the participants back during the prototyping phase to participate in online focus groups. The online focus groups were held on ZOOM. There were three online focus groups that lasted about 30 minutes. Each focus group included the same four participants, which provided the opportunity to hear their thoughts on my design as it evolved. During the meeting I showed my prototype and then asked a few questions about the participant's perspective on my prototype. This feedback helped me decide which design

ideas were good and what aspects I should refine. My survey questions and focus group prompts are included in Appendix 1.

My methods in response to Objectives 1 and 2 also involved documentary research in books, articles, videos, and online documents to identify important factors that can encourage partners to self-disclose and show a caring response. These are included in my literature review, presented earlier in this thesis.

Finally, my response to Objective 3 involved design thinking and an iterative design process to develop a prototype based on my research. As noted before, I tested my designs by sending an email to my online survey participants inviting them to participate in a follow-up online focus group. I showed them my drawings and descriptions and they gave me feedback that helped me refine my work.

My method for analysis was thematic analysis, which involved identifying themes in the data and grouping the results around these themes. These themes in the data guided my design work. My research provided a range of data from books, surveys, and discussions with users, so I worked with my data in stages. I analyzed the data from Objectives 1 and 2 before I explored objective 3 because the results from objectives 1 and 2 helped me identify the most important technology features that can help people maintain long-distance romantic relationships and increase self-disclosure/caring responses. I then explored the most promising technology for achieving that goal.

OUTCOMES

This chapter introduces the results of my online survey, design and prototyping process and the subsequent online focus groups. The online survey helped me to have a good understanding of how partners self-disclose and show a caring response with each other in a LDR as opposed to an in-person romantic relationship (Objective 1) and what online platforms do a good job of supporting self-disclosure/caring responses and which do not and why (Objective 2). The online survey results, together with the previous literature review, provided me with a rich response to Objective 1 and Objective 2, and inspired me to develop a design strategy and start prototyping a design. Subsequent online focus groups provided constant feedback on my prototype so that I was able to refine and upgrade it, and ultimately fulfil Objective 3.

Online Survey

I received a total of 67 responses; 62 constitute valid responses (respondent answers that were not relevant to the question or blank answers were counted as invalid). 59 participants were between 18 and 30 years old, more than half of them were older members of Gen Z, remainder of participants were young millennials. Gen Zers are those born between 1997 and 2012, while Millennials were born between 1981 and 1996. In order to better understand the participants of my online survey, I conducted some studies below.

Generation Z and millennials are similar in many ways. They have similar views on important social and political issues (Parker and Igielnik). "They also have similar views on many major issues today" (Parker and Igielnik). Many survey also show that the data

results of Gen Z are closer to Millennials compared to those of Gen X and baby boomers (Parker and Igielnik). Older Gen Z and young Millennials have more similar views on the world, values, and life since they grew up in almost the same social and economic environment. In view of this, as well as the vast majority of my survey participants are older generation Z, in the following I will explore characteristics of people born in Generation Z.

The IBM Institute for Business Value (IBV) conducted a global survey of 15,600 Gen Zers, 74 percent of survey respondents said they will spend their free time online; 75 percent of respondents selected a smartphone as their device of choice to do things online (Institute of Business Management); "Twenty-five percent of respondents said they spend more than five hours on their mobile phones every day" (Institute of Business Management); "Seventy-three percent of Gen Zers cited texting and chatting as their primary mobile-phone activities, followed by entertainment at 59 percent and gaming at 58 percent" (Institute of Business Management). From the above data, we can see that Gen Z is a heavy group of mobile users, who spend most of their time texting and chatting. Therefore, mobile software featuring characteristic and personalized chat function in the future is an excellent window to reach these young consumers.

"YouTube, Instagram and Snapchat are the most popular online platforms among teens" (Anderson and Jiang). Another research shows that "older Gen Zers, ages 16-24, are more evenly split across Facebook (55%), Snapchat (52%), and Instagram (52%)" (Pruett). "For Gen Z, visual content trumps written content"(Pruett). From the above research we can see the Gen Z prefer the platform that contain more visual content.

When it comes to choosing products and services, Gen Z values quality, product availability and value (Institute of Business Management). They are also very careful and sensitive about sharing their personal information online, and they favor the company that transparent about how users' personal data stored and used (Institute of Business Management). According to the survey conducted by the IBM Institute for Business Value , "75 percent of Gen Zers spend more than half of their monthly income, clothes, apps and

entertainment top their shopping lists" (Institute of Business Management). In addition, in another survey conducted by Morning Consult show that "more than 76% of Gen Z says they follow an influencer on social media, and one in four Gen Z women says they learn about new products from social media influencers". From the above data we can see that Gen Z pay attention to product quality and personal privacy, and they have formed the purchasing behavior pattern in app, which makes me believe that mobile app will be important to the company in the future. And they are deeply influenced by online influencer, so companies can pay influencer to help promote their products.

The Knot released a survey of nearly 1,000 older Gen Zers and young Millennials this year found they would like to prioritize establishing and achieving financial independence before marriage (Lee). "Gen Z believe the average age they will get married is 27, meanwhile, Millennials have skewed the average age of marriage in the US to 32, according to The Knot 2019 Real Weddings Study" (Lee). According to the above report, we find that young people are more focused on being financially independent before they get married, and marriage occurs later in their life trajectory, which means that older Gen Z and young Millennials will sacrifice early marriage for career, as a result, they will have more dating time compare to Gen X or Baby Boomers.

Except for my participants who are mostly older Gen Z, most of them are female (51), and sixty-three percent of participants were separated from their partners living in different cities, while the remainder of participants were separated from partners living in different countries. More than half of participants reported having been separated from their partner between 7 and 24 months, and 12/62participants have been separated from partners between 24 months and 5 years. The data shows that most participants have an in-person visit with their partners once every 2-6 months while 7/62 participants reported meeting their partners face-to-face once every 12 months or more.

Beyond these general results, the following are the major findings from the surveys.

Features of Online Communication Platforms

The first part of the survey helps me learned more about what features of online communication platforms potentially better support self-disclosure and caring responses, the most popular online platforms used in a long-distance romantic relationship, and how often LDR partners use different online platforms to communicate, this help me better understand the Objective 2.

In Figure 5, we can see that WeChat and FaceTime are the two most popular online platforms used in a long-distance romantic relationship, followed by Message, Snapchat, Instagram. One participant said: " we communicate everyday for at least 3 hours over FaceTime. And all day through text. I am happy with it. We speak whenever we have a chance. We FaceTime first thing in the morning and before going to bed. And we send texts within our breaks. I think we talk as much as we can without allowing it to distract from our work." It seems that through this we can understand that people face different scenarios in their daily lives, resulting in a variety of differentiated needs for communication and connection. Nearly half of the participants in the survey regard WeChat as their only communication software, this is precisely because WeChat is a complex software that contains multiple communication channel such as video, audio, Internet telephone, text, emoticons, etc., which meets the needs of users for different life and work scenarios. And nearly half of the participants who do not use WeChat indicate that they will use different social platforms to meet diverse needs. Many people use 3 or 4 online platforms at the same time, such as Facetime, Message, Snapchat, Instagram. Another participants said: " Difficulty communicating at night because it kept me from hanging out with my friends or going places because I would want to be on Facetime. Texting during the day was easy for me but hard for him since he was at work and I would get frustrated with how little we spoke." Like this participant, many other participants also expressed their preference for video channels. However, in some daily work and life scenarios, neither simple video channels nor texting can meet the new and growing needs of users.

In the Figure 6, we can see the best online communication feature to encourage the

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expression of thoughts, feelings, and care to a long-distance partner is video. For participants who answer "Skype, Facetime, and iMessage are the online communication channel encourage him/her to express him/her thoughts, feeling, and caring responses to their partner" in the online survey, I count one score for video channel and one score for text channel. Because Skype and Facetime is both mainly provide video chatting service for the user, so I count one score for video channel, and iMessage usually is used for sending text message, so I count one score for text channel. This question is very important because when people express their inner thoughts and feelings they are self-disclosing to their partner. Therefore, understanding which online feature better supports self-disclosure and partner care can aid our discovery of how to improve long-distance relationship satisfaction.
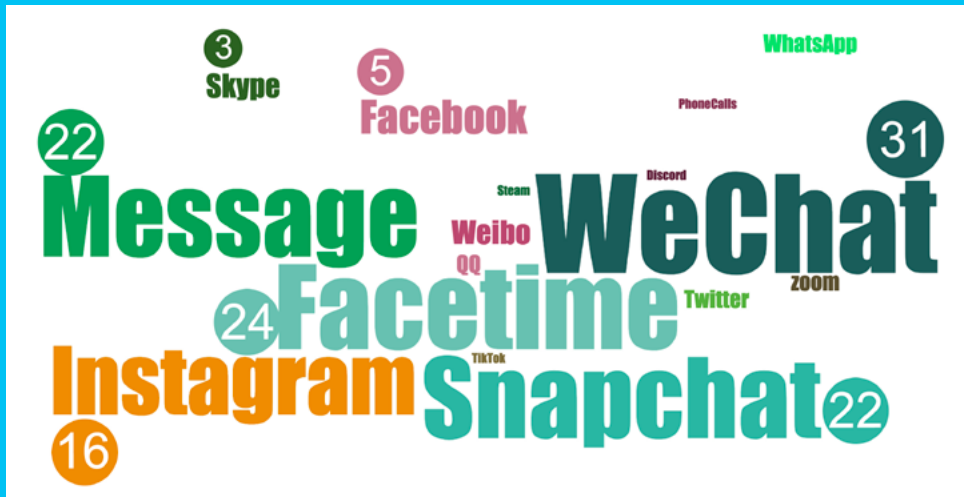
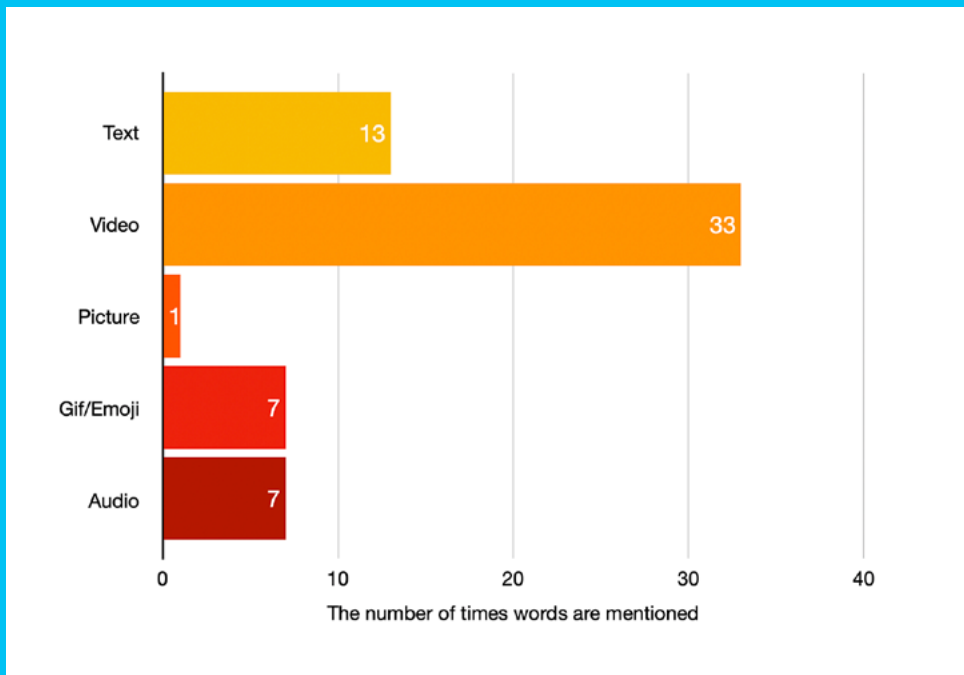**Figure 5 Online platforms for communication in LDRs**

