

IMPLEMENTING HUMAN-CENTERED PROCESSES AND EMPATHETIC DESIGN, WITHIN **SENIOR HIGH SCHOOL** PROFESSIONAL LEARNING COMMUNITY MEETINGS

How Designed Digital Spaces can Help Guide Educators into
Creating Systematic Changes and Productive Improvements
Within the Classroom Setting

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MGD STATEMENT

Program Statement on the Master of Graphic Design Final Project

This document details a final project, which in design is commonly referred to as a graduate “thesis,” at North Carolina State University. The work was defined in a 3-credit course in a fall semester and executed in a 6-credit course in the following spring semester. The Master of Graphic Design is a terminal professional degree with a research orientation, but like the MFA and MDes, it is not a primary research degree. This is a discovery-based investigation. Cash (2018) describes the process of building scientific knowledge as a cycle between theory building and theory testing. The theory building model includes (1) discovery and description, (2) definition of variables and limitation of domain, and (3) relationship building (pp. 88–89). This investigation is restricted to the theory building mode. The theory testing model includes (4) prediction, testing, and validation, and (5) extension and refinement (p. 89). While experts may have been consulted, this investigation does not entail any testing with human subjects, and it does not endeavor to prove anything; all assertions are tentative and speculative.

See: Cash, P. J. (2018). Developing theory-driven design research. *Design Studies*, 56, 84–119.

ABSTRACT

At the beginning of the school year, educators conduct their classroom planning during high school Professional Learning Community (PLC) meetings. Implementing empathetic and human-centered design into high school PLC meetings will create systematic changes and productive improvements within the classroom setting and learning environment. However, not many technological systems help professional educators implement empathetic design into PLC meetings, in both a virtual and in-person format. Understanding how to design digital spaces to help implement empathetic-centered design into high school PLC meetings will allow educators to collaborate and identify student and classroom needs while ideating solutions. The investigation results show the need for empathy processes and human-centered design within educational collaboration platforms. The representation of people encourages empathy processes.

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1. INTRODUCTION

Professional Learning Community meetings were created to foster teacher collaboration and support educators to improve their classroom settings and improve pedagogical strategies. Brett Taylor (2020), a designer of unique learning programs from elementary to higher education, saw PLC meetings as challenging and mandatory to fulfill administration goals. Taylor then implemented empathetic and service design methods to create PLC meetings to be more productive and collaborative in the process.

Growing up in a low-socioeconomic public-school environment and watching my children go through similar educational experiences, I have seen and experienced the lack of access these types of school districts have to newer designed structures and methods to PLC meetings. As COVID-19 shut down the world and disrupted in-person meetings, PLC meetings were even more important as educators and administrators scrambled to figure out how to conduct virtual online learning classrooms. Lower-socioeconomic school districts suffered even more so and struggled with access to the technologies needed and implementing newer pedagogical strategies in a virtual environment. More importantly, they had to help their students through this time of crisis while learning how to navigate it themselves. PLC meetings could have been conducted in any situation, both in person and virtually, had educators had access to virtual spaces and tools to help guide them through productive collaboration processes. How can digital designed spaces and tools guide educators into strategizing systematic changes and productive improvements within PLC meetings for all school systems to access Taylor's methods in any situation and environment?

2. PROBLEM SPACE

2.1 PROBLEM STATEMENT

The purpose of high school Professional Learning Community (PLC) meetings is to support teachers and improve student learning. Professional Learning Communities are a collaborative process among professional educators (Taylor, B. 2020). Depending on the school, these meetings occur before classes begin in the fall, and some schools conduct these meetings towards the end of the school year in the spring. PLC meetings are currently designed with the expectation that pedagogical understandings are further emphasized through social interactions and discourse that promote the developments of knowledge developed by a community (Popp, & Goldman, 2016).

However, there is a series of issues that happen within these meetings that cause the outcomes to be uncollaborative and with little to no improvement in the educational learning environments within classroom settings (Taylor. B. 2020). According to Taylor (2020) these meetings have become compliance-focused, causing educators to focus on state testing and student achievement versus focusing on pedagogical strategies and student learning. Also, conversations during PLC meetings tend to surround negative classroom experiences with no actionable solutions. PLC meetings have limited solution-based outcomes with how to help the classroom setting due to the lack of structure and a guided problem-solving system. Brett Taylor implemented an empathetic and service design method that allows collaborative teams to work together to support student education. Taylor's (2020) method addresses the lack of structure within these meetings and creates the requisite foundation and structure by prescribing distinct phases for collaborators to follow. He explains this system is an interactive process that focuses on identifying the needs of teachers and students and allows the creation and testing of new solutions. Collaborators will create new ideas and realistically design solutions for the addressed pain points. Educators who have implemented this system had said they saw progression and structure within their PLC meetings, and they were able to understand their student's needs and perspectives fully. Educators were also able to innovate their teaching methods and had seen increases in their teacher and student engagement.

Designing practical and successful digital spaces for asynchronous and synchronous collaborations is essential for educators to have successful PLC meetings. Most digital spaces for asynchronous and synchronous collaborations are missing tools to help enhance the collaborative processes. Some virtual platforms offer video conferencing but lack collaborative boards for digital workspaces. There are digital collaborative boards that lack video conferencing features and also lack effective communication messaging tools. The lack of these tools creates a barrier for proper human-to-human communicative processes, which can cause marginalization and an empathetic interference within users and their cohorts. The lack of these tools can also lead to confusion of the main focuses of meetings, which in turn could impact educators successfully conducting PLC meetings.

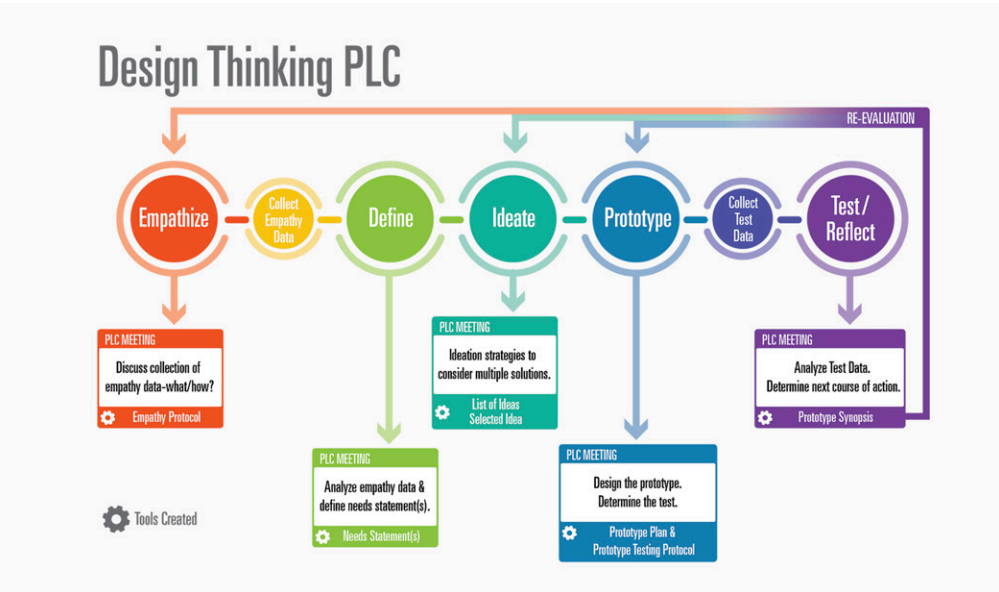


Figure 2.1.1. Brett Taylor’s Design Thinking in Professional Learning Community Meetings Chart (Taylor, B. 2020).

2.2. JUSTIFICATION

Currently, there are no digital applications available using Taylor's method, working as a functional guide to help teachers find progressive improvements within PLC meetings. Designed digital spaces and tools will allow educators to have access and the affordances to use Taylor's methods while conducting in-person and or virtual meetings. Digital design tools can be used with schools in all regions and of any socioeconomic background. Digital spaces also help mediate and grant access to Taylor's design phases educators need within their Professional Learning Community Meetings. Educators within any school setting should have the affordances to conduct PLC meetings without worrying about the effects that environmental disasters and global and individual health impacts can have on these meetings. PLC meetings should be able to be conducted both in-person and virtually, so if environmental factors affect in-person meetings, PLC meetings could still take place. Designing for either circumstance helps alleviate the stresses of coordinating PLC meetings around most environmental disasters, and global and individual health impacts.

The user interface design of digital spaces and tools should understand the educator's experiences and journey of PLC meetings while focusing on the output of their empathetic and human-centered design processes. The design of effective digital spaces for asynchronous and synchronous communication will need to incorporate virtual tools to help the collaborative process and help reduce marginalization that could occur during teacher to teacher interactions.

2.3. ANNOTATED BIBLIOGRAPHY

I explored sources in scholarly journal articles and books published within the past year to 30 years. Several sources were found on the following topics: professional learning community meetings, empathetic design, human processes within education, user interaction design, and design thinking within professional learning communities.

Professional Learning Communities

Professional Learning Communities were created with the intention that collective and individual pedagogical understandings are strengthened through social interactions and discourse, which in turn promoted the community developments of knowledge (Popp, & Goldman, 2016). Professional Learning Communities have become focused on meeting compliance standards (Taylor, 2020). The success of Professional Learning Communities is dependent on the success and results of students (Taylor, 2020).

Professional Learning Communities	
Fisher, D., Frey, N., Quaglia, R. J., Smith, D., & Lande, L. L. (2018).	Engagement by design creating learning environments where students thrive.
Popp, J. S., & Goldman, S. R. (2016).	Knowledge building in teacher professional learning communities: Focus of meeting matters.
Taylor, B. (2020).	Design Thinking PLCs Revolutionize Teacher Collaboration.

Empathetic Design

Empathetic design allows educators to have a deeper understanding of their student's educational experiences (Hartman, R. J., Johnston, E., & Hill, M. 2017). Co-creation is a principle often found within empathetic design. Designers work with end-users to understand the foundation and contexts within a project while learning how to brainstorm and ideate new solutions that could enhance user's lives (Lupton, 2017). The exercises used within co-creation, help build collaborative discussions, strengthen creative thinking processes, as well as enhance understanding of empathy between designers and their end-users. Taylor (2020) implemented empathetic design methodologies for educators to develop protocols and processes in order to collect empathy data, such as student feedback, within design phases. Taylor's process allows collaborative teams to work together.

Empathetic Design	
Hartman, R. J., Johnston, E., & Hill, M. (2017).	Empathetic Design: A Sustainable Approach to School Change. <i>Discourse and Communication for Sustainable Education</i>
Lupton, E. (2017).	Design is storytelling.
Lupton, E. (2011).	Graphic design thinking: Beyond brainstorming.