Figure 6 The online communication features that encourage participants to express thoughts, feeling and care with their partner

In Figure 7 we can see the most frequently used online communication feature is text followed by video. Out of 62 survey participants, 57 said that they communicate daily. Some participants share relevant details about their patterns of communication. For instance, some report that they usually send texts throughout the day, and video chat only in the evening (Figure 8). Some representative participant responses are:

- "Text doesn't allow you to actually give the tone of voice in which you are speaking and sometimes it's not realistic to facetime."

- "Sometimes texts get tricky or they can't FaceTime because they are busy or you are busy."

- "It's hard to find a time for both of us to talk on the phone."

From the details disclosed in these responses we can deduce that most participants text rather frequently because it is more convenient, however, video chat is their preferred method of communication.
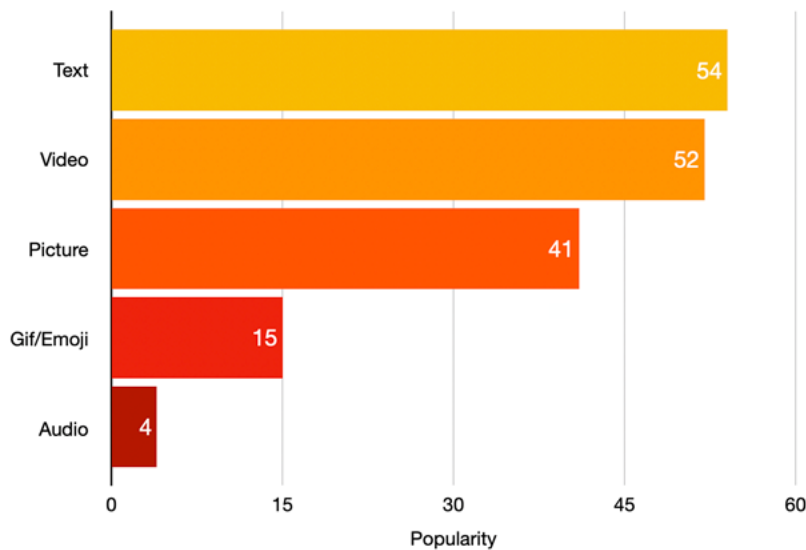

Figure 7 The most frequently used online communication feature

Figure 8 Communication pattern

Online and Offline Communication in a Long-Distance Romantic Relationship

From the second portion of the survey, I learned more about what is the hardest part of online communication, what is the favorite part of face-to-face communication, and what causes online communication to be difficult or easy, and why.

Most survey participants said that their favorite part of offline communication is physical contact, including sex, kissing, and hugs. For 18 participants, good communication includes body language, facial expressions, eye contact, and easily interpreted emotions. Seventeen participants state that companionship is important in offline communication, which they interpret as including activities such as watching movies, eating dinner, and taking walks together (Figure 9).

When asked about the most difficult part of online communication, most participants said online communication is difficult because of the lack of body language, facial expressions, eye contact, etc. (Figure 10). Some participants provided interesting and detailed responses:

• "Misunderstanding the tone of texts"

• "Doesn't feel real sometimes"

• "Sometimes it's difficult to feel connected and I miss being in the same space as him"
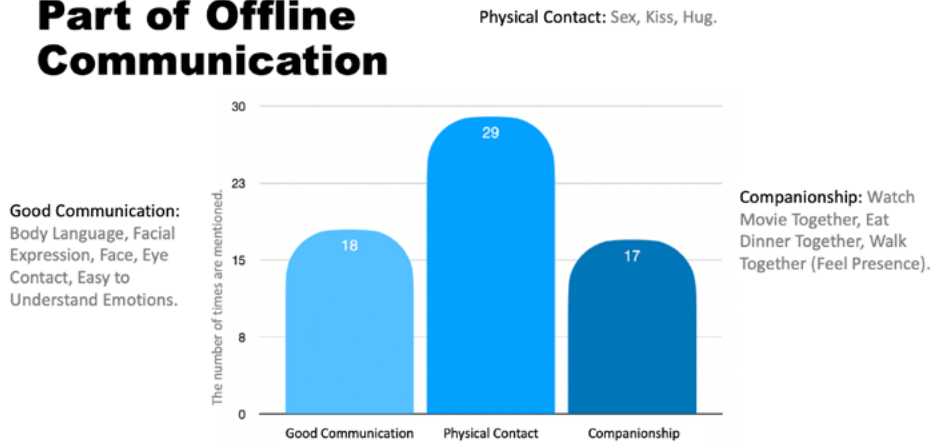
29

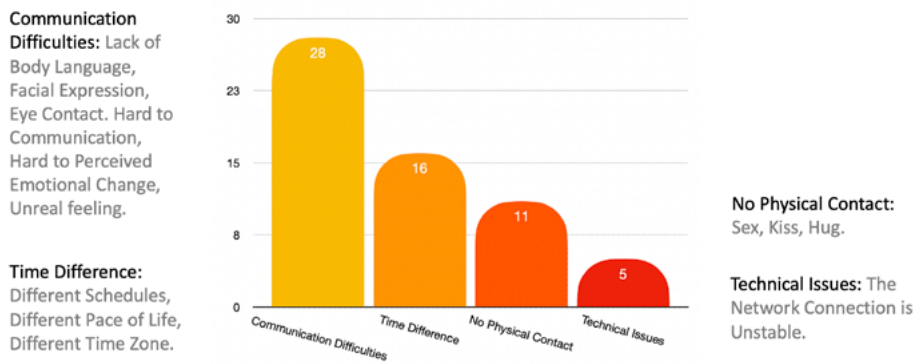**Figure 9 The favorite part of offline communication**

Figure 10 The hard part of online communication

Communication difficulties are harmful to a partner's overall satisfaction with the communication process and, thus, their relationship satisfaction. I think online communication difficulties also reduce instances of self-disclosure online. Out of 62 survey participants, 45 express that self-disclosure online is difficult. The main reasons reported were a lack of body language, facial expression, and tone of voice. Five participants also expressed that they can't perceive and express emotions, five stated that the lack of physical contact is the reason they feel it is difficult to self-disclose online, four cited misunderstandings, and three noted time difference (Figure 11). The following are some interesting responses to the question that highlight communication difficulties:

- "I didn't want the first time I expressed deeper emotions to be over a phone. It felt like it needed to be in person, and I have to wait."

- "We can't see each other or comfort each other and body language is super important when we communicate."

- "You can't physically express anything so it has to be all with words. And sometimes taking the effort to bring up your emotions over text or facetime can seem like overkill especially if it is something small. Whereas in person you are likely to bring up something small, talk about it for a little, and then let it go."

Reason for Harder

Figure 11 Most participants feel Self-Disclosure online is more challenging and the reason for that
(If one respondent mentions the reasons for harder is because you can't touch, hug and kiss, and can't see body language and facial expressions, I will count 1 x Lack of Physical Contact and 1 x Lack of Body Language, Facial Expressions, Tone. Some responds are unclear, like some respondents said the reason for harder is very hard to explain or just say harder, these responds will not count.)

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Most survey participants show they don't worry about delays in their partner's reply (Figure 12). I took a close look at two participants who feel very upset when there is a delay in their partner's response. One participant has been separated from her partner for 4 years; she said: "we connect daily and nightly. Sometimes I wish we could talk more but I am happy I can talk to him as much as I am able to talk with him." She uses Snapchat and Zoom to communicate with her partner. She very much wishes she could be in the same space as her partner.

Figure 12 The feeling of delay in reply
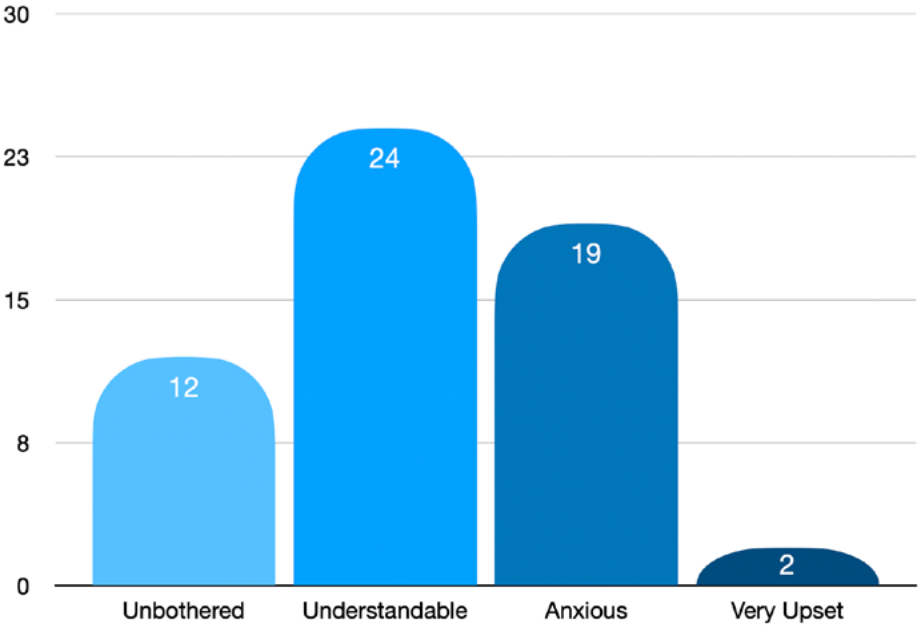
Survey Results Conclusion:

From part one of the survey - Finding 1 (Different features of online communication platforms):

I found that the most popular online platforms among survey participants is WeChat and Facetime, which each support video chatting. I also gleaned from the survey that video proved the most ideal communicative medium for facilitating deeper self-disclosure

and partner care. Therefore, platforms that are equipped with video-chatting features do a better job of supporting self-disclosure and partner care. I have also found that most people text all the time throughout the day, video chatting only in the evenings. According to our survey responses, participants prefer video chatting to other forms of communication with their romantic partners. Yet, they indicate a greater frequency of text messaging in comparison to video chatting. Still, based on their responses, I discovered that certain material constraints make texting a more accessible option for communicating with loved ones throughout the day; but, evenings generally pose a more convenient time for video discourse. Thus, many partners reserve video conversations for times when they will have more privacy and fewer distractions. Ultimately, their choice of communicative medium is affected by their material conditions.

From part two of the survey we glean another category of findings: Findings 2 (online and offline communication in a long-distance romantic relationship). Based on the results of this portion of the survey, I found that most participants favor offline , face-to-face communication because they can have physical contact with their partners; see their body language; observe their facial expressions; hear their tone of voice; and generally feel a closer sense of companionship. Most participants indicated that, in addition to negotiating time differences, the hardest part of online communication is the inability to observe their partner's body language, facial expressions, eye contact, and emotional state. Most participants show little to zero concern about reply delays.

Design strategy:

    My documentary research showed me the factors that affect relationship satisfaction, guiding my design focus and indicating which communication channels would be most relevant in my prototype design. This information also inspired the online survey questions that I developed. The results from this survey were also a major inspiration in my design. Considering that most participants prefer video chatting, but use texting interfaces with greater frequency, I aimed to develop a design intervention that offers participants the advantages of both video and text exchanges, while limiting their disadvantages. Additionally, considering that 45 of 62 participants expressed difficulty self-disclosing online due to a limited ability to observe body language, facial expressions, and hear tone of voice, these features were given primary consideration in the design intervention. I designed four prototypes, hosting a focus group for feedback between each prototype and iteration.

First Prototype:

In my initial prototype, I tried to create an application capable of performing a 3D scan on a real partner that could then convert that three-dimensional image into a virtual avatar that looks like the actual partner. I aimed to incorporate various settings for avatar behavior, facial expression, body language, and voice augmentation that had a realistic feel. The objective was for partners to be able to send a message to a partner via their avatar just like they would a text message. When the partner receives an AR message, they can just simply open it, the same way they would a normal text message from iMessage or Facebook Messenger. Yet, when they open the message they can cast the virtual avatar of their partner into their real-world surroundings (Figure 13). What happens next will depend on the settings determined by the interfacing partner.
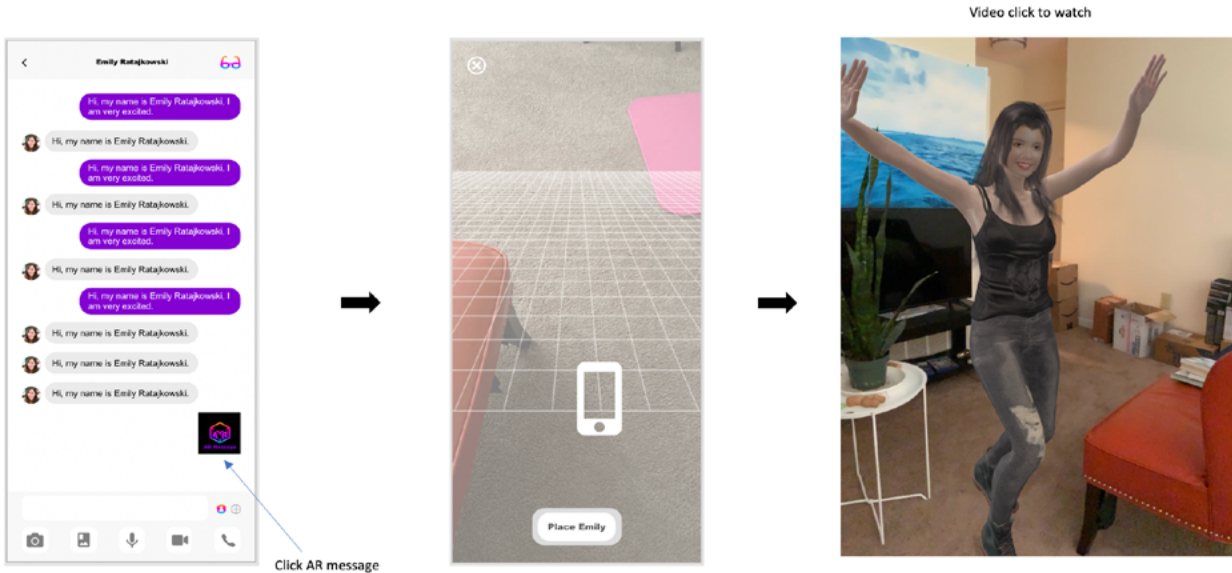

Figure 13 Projecting the virtual avatar

This app design combines the advantages of both video and text communication formats, while minimizing some of the shortcomings of these mediums. The AR message can help people to view the facial expression and body language of their partner. Most im-

portantly, one can experience the presence of their partner within their surroundings. This deepened sense of partner presence can facilitate deepened feelings of companionship. This feature is especially great for partners living in different time zones, affording greater flexibility in their communication schedule. After all, one can send an AR message anytime anywhere. AR messages are super easy to use and convenient for various occasions! AR messages also include important details like facial expressions, body language, tone of voice, and the virtual experience of partner presence within one's surroundings. More details about the AR feature in my first prototype are available in Appendix 2.

Letter Function:

In addition to using augmented reality and virtual avatar to enable and help people communicate better, I also see new opportunities from traditional and primitive communication channels - letters. Janning et al. found that people may regard letters as more meaningful because of how rare letter-writing has become. Additionally, while writing letters takes more time and care, requiring deliberation and patience, it is precisely this level of time and care that makes the overall experience more meaningful to some. Therefore, I plan to use the special form and unique characteristics of letters to establish a private communication channel between lovers. This is an additional feature of my app design for prototype 1.

In the chat page we can click the plus (+) button and click the envelope icon to open the Letter function (Figure 14).

On the letter page, users can compose a letter to someone. After the letter is sent, the recipient will be alerted but will not receive the letter immediately. A week later, the recipient can open the letter. Sometimes we want to keep our words to ourselves; sometimes we want to find a place to write those words down; and sometimes it is time itself that gives words their power (see Figure 15).
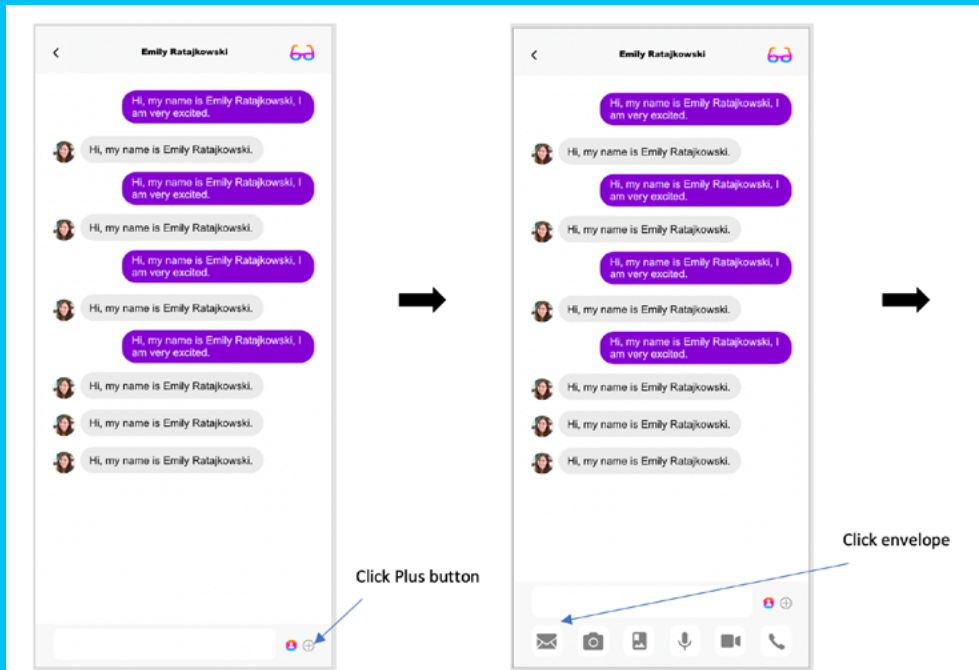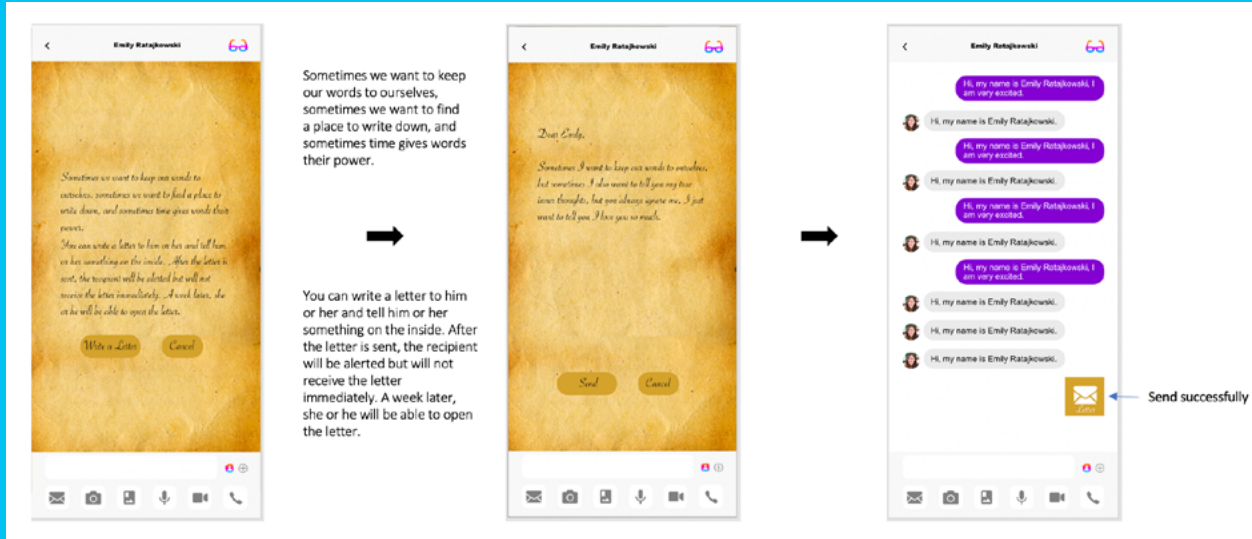
Figure 14 Letter function