Human and User-Centered Process Within Education

Human-centered design supplies certain methodologies for designers to address complex issues (Garreta-Domingo, M., Sloep, P. B., & Hernández-Leo, D. 2018). Human-centered design is focused on understanding people in order to help them meet their needs, goals, and ambitions (Silva, T. F. P., & Marques, J. P. C. 2020). The Human-centered process consists of empathizing with the user and the experience of the user is considered throughout the cycle (Taylor, 2020). Human and user-centered design is not only secluded to designers to use but is a process other practices can use. Lee (2018) emphasizes that with training, everyone has the potential to make changes, be creative, and become innovators, including both students and educators. Human and user-centered design processes can be implemented within the educational environment in order to look deeper into educators' and students' perspectives within the classroom setting. Empathy data is the research that connects experiences with the end-user (Taylor, 2020). Human-centered design within education focuses on the empathy data, in order to meet students' needs (Taylor, 2020).

Human and User-Centered Process with Education	
Garreta-Domingo, M., Sloep, P. B., & Hernández-Leo, D. (2018).	Human-centered design to empower "teachers as designers".
Lee, D. (2018).	Design thinking in the classroom: Easy-to-use teaching tools to foster creativity, encourage innovation, and unleash the potential in every student.
Silva, T. F. P., & Marques, J. P. C. (2020).	Human-centered design for collaborative innovation.

User Interface and Interaction Design

User interface design understands the user experience and journey while focusing on the aesthetic output of design human-centered processes (Hills, S. 2017). When users have more digital interactions, these interactions are shaping users to be more human and natural within digital spaces by removing normal barriers and simplifying lives (Hills, S. 2017). Design interactions and processes can be fully experienced from services and complex systems, including communication (Tolino, & Mariani 2018). Consequently, technology within society has gradually evolved to shifting the focal point from problem-solving to becoming a way to satisfy user needs (Hassenzahl and Tractinsky, 2006.) The focus should be on problem-solving to satisfy users' needs. Users test prototypes and services after user prototypes and solutions are designed. Designers will then observe the user interact with the prototype and follow up with questions (Taylor, 2020).

User Interface and Interaction Design	
Hassenzahl and Tractinsky, (2006.)	User Experience - a research agenda. Behaviour & Information Technology
Hills, S. (2017).	User Interface Design Or User Interaction Design?
Taylor, B. (2020).	Design Thinking PLCs Revolutionize Teacher Collaboration.
Tolino, U., & Mariani, I. (2018).	Do you think what I think? Strategic ways to design product-human conversation.

2.4. DEFINITION OF TERMS

Defined below are the technical terms used within this document.

Coordinated Video Feature: Harmoniously bringing together elements of a virtual live stream video conference with elements of digital workspaces.

Digital Workspaces: Virtual, visual, and collaborative shared workspaces, that enable workplace teams to brainstorm.

Empathy: The ability to sense, understand, and share the emotions of another person.

Empathetic Design: User-centered design approaches, with the designer's goal to focus on the user's perspectives and feelings to gain understanding.

Empathy Data: The collection of deep and meaningful data of the user's perspectives and emotions.

Equity: Fairness and impartiality.

Human-centered design: Understanding users, to help users meet their goals, needs, and ambitions.

Marginalization: The disempowerment, disenfranchisement, and exclusion of a person, group, or concept.

Messaging Tool: Communication platform, in which a user instantaneously sends a message to another user.

Professional Educators: a licensed person who teaches and helps students to acquire knowledge within a school.

Professional Learning Community Meeting: Professional Educators and School administrators coming together to discuss, plan, and improve classroom settings within educational environments.

2.5. ASSUMPTIONS AND LIMITATIONS

Assumptions. I understand that school systems will vary in the types of digital tools they have access to, and I assume most high school educational environments would have access to cell phones and computers to allow them to use a mobile app tool and website. I assume users would also have access to the internet. I also assume that users will be educators and students within professional learning community meetings. However, professional educators are the main stakeholders within my study, and while students would be potential users, they are secondary stakeholders here. I also assume that educational environments will want to use human-centered processes and empathetic design within their meetings.

Limitations. The implementation of human-centered processes and empathetic design within a mobile app for professional learning community meetings do not currently exist. This creates a limitation to the evidence-based design of this platform for professional learning community meetings. Access to current precedents is limiting. The creation of functional prototypes is limited, due to the time constraints of this study. Another limitation of this investigation is the lack of interviews, and likewise user testing. I have to rely on the qualitative research done by other designers and professional educators within this field in order to create digital tools within my study.

2.6. PRECEDENTS

To set the foundation for this project, I examined and analyzed current and existing literature, applications, and websites of empathetic design practices, service design practices, peripheral participation, mobile learning, and participatory action research within high school academic settings.

Findings from these precedents:

Professional Learning Communities are meant to be a collaborative process among professional educators (Taylor, B. 2020).

The Human-Centered Process consists of empathizing with the user and the experience of the user is considered throughout the cycle (Taylor, B. 2020).

Educational designed digital tools should empower educators by giving them access to the tools they need to properly educate their students.

Educational communication tools should allow educators the opportunity to assess their students quickly and effectively.

Educational communication tools should allow students to be able to voice their viewpoints without judgement and peer pressure.