Figure 15 Compose a letter

Moments:

Like the letter function, I also included an additional feature of the app. These different features allowed me to experiment with different possibilities for the project. Moments is a place where we can browse our friends' posts. Posts can include picture, video, text, and of course AR Messages (Figure 16).
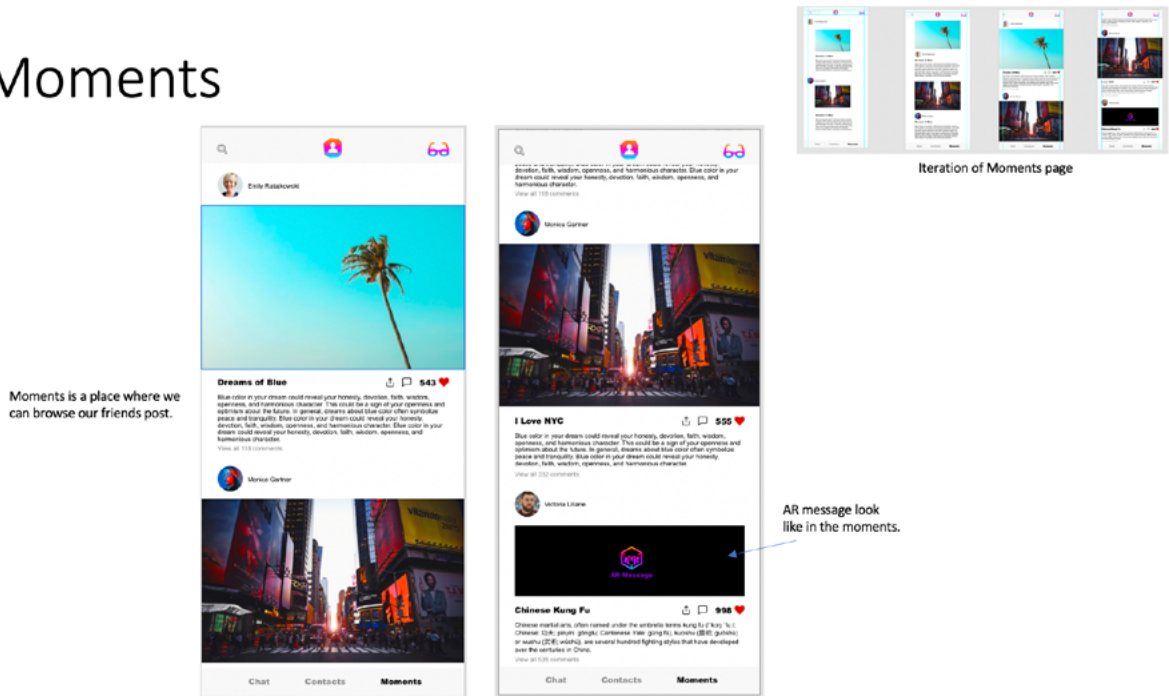

Figure 16 Moments page

Relationship status:

Finally, this initial app concept included a personal homepage for each user. When people are able to indicate their relationship status to the public with cues like "single" or "in a relationship" or by posting photos with an intimate partner it can strengthen the relationship by including their families and friends, while serving as a deterrent to infidelity. Visible indicators of relationship status can also help to foster a sense of security in LDRs.

You can change the relationship status and upload your AR Message, video, picture in the personal homepage (Figure 17, 18).
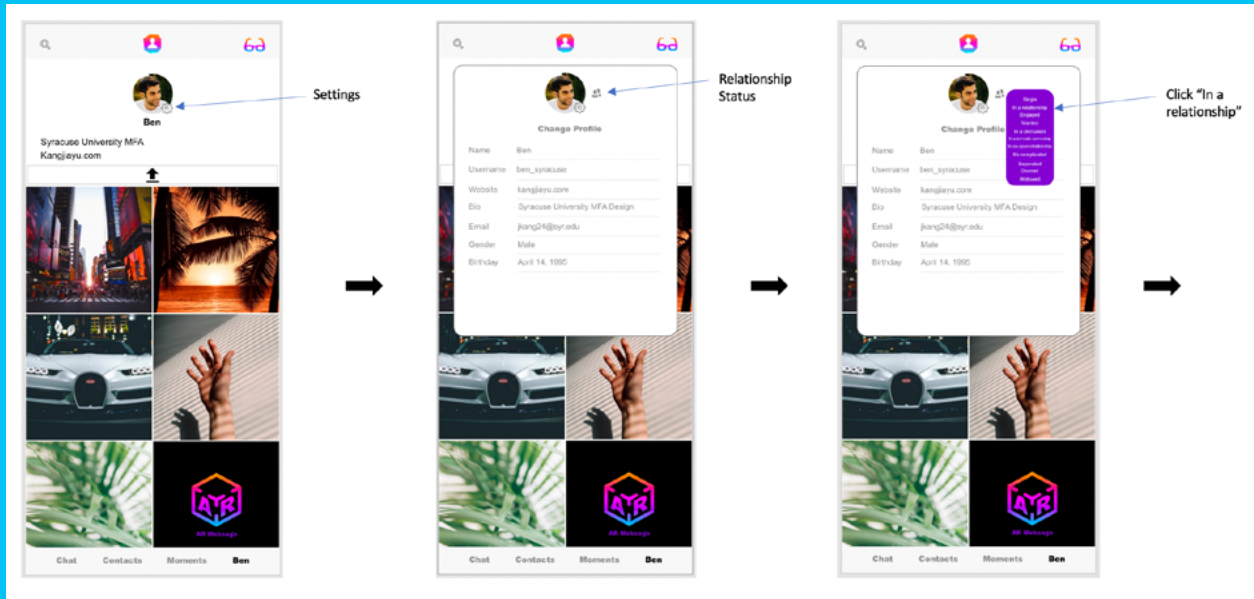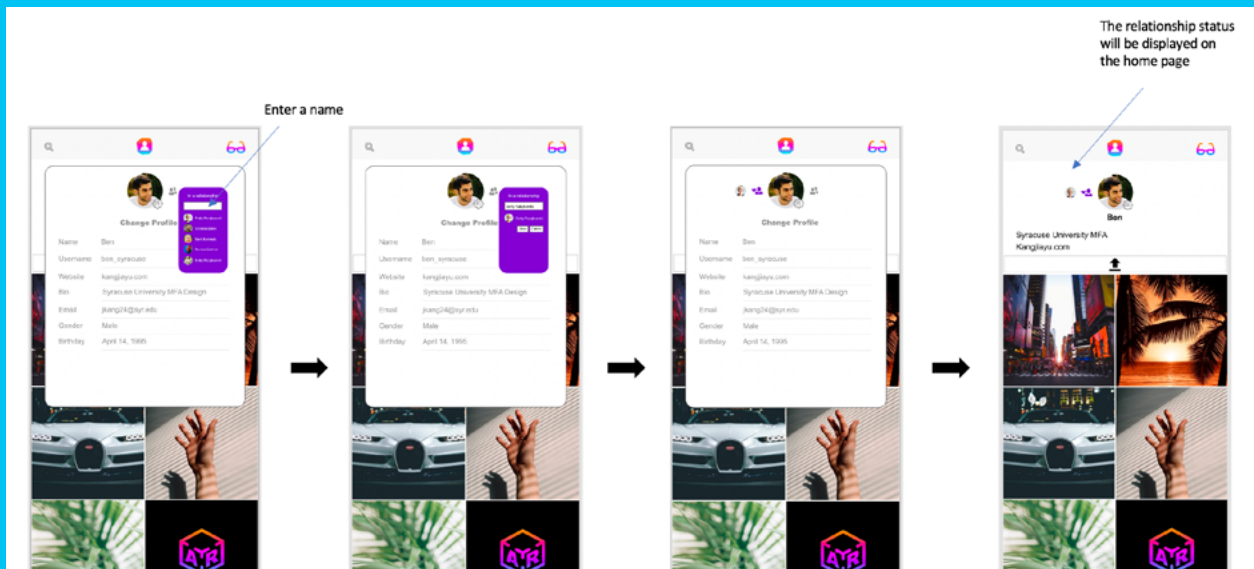
Figure 17 Personal homepage

Figure 18 Change the relationship status

First Focus Group

The first focus group was held on December 28, 2020 with four participants. Two par-ticipants were very interested in the letter function because the delivery time of the letter function is based on the geographic location of you and your partner. For example, if you are in Syracuse and your partner is in New York, this virtual e-mail is sent by the sender. It may take up to 2 days for the recipient to open the letter. If one person is in China and the other is in the United States, it may take a week for the recipient to open the letter. Participants also mentioned that there are multiple functions that can be added to the letter. One participant considers adding an additional function that you can add voice, emojis, animation, and/or music into the letter to enhance the atmosphere, encouraging greater instances of self-disclosure. Another participant said that you can integrate the letter function into the page of your own virtual character, use the AR function so that when you open the message of the letter a virtual mailbox will appear at home. Then, when approaching that virtual mailbox, a large envelope will appear.

Research participants reported that the virtual avatar is a bit too complicated and time-consuming. Some even think that it is a little scary because of the uncanny valley. Uncanny valley theory indicates that when the appearance of robots gets closer and closer to humans, our love and affinity for them increases until we pass a certain point (Mori 98). When the appearance of robots is too close to humans, but not exactly like humans, they become somewhat creepy and less appealing (Mori 98). Participants had hoped that this function would be more convenient and save time. They desire the editing and sending interfaces to be as easy to use as possible, to make it more convenient to compose and edit content in busy or tense situations. Participants indicated that people like to incorporate emojis in short messages. They suggested combining the virtual avatar with custom emoji, and integrating the emoji function with the letter function to make it interactive.

One participant said that some AR and VR related functions can be created on Mo-

ments and on the personal homepage. That is, users can share 360-degree couple photos or 360-degree videos on both the Moments or personal home pages. Couples can use a 360-degree camera to create a 360-degree personal space. For example, several 360-degree photos or videos are connected to each other in a virtual space, so that other people can explore a user's 360-degree space. However, 3 participants said that pages such as Moments and personal homepages are very similar to existing apps like Instagram and Facebook Messenger. They hope I can create a unique app.

Second Prototype:

After digesting and sorting out the feedback from the first focus group, I started the second prototype design based on the first version.

Letter and Custom Emoji:

In the letter function, I added a variety of functions (Figure 19), including the user's voice baseline establishment and eye tracking system (Figure 20, 21), which allows the app to detect where the user's eyes are on the screen and to automatically generate their partner's voice. I also added painting and letter background management options to the letter function (Figure 22).

Figure 19 Multiple functions

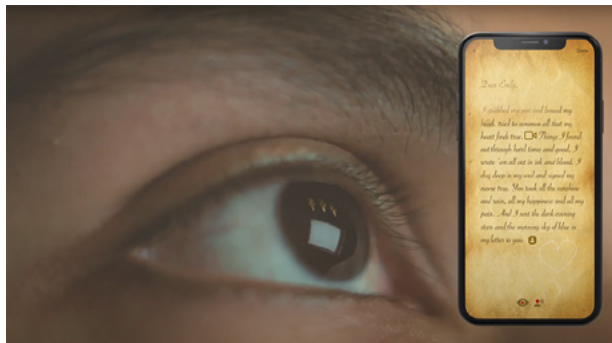**Figure 20 Voice baseline establishment**

Figure 21 Eye-Tracking

Figure 22 Painting

In order to simplify the virtual avatar function so that it can be widely accepted, I changed the steps of uploading personal photos to scan the face, and simplified the operation interface, eliminated redundant functions, and converted the virtual avatar function into user-made emoticons Based on their facial model (Figure 23, 24). At the same time, this self-made emoticon function is combined with the letter function.

The delivery time of the letter is based on the geographic location of you and your partner (Figure 25).

The stationery background supports the replacement of 360-degree videos, which can provide richer detail and experience (Figure 26).

I decided to leave out the additional features from Prototype 1 and focus on these specific ideas, which were shown to be most relevant in the focus group discussion.
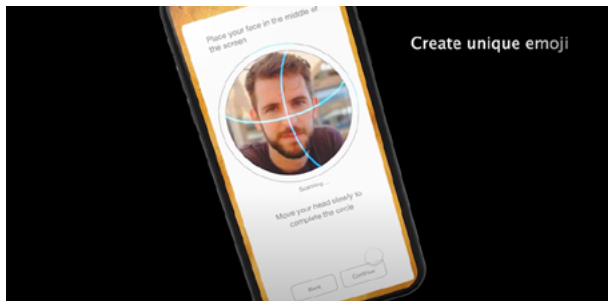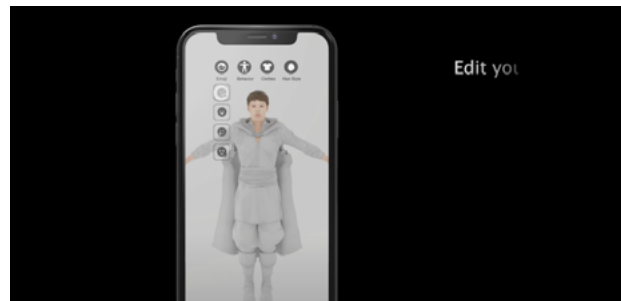

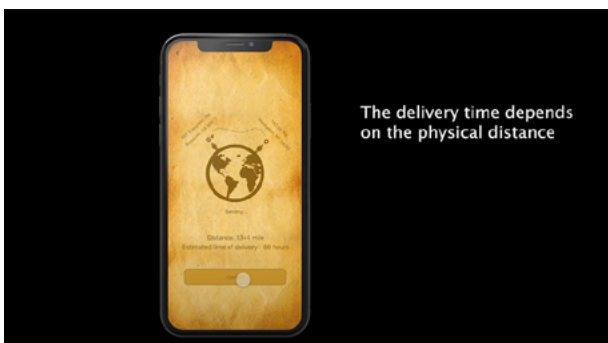**Figure 23 Unique emoji creation**

Figure 24 Edit emoji

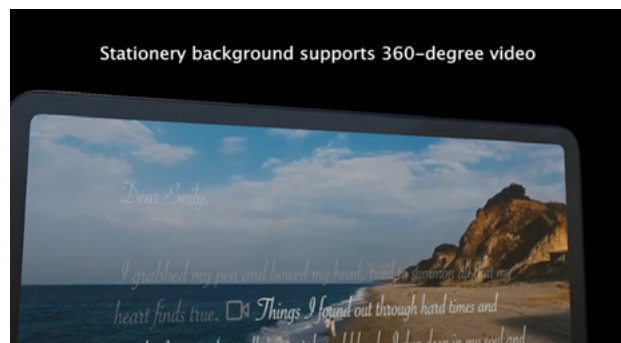**Figure 25 Letter delivery time**

Figure 26 360-degree video

Second Focus Group:

The second focus group was held on January 26, 2021 with four participants, they are the same people as my first focus group participants. The following is a summary of their feedback. Their favorite parts of the design were:

• The letter function and, especially, the voice baseline recognition that helps users imagine when their partner's voice appears. It provides a feeling of warmth and care.

• The role that time played in letter delivery.

• The ability to change the traditional background of letter to a dynamic video background.

Their critiques and suggestions were:

• The design of letter paper and app UI design is too old. Participants hoped it would be a more modern and novel design language. Some Icon designs need to be improved. Participants feel that the UI design of my first prototype is simple but looks great.

• Participants would like to add custom emojis into their letters, but the app needs to provide another way to do it.

• The letter-paper background can be replaced with 360-degree video, participants hope to see a page on how to change the background, and they think it would be better if the 360-degree selfie of the partner can be shown in the video.

• Participants like to see the animation of letter transfer.

Final Design Development:

Based on the feedback from the second focus group, I decided to modify the following points:

- The current trend of UI design is simplicity and freshness, and the audience and user group of my app are young people, so I decided to change the design style of the app.

- Enhance the expression function in letters, and enlarge facial expression to help users express emotional information more efficiently.

- Added animation for message sending and delivery.

As for the comments about inserting a 360-degree video into the background of a letter, I will not adopt it. Firstly, background video will seriously affect reading, and secondly, mobile phones that can shoot 360-degree video hardly exist yet.

I developed four prototypes in total, but my third and fourth prototypes narrow-in on my final design concept and are quite similar to each other. I conducted a third focus group between the two prototypes. However, compared to feedback from the previous focus group, their feedback this time focused on more minor details. This showed me that the overall design concept was well appreciated. I will talk about the specific design details and ideas of my final design in this section.

The final concept is an app called LoveNotes (Figure 27), which was inspired by love letters and non-verbal communication. In the LoveNotes app, Gugu is your emotional messenger! When you talk to Gugu, it will change its facial expression, body language, background animation and background music according to the information you provide. Then it will convey this emotionally rich information to your partner. The arrival time of the message is determined based on the location of the user and their partner in the real world. The further the distance between the two, the longer the delivery time. In order to better serve couples and avoid unnecessary misunderstandings, Gugu is genderless.

Figure 27 LoveNotes welcome page

Detect + Amplify facial expressions and body language:

Gugu will carefully analyze the content you input and be especially sensitive to words that contain emotions and attitudes. Finally, GUGU will change its facial expressions and body language according to the wording and overall meaning of the content. Thus, instead of emoji surrounded by the words in the traditional way, emoji (Gugu, in this case) become the main body where words are included in it (Figure 28). Gugu can also convey the partner's voice and hand drawings. Instead of writing the letter, users speak to Gugu who then transcribes their message and plays their voice for the recipient. Users can also customize their messages with a sketch. In this way, facial expression and body language are amplified, plus tone of voice and emotion-rich drawings, which can help LDR partners express emotion and thoughts in a stronger, more accurate, more detectable way.

Figure 28 Facial expression, body language, and tone of voice are amplified

Connotation of Letter:

Letters are slow and inefficient ways to communicate. But this delay can also make them more meaningful, because it requires deliberation and patience (Janning et al. 1297). People also assign a particular romantic meaning to letters. because they are dwindling in frequency of use. In the LoveNotes app, the delivery time of the message depends on the real physical distance between partners (Figure 29). For example, if a person lives in New York and his or her partner lives in China, It takes three hours to deliver the message. Partners will be assigned to different planets based on their real-world geographical location after they log into the app. The reason for setting the scene in the cosmic space is that after the popularization of the Internet, our understanding of distance has become blurred, and no matter how far away we are, we can instantly contact each other. This easy access to communication may lead us to pay less attention to each message. Just imagine that before the Internet became ubiquitous, we had to wait several days for a handwritten letter to arrive, which will make us very cherish the content of those letters. In the app, the space scene will enlarge the experience and feeling of distance, so that lovers will cherish the sending and receiving of every message.

Figure 29 Message delivery

Background Animation + Sound:

In addition to changing facial expressions and body language according to the content of the message, Gugu also changes the background animation and music in its environment to increase the expression of emotions (Figure 30).