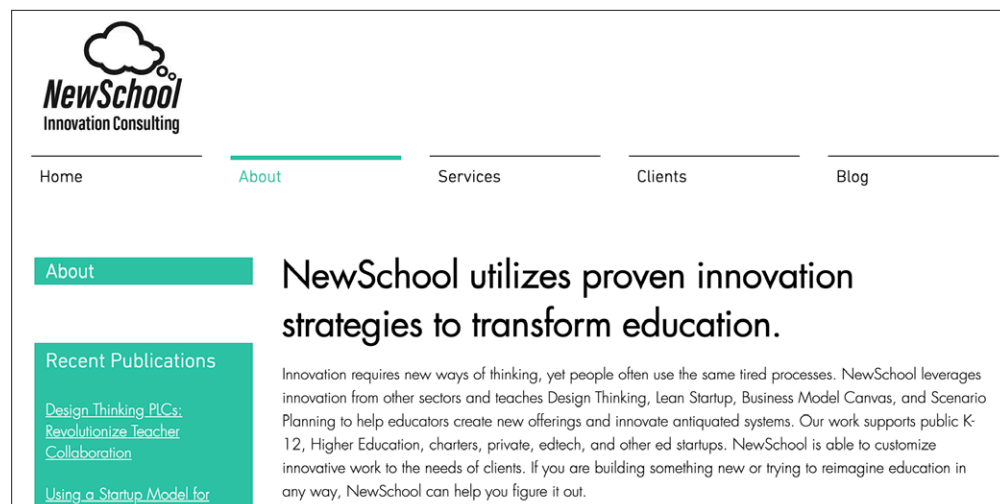


Figure 2.6.1 - New School Innovation Consulting supports K-12 schools with “educational innovation” through workshops, collaborations, and curriculum design based on the needs of a particular school they work with.

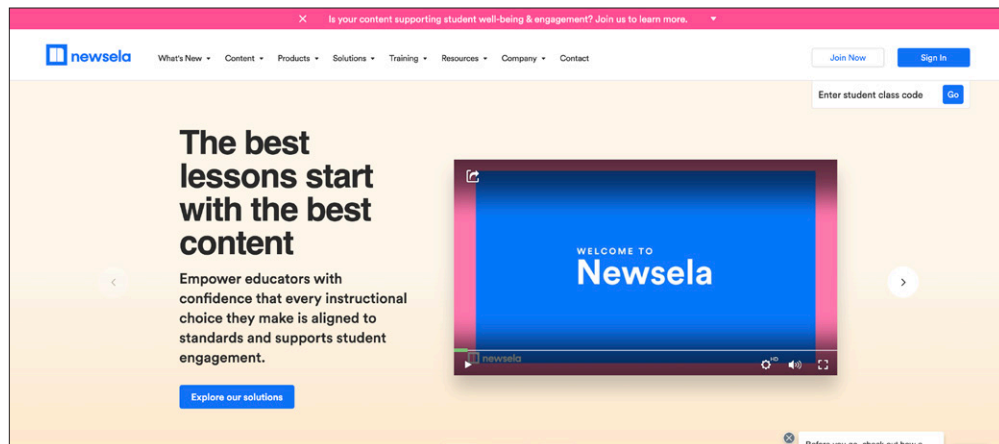


Figure 2.6.2 - Newsela is an instructional content tool that helps educators to find appropriate reading content for their students. This tool helps educators have easy and organized access to articles their students will understand. Other search engines tend to pull up college and university reading level articles which hinders educator's ability to find appropriate content for their students. This tool reduces marginalization by optimizing ease of access, and empowers educators to have control over what their students will be able to read and research.

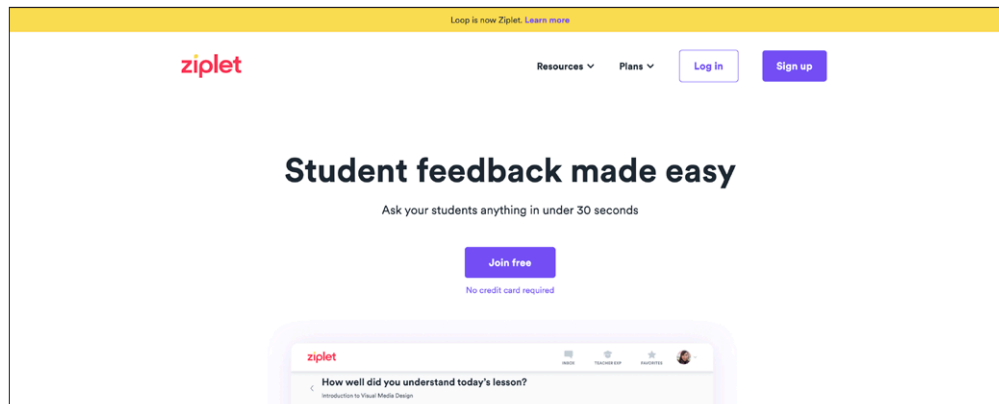


Figure 2.6.3 - Ziplet is a communication tool that helps educators connect with their students. Educators are able to assess their students quickly, and students have the opportunity to respond privately. This allows educators to connect with their students on a deeper level than regular in person class communication. This allows students' voices to be heard without the pressure of their peers potentially influencing their answers, due to the anonymity factors within this tool.