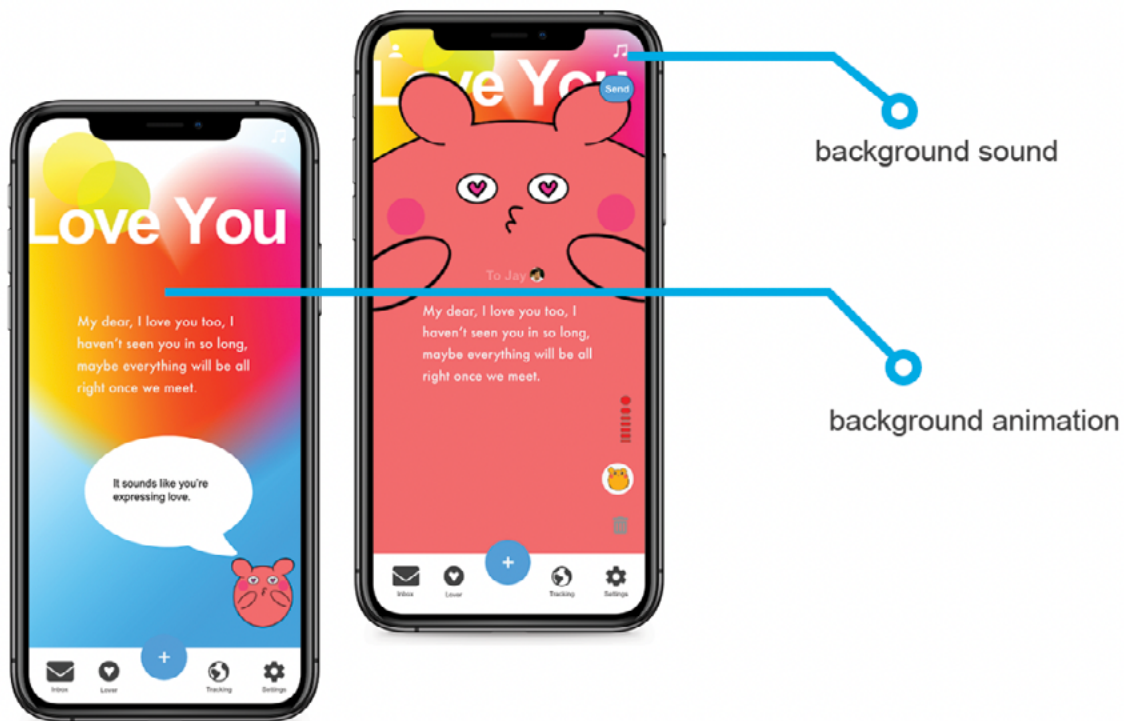**Figure 30 Background animation and background sound**

Reconstruction of Message:

Gugu will also help you reorganize sentences and words, and transform emotional words into Icons if you wish (Figure 31).
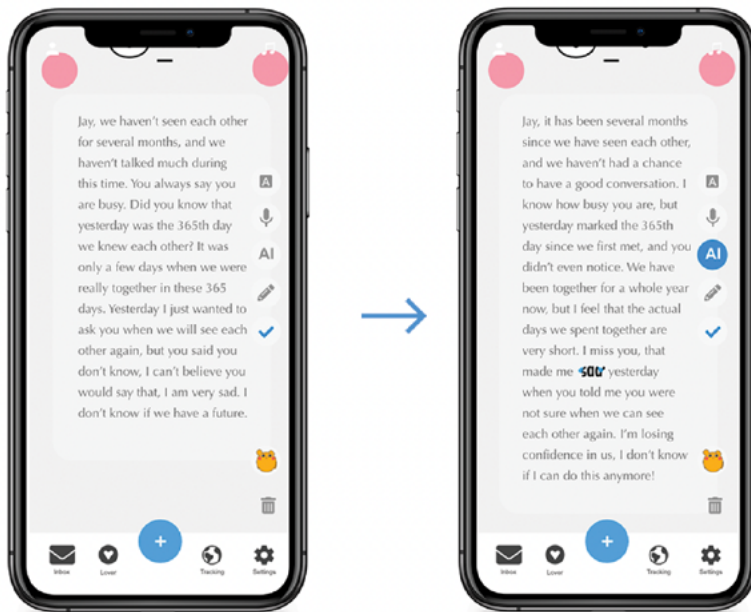

Figure 31 Reconstruction of message

Emotional Intensity Indicator:

Gugu will analyze the user's voice and what the user says to judge the intensity of the user's emotions. The intensity indicator is displayed in a striped shape when editing the content, which can be adjusted manually. On the recipient's page, the intensity indicator will be displayed in the form of two circles on the cheeks of GUGU, the circle flashing frequency and the tone of the color represent the intensity of emotions (Figure 32).

Figure 32 Emotional Intensity Indicator

As mentioned previously, my third and fourth prototypes were quite similar. The third focus group was held on March 11, 2021 with four participants – the same participants as my previous focus groups. They enjoyed the updated design and guided me to make the following updates, which are reflected in the final design I just presented.

- I significantly reduced the delivery time of the message. Prototype 3 had a long delivery time (up to 2 days), but the focus group participants suggested shortening this, which is reflected in Prototype 4.

- Participants said they couldn't feel the emotional intensity of the message in Prototype 3, which inspired me to add the emotional intensity indicator feature.

- Participants told me that the app is not very friendly to first-time users, so I redesigned the welcome page and added more guidance and tips in the app.

- Finally, participants pointed out that a navigation bar on the reply page was redundant and affects the overall visual experience, so I hid this feature in prototype 4.

Reflections on the Design:

Online communication loses many of the details of real-world interactions, which can include nonverbal behavior such as facial expressions, body language, and tone of voice and volume of voice (Regan 95). Together with verbal language, these factors contribute to a full understanding of what your partner wants to express and their real intention and feeling. By amplifying facial expressions, body language and encouraging users to use voices, along with emotional intensity indicators and changing the ambient atmosphere, the LoveNotes App can encourage LDRs partners to express emotion and thoughts in a stronger, more accurate, more detectable way, which means it provide long-distance romantic partners a great platform to self-disclose and show a caring response.

At different stages of life, people have different types of relationships with different people, and different types of relationships may have similarities and differences. Therefore, in addition to serving long-distance romantic relationships, LoveNotes may also be applicable to many other relationships. LoveNotes is featured by intelligently amplifying and strengthening the reception and expression of non-verbal behaviors to help people better self-disclose and conduct a caring response. Below I will try to explain its applicable relationships.

Marriage is a long-term contractual relationship established by two people on the basis of equality and voluntariness. Two people support and help each other in life. Generally, after marriage, both men and women tend to be stable in both work and relationship, and there is rarely a lack of offline communication, so LoveNotes may not be the best communication platform for married people.

Casual relationship means that two people do not have a formal commitment to intimacy like a boyfriend and girlfriend. Most people in a casual relationship may not have deep emotional connections, and may or may not have sex. Today, with the development of online dating platforms, this kind of relationship is very common. LoveNotes may not be suitable for the superficial relationship that does not require deep emotional commu-

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nication. However, it is possible that this casual relationship can be transformed into a romantic relationship through further in-depth communication and contact, so Gugu may provide help and support for this transformation.

A third-party relationship refers to people having sex or involving close emotional ties with someone other than their spouse or boyfriend or girlfriend. Considering that Love-Notes is an emotional communication platform that focuses on privacy and intimacy, and people who have this kind of relationship may be in a state of online communication frequently, so perhaps LoveNotes could apply to this kind of relationship.

Close friendship means that two people are very close and talk about everything, but there is no sexual activity between the two people. People may develop close friendship at all stages of life. Through Gugu vividly conveying emotions and feelings, LoveNotes is likely to become a special space of communication between close friends, perhaps to maintain long-distance close friendships are no longer a difficult thing.

Due to studies, careers, and the face of starting a family, most of the communication between children and parents after adulthood is through the Internet. Although family members are separated from each other by physical distance, the bond and emotional connection between children and parents are strong. Perhaps LoveNotes' Gugu can help children and young parents to share emotional expressions more accurately and strongly, and establish in-depth communication.

In some regions and traditional cultures of the world, grandparents play an important role in the upbringing, education, and companionship of early childhood of grandchildren. Therefore, some grandparents and grandsons may have a strong emotional connection. But LoveNotes may not be suitable for the relationship between grandparents and grandchildren, because although LoveNotes has been working hard to optimize the ease of operation, it has not been specifically optimized for the elderly.

Kinship is huge and complex in some countries, with different branches and nodes, but generally speaking, this kind of relationship is not as important as other relation-

ships for the needs of communication and emotional connection. And considering that LoveNotes focuses on providing intimate, in-depth, and private communication channels, this is obviously not in line with the nature of kinship, so LoveNotes may not be the preferred software for communication with relatives. The same reason applies to colleague relationships. Since the communication between colleagues rarely contains emotional factors or emotional changes, and the communication between colleagues emphasizes the timeliness and efficiency of communication, LoveNotes may not apply to colleague relationships.

Combining the previous research and design reflection, the design of this app is based on the data of the older Gen Z and young Millennials. In addition, LoveNotes focuses on online emotional expression and in-depth communication, so the target audience for the app is the older Gen Z and young Millennials who are experiencing a long-distance romantic relationship, or the older Gen Z and young Millennials who may be experiencing one of the following relationships: third-party relationship, close friendship, the relationship between young parents and children who have reached the age of 18.
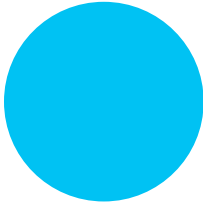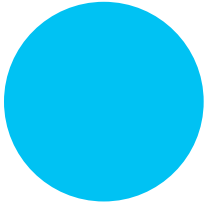
CONCLUSION

In this thesis, I explain many of the factors that can increase the intimacy that partners share in a relationship, focusing primarily on the factors of self-disclosure and partner care. Since self-disclosure and care are integral to relationship intimacy and satisfaction, I designed an online questionnaire and prototype around these two factors. After that, I held three focus groups and continuously improved my prototype design. The final design was an app that emphasized the function of love letters. In the App, instead of emojis added to words in the traditional way, emojis become the main body for a message with words included within it. This setup amplifies facial expressions and body language. The app incorporates other voice tone and animation features that can help LDR partners to convey much richer information to one another.

In his book Change by Design, Tim Brown said, "a purely technocentric view of innovation is less sustainable now than ever"(3). In other words, sometimes we just look at what has happened in the last decade and compare it to what's happening now. Although such an approach has led us to develop communication technologies considerably more advanced than ever before, so many people still fail to achieve successful long-distance romantic relationships even amidst these innovative technologies. Subsequently, we need a new product employing a new approach to design so that we can better support the needs of people in long-distance romantic relationships. The app that I have proposed can encourage LDR partners to express emotion and thoughts in a stronger, more accurate, and discernable way. It also provides a novel experience, encourages a positive response, helps reduce loneliness and emotional barriers, and can help increases mutual

trust for people who must live far away from their partners. Besides, given the popularity of network communication and the advantages of LoveNotes in the transmission of emotional information, it may also be able to provide help for different groups who are far away from family members and friends, and the people who struggle expressing themselves.

The limitation is my study only focused on the effects of self-disclosure and caring responses on long-distance relationships, but many other factors can also affect the quality of a long-distance relationship. In addition, my design might be more appropriate for older members of Gen Zers and younger Millennials – since it was designed based on research with them. Besides, most of the participants in my online survey were women, so maybe apps are more attractive to female users. Also, I still need to develop the app and test it with users to see if it really impacts their relationship satisfaction. Next, I will try to share my design and research with more people and recruit a programmer and a marketing expert to help me build the Lovenotes app. I hope this product will help connect more people in a more intimate, more private, and more substantial way.

APPENDIX 1

Anonymous Online Survey Questions:

Age:

Gender:

Your location during the long distance relationship:

Location of your partner during the long distance relationship

Length of time living separately:

Frequency of in-person visits:

Communication

1. What online software do you use to communicate with your partner at a distance? Name all platforms that you use in an average week.

2. What online communication features do you use most with your partner? (E.g. video, pictures, text, gifs, etc.)

3. What online communication feature encourage you to express your thoughts, feel-

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ing and care to your long distance partner?

4. How frequently do you communicate with your long-distance partner? Are you happy with this frequency – why?

5. What do you miss most about face-to-face contact with your partner?

6. What's the hardest part about communicating with your partner through an online platform?

7. How do you feel when there's a delay between sending a message and your partner's response?

8. Is it harder, easier or no different expressing feeling or emotions with your partner in an online platform? If so, why?

Based on the survey responses, I will design a product to better support couples in long distance relationships. Add your email below if you're interested in participating in a focus group about my design concept.

Your Email: _____ _____.

I would love to hear your thoughts and ideas on my design.

Non-anonymous Online Focus Group:

Kang will begin the focus group by saying: "Take a moment to think about your long distance romantic relationship. I want you to answer these questions based on your relationship and experience of long distance relationships."

1. Imagine you used my design for your next communication with your partner. What features would you enjoy the most?

2. Imagine you used my design for your next communication with your partner. What features would you enjoy the least?

3. Compared to other platforms you use to communicate with your partner, how would this design impact the way your express your feeling and private thoughts?

4. Compared to other platforms you use to communicate with your partner, how would this design impact the way you show your care? How would this design impact the frequency you show your care?

5. How would you improve the design to make it work better for you and your partner?
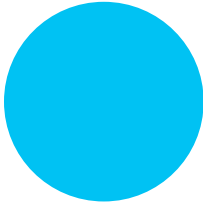
APPENDIX 2

This appendix includes further details about the AR feature in my first prototype.

User Goal:

Users can use URreal to both send and receive AR messages, just as they would send and receive text messages. They can also send letters to others. Such functions can better support people in long-distance romantic relationships, helping them self-disclose and show caring responses for their partner in more fulfilling ways.

User Journey:

User journey for AR message and letter (Figure A-1).

AR Message Function:

This app has two versions; one is for mobile phones, the other is for AR glasses. There is a switch button that allows users to shift from the mobile phone version to the AR-glasses version. (Figure A-2).

The first thing users should do after logging in to the app is to create a virtual avatar of themselves (Figure A-3). Then, users select their gender category and other basic details about themselves. Finally, users take or upload their head-shot image in order to create their own virtual avatar (Figure A-4).

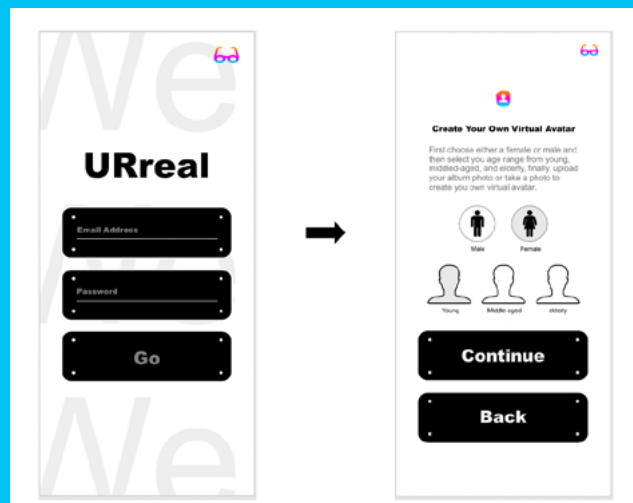**Figure A-1 User journey**

Figure A-2 Switch button

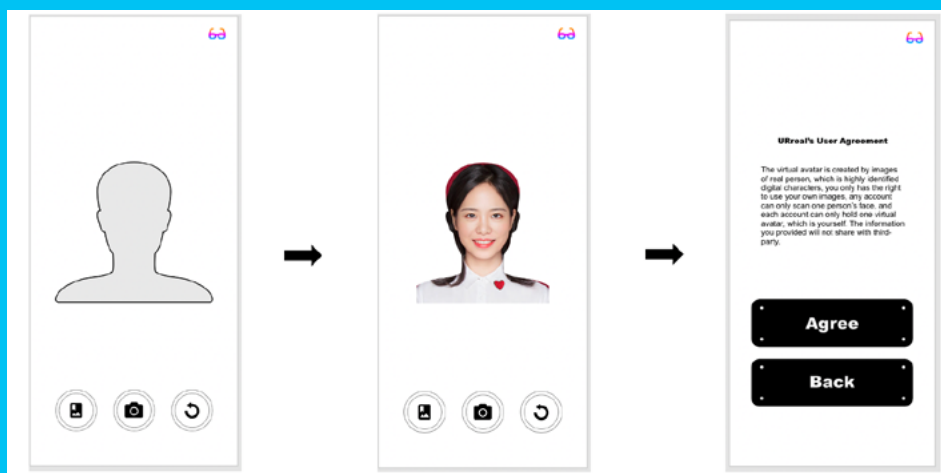**Figure A-3 Virtual avatar creation page**

Figure A-4 Upload Photo

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After people upload your head photo, the system will automatically generate a virtual avatar based on the information you provided, then users can make adjustments to their avatar (e.g., hair, clothes, etc.) (Figure A-6).

Chat-list page: In the top left, users can locate their personal homepage. In the top center of the page is the URreal App icon that leads to the Virtual Avatar creation page. In the top right is the switch button used to move between the mobile-phone and AR-Glasses version. There are 3 sections on the bottom of the page: Chat, Contacts, and Moments (Figure A-7).

On the chat page, users can send virtual avatar to others, and it is just as simple as sending a video or picture. First user need to click the little icon in the bottom right of the chat page (Figure A-8). It will lead user to the avatar creation page, user can add behavior, voice, sound, and music settings to the virtual avatar. Also, users can alter the hair styles and clothing of their virtual avatar. After which, they can then send them to partners or friends.

When user click the scan button, they can scan their body behavior, and then user can upload unique poses and gestures to the app, next user can add selected poses or gestures to their virtual avatar, which can resonate with their partner (Figure A-9).
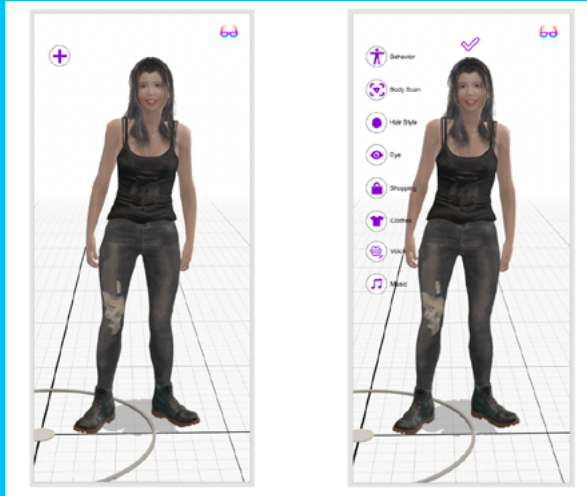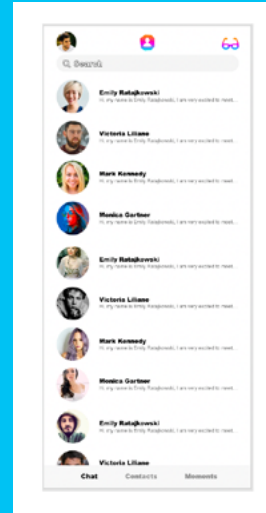
Figure A-5 Virtual Avatar Main Page
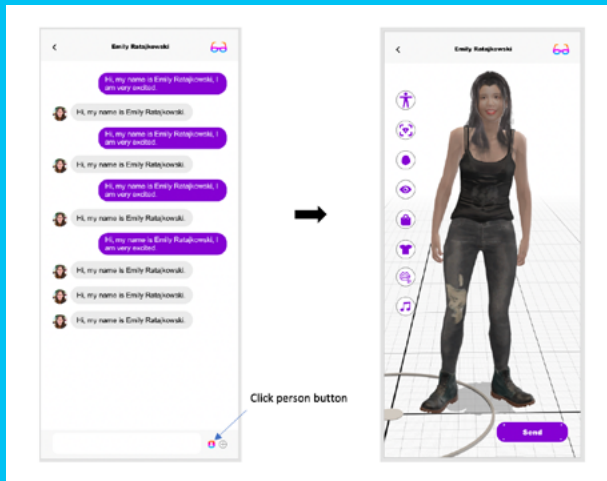

Figure A-6 Chat-list page
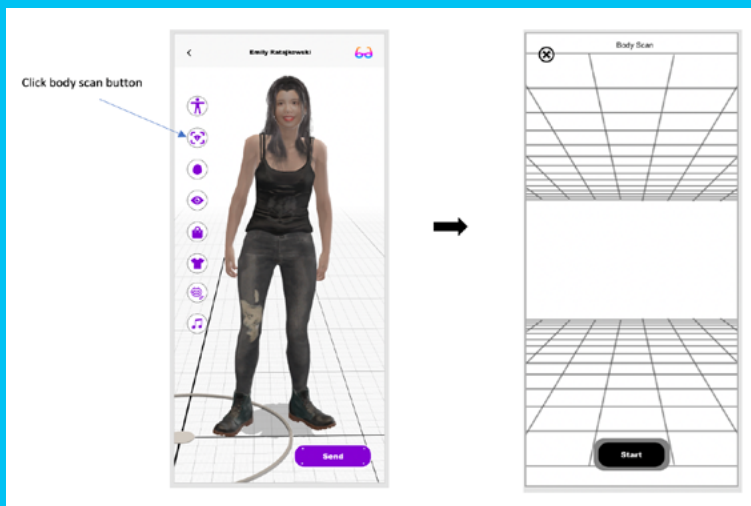

Figure A-7 Chat page

Figure A-8 Scan Body Behavior

The "Shopping Center" is a place where users can upload and download body behaviors, gestures, and poses. The shopping center will also feature clothes and decorations that users can select (Figure A-9).