3. INVESTIGATION PLAN

3.1. CONCEPTUAL FRAMEWORK

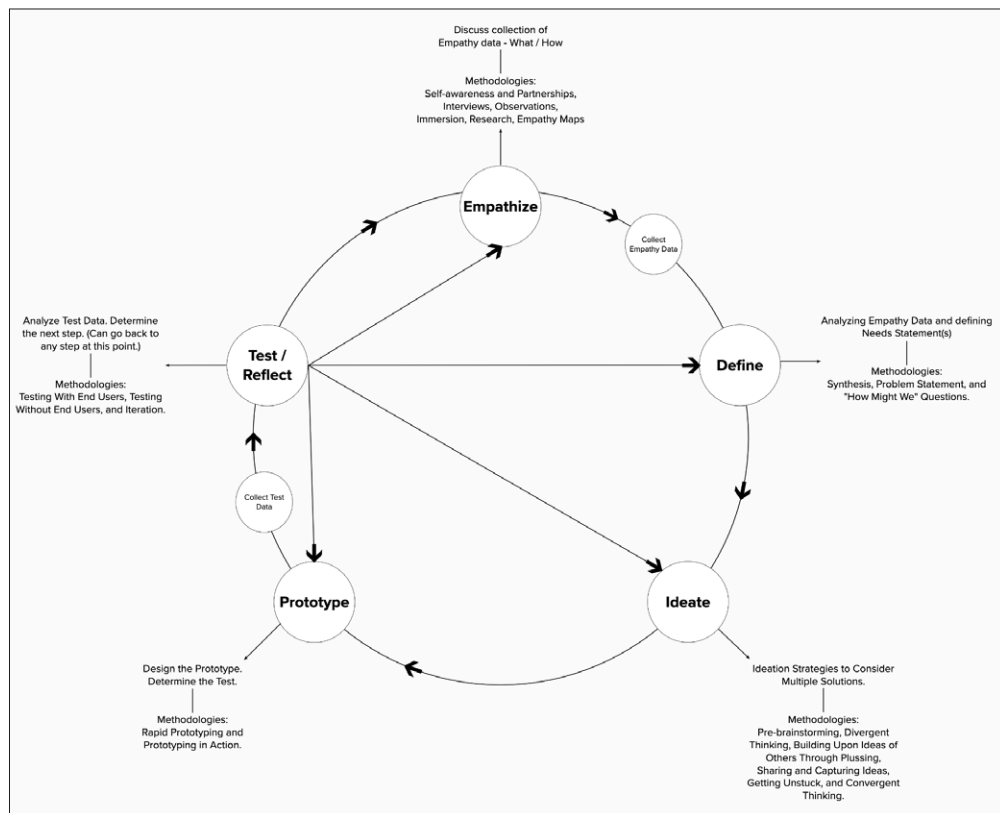


Figure 3.1.1. Design Thinking within Professional Learning Community Meetings
 Conceptual Framework of Brett Taylor's Design Thinking in Professional Learning Community Meetings Chart (Taylor, B. 2020), Brett Taylor's Meeting Outline, and David Lee's methodologies associated with Design Thinking.

The conceptual framework for this investigation (see Figure 3.1.1) is based on (a) Brett Taylor's Design Thinking in Professional Learning Community Meetings Chart, and (b) David Lee's five phases of Design Thinking.

Brett Taylor's Design Thinking in Professional Learning Community Meetings Chart (Taylor, B. 2020) outlines the categories of human and user-centered design processes. This chart breaks down these stages in 5 main categories: empathize, define, ideate, prototype, and test/reflect. Each of these categories relates to subcategories of Professional Learning Community Meetings.

The first step starts within the Empathy Protocol to discuss the collection of empathy data: what that data entails, and how it was collected. The second step falls within defining needs statement(s): analyze empathy data and define the needs statement based on the analysis of the data. The third step is to ideate by listing the ideas and then selecting those ideas: ideating strategies to consider multiple solutions. The fourth step is to prototype the planned strategies and determine the testing protocol. The final step is to test, then reflect by analyzing the test data and determining the next steps needed to be taken. This process chart is to help educators meet the needs of their students through pedagogy and learning. These steps were summarized in figure 3.1.1.

David Lee's five phases of Design Thinking (Davis, 2017) outlines a similar system to Brett Taylor's chart with the categories of human and user-centered design processes. These five phases are empathize, define, ideate, prototype, and test. David Lee goes into further detail with each category and provides examples of methodologies that can be used per category. Empathy Phase: self-awareness and partnerships, interviews, observations, immersion, research, and empathy map. Define Phase: synthesis, problem statement, and "How Might We" questions. Ideate Phase: pre-brainstorming, divergent thinking, building upon ideas of others through plussing, sharing and capturing ideas, getting unstuck, and convergent thinking. Prototyping Phase: rapid prototyping and prototyping in action. Testing Phase: testing with end-users, testing without end-users, and iteration. These methodologies were connected to each phase in figure 3.1.1.

3.2. RESEARCH QUESTIONS

Research question:

How can designed digital spaces guide professional educators to follow step by step phases for creating empathetic curricular plans within high school Professional Learning Community Meetings?

Sub questions:

- SQ 1:** *During meetings.* How can the design of a coordinated video feature mitigate the sense of marginalization among individual participants while enabling PLC groups to see each other during a brainstorming session?
- SQ 2:** *Between and during meetings.* How can a messaging tool on a virtual platform create a safe space to minimize judgments and enhance empathy processes between educators?
- SQ 3:** *Between and during meetings.* How can the structural form of comment sections within digital workspaces and boards, help educators feel safe and comfortable when interacting in a high school professional learning community meeting?
- SQ 4:** *During meetings.* How can an anonymous virtual voting tool within a digital collaborative workspace be implemented within a mobile app to help guide professional educators to define their classroom educational needs in order to collect the equitable and accurate type of student empathy data?

3.3. INVESTIGATION MODEL



Figure 3.3.1. Design Intervention within Digital Spaces

This investigation model (Figure 3.3.1.) was designed in line with the conceptual framework to guide my studies. By understanding human-centered design process steps (empathize, define, ideate, prototype, and test and reflect), I was able to acknowledge where design would need to intervene within digital spaces of these processes. Each sub-question addresses the technological interfaces that would need to be focused on when designing digital design spaces to guide professional educators to follow step-by-step phases. The sub-questions also guided the notion to keep empathy in mind when designing the mobile interface to help reduce potential marginalization, to minimize judgments, to collect equitable and accurate type of student empathy data, and to allow educators to feel safe and comfortable when interacting in a high school professional learning community meeting.

3.4. SCENARIO

Phase 1 - Meeting 1 of 3 - Exploration of Problem Areas

It is 8 am on a Monday morning, three weeks before the start of the school year at a semi-annual Professional Learning Community (PLC) meeting that is taking place at Pleasant High School. Jean Branch is a Sophomore English teacher. Jean remembers past PLC meetings lacking structure and oftentimes are non-collaborative, with not having real solutions to help the students within her class.