On the behavior page, users can add different facial expressions and body behavior to the virtual avatar. Emojis are popular in various forms of communication because they indicate facial expressions. Here, we can use a real avatar to express a range of facial expressions. There are also a number of body behaviors that users can select. For example, we can click on the dance option on the page (Figure A-10).

After clicking the dance button and returning to the main avatar creation page, users can click the send button, then this AR message will show on the chat page (Figure A-11).

After your partner or friends click the AR message, the app will require users to find a flat space; then users can cast the virtual avatar in the surrounding space (Figure A-12).
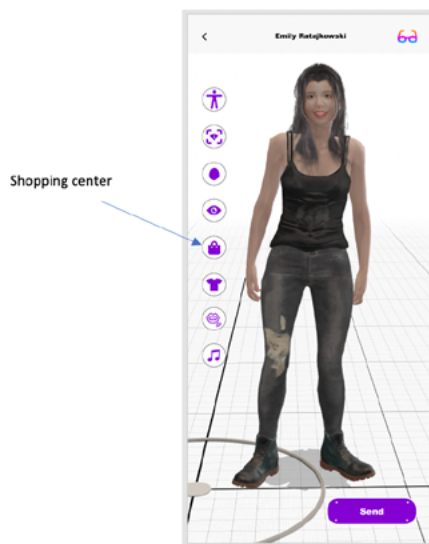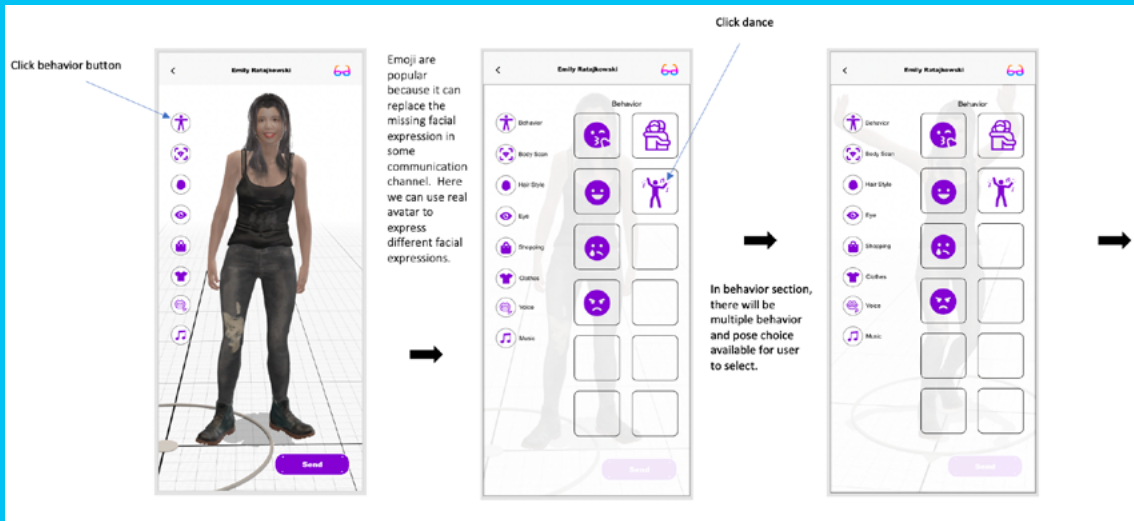

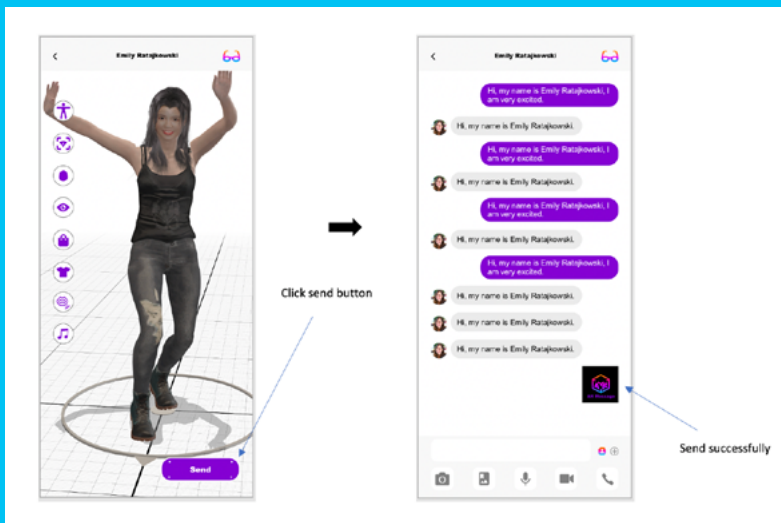**Figure A-9 Shopping Center**

Figure A-10 Adding Body Behavior
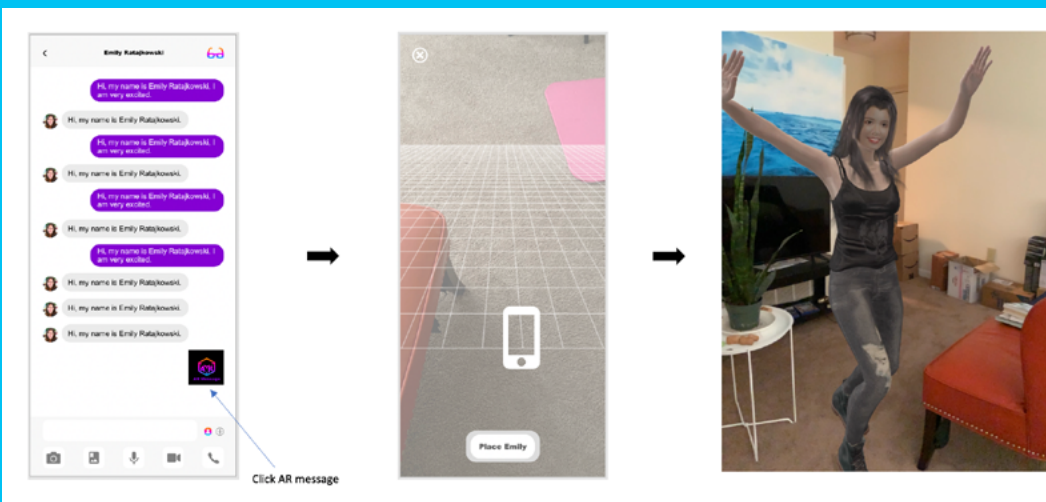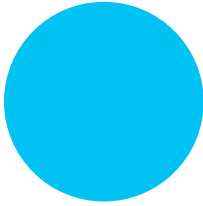

Figure A-11 Sending AR Message

Figure A-12 Projecting the Virtual Avatar

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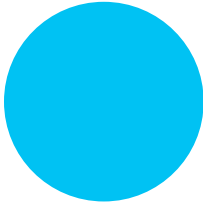
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VITA

AREAS OF EXPERTISE:

As a designer with five years of graphic design experience and two years of UI/UX design experience, I create and lead good designs not only visually but also deeply realize the importance of user-centered design concepts. In addition, in the past two years, I have focused on the AR/VR field, trying to combine both creative and technical skills to design and deliver interactive 3D experience solutions.

Ability to craft and communicate thoughtful user experiences. Experience with Unity and AR/VR development. Experience with Adobe Creative Suite. Motion graphics and 3D software (Blender, Character Creator 3, MakeHuman, After Effects) skills. Strong commitment to explore and learn new technologies and unafraid to be out of my comfort zone. Excellent presentation, written, and oral skills. I am able to collaborate, multitask, and work within deadlines.

EDUCATION:

School of Design, College of Visual and Performing Arts; Syracuse University   Syracuse, NY
Master of Fine Arts: Design   07/2019 – Present
• In the Bird Library project, we design a Public Communication Board which can help students and faculty to get help and make friends.
• In the project of Green Lakes State Park, I design a brochure that can present the beautiful scene of the park in a unique way with help of augmented reality.

WORK EXPERIENCE:

Syracuse University   Syracuse, NY
Teaching Assistant, Design Dept.   08/2020 - 05/2021
• In the class project, the professor and I redesigned Myslice (the Syracuse University's service center for students and faculties), we reconstruct the interface and interactive experience of Myslice. The new interface can better encourage the interaction and connection of various activities and information between students and the university, in addition, highly flexible and personalized settings meets different needs for different group of people.

Syracuse University   Syracuse, NY
Graphic Assistant, Newhouse Advertisement Dept.   10/2020 - 12/2020
• Teach students graphic design and Adobe Creative Suite

SKILLS:

• Adobe Creative Suite, Adobe XD, Sketch, Figma, Adobe Effects, Adobe Premiere, Adobe Aero, Blender, Unity, MakeHuman, Character Creator 3, Html&Css&JavaScript

PRIZE:

• Second prize, The 32th China Industrial Economics News Award, Association of China Industrial Newspapers
• Third prize, The 30th and 31th China Industrial Economics News Award, Association of China Industrial Newspapers