However this year she watches the large screen in the conference room of 10th-grade teachers, flashes the words Empathetic Classroom Design Meetings. It is announced that all professional high school educators in the district will be using human-centered processes and empathetic design during these meetings. Various designed digital spaces centered around human-centered processes will help educators work together and define student and educational needs, as well as ideate innovative solutions.

The screen then starts to guide the teachers on a National Networking System into exploring problem areas within the classroom through discussions of shared issues to explore from past voted pain point results. Each teacher takes a survey of issues they experience. The app then generates percentages of the top shared issues. The educators then discuss which 5-10 issues they would like to focus on.

Phase 2 - Meeting 1 of 3 - Development of Empathetic Data Guidelines

At the second half of the meeting, the app then guides the educators to determine the specific equitable student empathy data that will need to be collected to identify and define the students' needs. The educators will then develop and input the guidelines within the app.

Jean uses the app on her phone to track student empathy data in-between class periods during the first month of school and to communicate with her colleagues.

Phase 3 - Meeting 2 of 3 - Assessment of Student Needs

During the 1st teacher workday of the year, Jean and the other educators meet to assess the data the app tracked and synthesized. Educators then define 1-5 student needs statements.

Phase 4 - Meeting 2 of 3 - Ideation

During the same meeting, Jean and her counterparts use coordinated video features within a digital workspace to brainstorm several solutions to the student needs statements. They then select the top 3-5 solutions to prepare for prototyping.

Phase 5 - Meeting 2 of 3 - Creation of Prototypes

At the final part of the 2nd meeting, the educators design how to test out their selected solutions, and what data will be collected to fulfill the student needs statements, and input that information into the app.

Jean then uses the app on her phone to track the solutions data in-between class periods during the second half of the school year.

Phase 6 - Meeting 3 of 3 - Evaluation and Reflection of Data

The app shows the synthesized data on the large screen. The educators determine the progression and the retrogression and decide what needs to be changed (if anything.) The educators are able to go to any part of the design phase within the app. Jean and her team decide they are satisfied with some of the results, but go back to find another solution for one of the student needs statements.

The educators meet again halfway through the year to evaluate progression and go back to the 1st phase to discuss new problems they noticed within the first half of the year.

4. STUDIES

4.1. MARGINALIZATION

4.1.1. Exploration of how to coordinate video features within digital workspaces.

What allows users to see their group audience on a virtual platform while brainstorming and coordinating ideas (such as combining platforms like zoom and mural versus using both and having to constantly toggle back and forth between platforms)?

As the COVID-19 pandemic took effect, most PLC meetings and educators' conferences took place within digital environments. Users had to synchronously collaborate ideas on one platform while still needing to see their audience through another platform. Having to toggle back and forth between platforms was not only an inconvenience to users but disrupted and hindered communication processes. The move to online platforms also possibly increased marginalization. The positioning of screen layouts in most video formats adds to marginalization during communication processes. Constant individual interruptions also contribute to marginalization and hinder conversational flow when educators discuss shared issues to explore, define their needs, and brainstorm ideas.

Whether in physical work environments or on digital platforms, marginalized groups are often overpowered in conversation and are less likely to be addressed compared to non-marginalized groups. "Workplace incivility is a ubiquitous and often chronic process that occurs when a person or group of people feel marginalized by the communication and behaviors of others" (Hall et al., 2020, p. 486). According to Hall (2020), isolating communication restricts the flow of communication to and from marginalized individuals. This type of communication feeds into a type of macro-aggression. Hall (2020) also describes the macro-aggression of being silenced as a marginalized individual's ideas and perspectives being rejected, overlooked, and or seen as incompetent. The following studies explore the notion of how to foster empowerment for those who are silenced through designed communication platforms.

4.1.2. Multifunctional Digital Workspace

Creating a multifunctional digital workspace would help mitigate the inconveniences of using multiple platforms during synchronous collaboration meetings and brainstorming sessions. Combining the coordinated virtual video function within a digital workspace would allow users to synchronously see each other while collaborating during meetings. The coordinated virtual video feature would sit at the top left corner of the screen and would sit on top of the digital workspace.

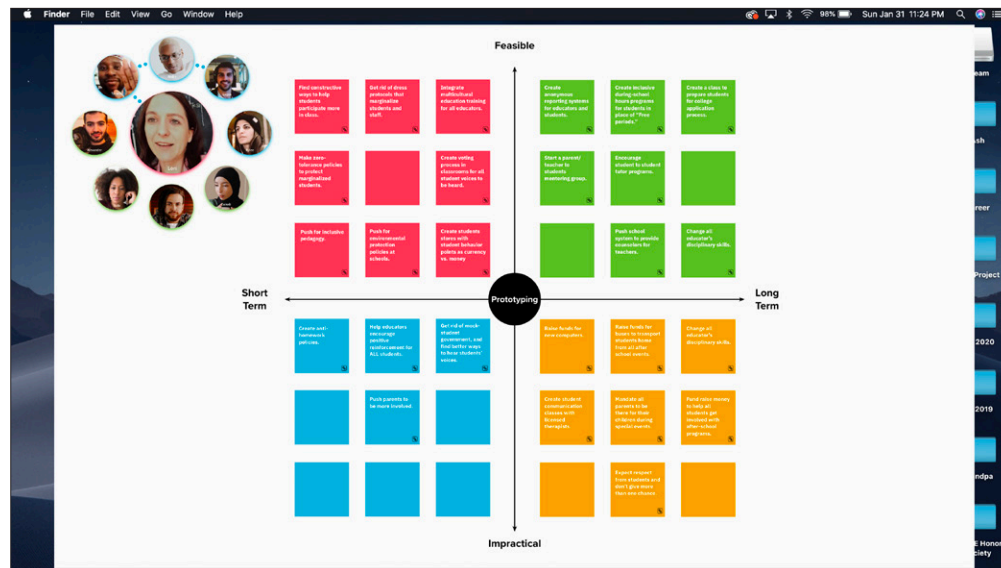


Figure 4.1.2.1. - Circular Formats

The layout format as seen in figure 4.1.2.1. of individual video screens on one merged group screen could contribute to an isolated feeling of space and the restriction of conversational flow. I challenge the rectangular shape format of the group screen layout and the speaker's position in that layout. On the platform Zoom, the lead speaker is usually at the far top left corner of the screen, which in turn distances them from individuals that are to the far left area of the screen and the mid to bottom sections of the screen, disconnecting them from those individuals. This position could feed into macroaggressions, and not allow the speaking individuals to have everyone's full attention.

Creating a circular format where the speaker is in the center and each individual's video screen is surrounding the speaker allows for everyone to be positioned and connected to the speaker and each other. Positioning the speaker in the center of a group allows natural attention to be placed on the center of the circle.

The way most virtual video conference platforms are set up, there are not many options to limit conversation interruptions. This can feed into marginalized individuals being overpowered and or silenced within conversations which limit their perspectives and ideas from coming forward. Inclusive communication with a diverse set of ideas from all educators will add a plethora of brainstorming ideas and potential solutions for educators to choose from. The following studies address issues of representation, scale, depth, movement, color, and video-workboard integration. In each case, the intent is to minimize marginalization.

4.1.3. Representation Exploration

The way users are represented can add or limit marginalization.

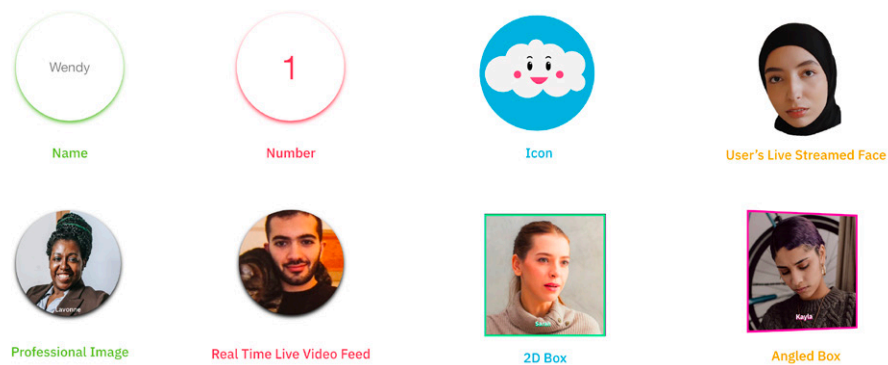


Figure 4.1.3.1. Different Forms of User Representation

Name: Name representation can be disconnecting on a visual front. "Put a face with the name" is called to attention with accessibility issues to users who need to visually connect with other users.

Number: Number representation can also be disconnecting from visual and human connections. People need the representation of whom they're speaking with in order to have rapport. Anonymity might not be the best option in this case.

Icon: Icon representation can also be disconnecting for visual and social human connections. Icon representation can secure anonymity and allow users a sense of privacy. Some users might want to hide their faces to feel more comfortable.

User's Live Streamed Face: Is connecting the audience to the represented user. However, the cut-out shape of users' heads feels abnormal and disconnecting to many environmental backgrounds and layouts.

Professional Image: Is connecting the audience to the represented user. However, there's still a disconnection. Similar to talking to a live cutout person with a speaker attached to the cutout, it feels abrupt and missing interactive quality connections.

Real-Time Live Video Feed: Is connecting the audience to the represented user. There are natural human qualities with seeing a person's motions and behaviors on a screen, vs a set image of that user. Conversations tend to flow naturally. However, this could make users feel invaded in their personal spaces.

2D Box: Are seen on common live stream video platforms. This layout is familiar to most users and connecting as their live video footage is seen in a real time format.

Angled Boxes: Might seem disconnecting on their own. However, the represented angled box is tilted towards a digital workboard and audience on the opposite side of the workboard as seen in the later figure 4.1.9.5. In a group setting, the angled box format is connecting the user to their workboard and cohorts.

4.1.4. Scale Exploration

Looking further into how a coordinated video feature can add or limit marginalization.



Figure 4.1.4.1. Scaling Conversations

Users' bubbles would get larger the more they talk in the conversation, and users' bubbles will shrink the less they talk within conversation.

This action could naturally encourage users to recognize who has more chances to speak over other users. This tactic might encourage users to talk more and allow a natural flow of "turn-taking". However, this could also create anxiety and pressure for users who are naturally shy.



Figure 4.1.4.2. Overshadowed Conversations

As users talk, if one user is constantly taking over the conversation, their bubble will start to cover other bubbles to indicate how much more they are talking.

This action is to encourage users to allow other users to have an equal chance to speak and share their ideas. It shows the explicit marginalization that could occur if a user is being limited to speak during meetings. However, conversation flow might be disrupted by the constant movement of bubbles.



Figure 4.1.4.3. Overemphasis

These are two scenarios of how user's live-streamed faces will grow and shrink throughout the conversation.

Similar to the other two scenarios, if a user is overpowering the conversation, their face will grow in size. As a user stays silent, their face will shrink in size. Overlapping will start to begin in conjunction with the scaling changes. The overlapping action could cause an inverse effect and cause ego-centered personalities to thrive off of being bigger than other members within the group setting.

4.1.5. Depth Exploration

Depth between the digital work board and the video space can show a connection or hindrance between the users and their workspace.

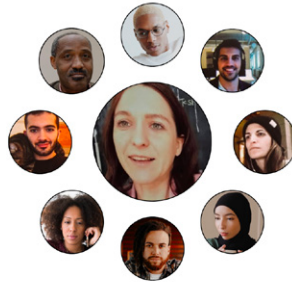


Figure 4.1.5.1. - Blended Outline

A basic outline around each video screen causes the view of the users to be too blended in within the digital workspace.

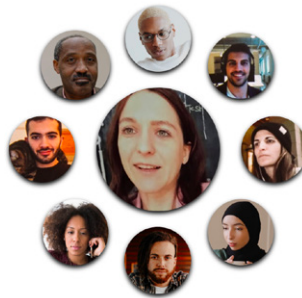


Figure 4.1.5.2. Shadowed Disconnect

A bold, dark shadow cast behind each user creates too much distance and depth to the digital workspace.

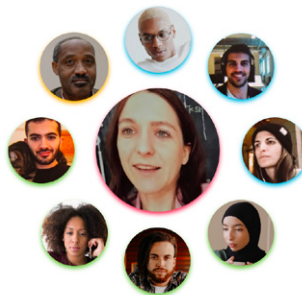


Figure 4.1.5.3. Color Connection

Glowing colors cast behind each user create a balanced separation to the digital workspace and a connection to each user. However, this would cause users to have to learn a new “design language essentially.”

4.1.6. Next In Line Movement

The “Next in Line” feature’s physical movement icons and bubbles can help users acknowledge other users’ turns within this space; however, this feature could also cause distractions.



Figure 4.1.6.1. Movement

The users waiting in line would be slightly moving around to indicate how a person might casually sway or move while waiting in a physical line.

The movement could be a big distraction, especially to anyone who has attention disorders. Another notion to this would be only to have the users moving during exchanges of speakers. For example, Ryan would move into Austin’s place when it’s his turn to speak, Austin would move into April’s spot and shift the user’s counter-clockwise one space. The exchange would help minimize distractions during active conversations.



Figure 4.1.6.2. Circular Arrow

The arrow would be motionless unless extend to accommodate users added to the “Next in Line” area.

This action signals which user is in front and behind other users who are in line to speak. The extension of the arrow might be distracting to users who have attention disorders but would be less distracting than the idea of constant movement. However, bubbles would still move when users exchange to speak and move next in line (the example was given in the Movement section.)

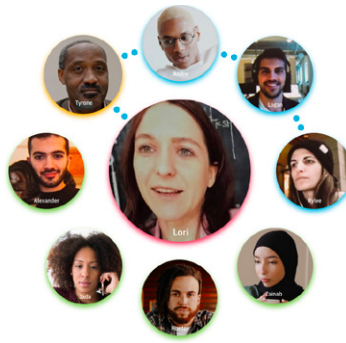


Figure 4.1.6.3. Connect the Dots

Connecting dots would represent the connection of users waiting their turn to speak.

These dots would not move, and more dots would appear or disappear depending on the number of users wanting a turn to speak. User bubbles would still move when users exchange to speak and move next in line (the example was given in the Movement section.)

4.1.7. Colors

The colors indicate the “taking turns” feature, and the active listening feature.

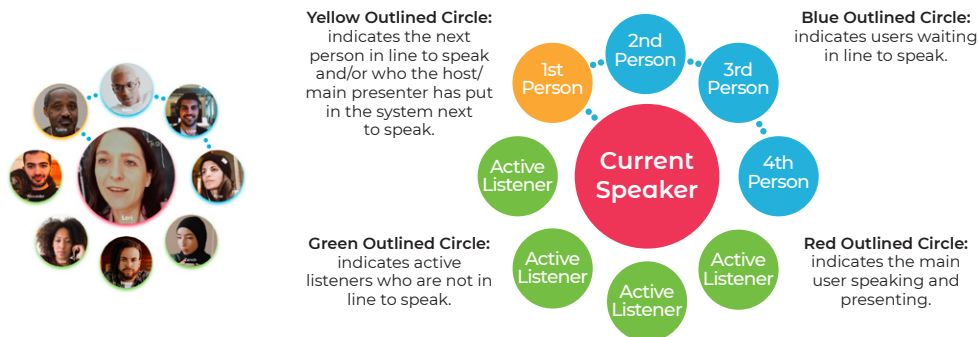


Figure 4.1.7.1. Next in Line Color Mapping

This is the visual mapping representation of the “Next in Line” feature. Creating a “next in line” or “turn-taking” function could help limit constant interruptions during the conversation.

If an individual tries to talk over another person, they will get muted, and there will be a small popup notification on their private individual screen with a “next in line” number. The outline of their circle will change color in the coordination of the “next in line to speak” color of the others’ individual screen outlines. Those users in line to speak will circle towards the top left part of the group circle and go in a clockwise direction of numbered order to speak on the group viewing section. Those not in line to speak will be in a different color from those in line to speak. When it’s the next person’s turn to speak, the current speaker’s circle will move outside of the inner circle with the outline color changed to those not in turn to speak, and the next person’s circle will move to the center to speak.

The host of the video chat session will also have a function to go back to the center of the circle to address any points of the conversation. They are also allowed to move individuals to speak if they have direct questions or statements for that individual. However, the rest of the participants cannot “cut the line” but can use the chat feature to type in questions and statements towards the host’s end. This action limits the interruptions and allows the host to see which questions and idea points are related to the conversation’s current topic.

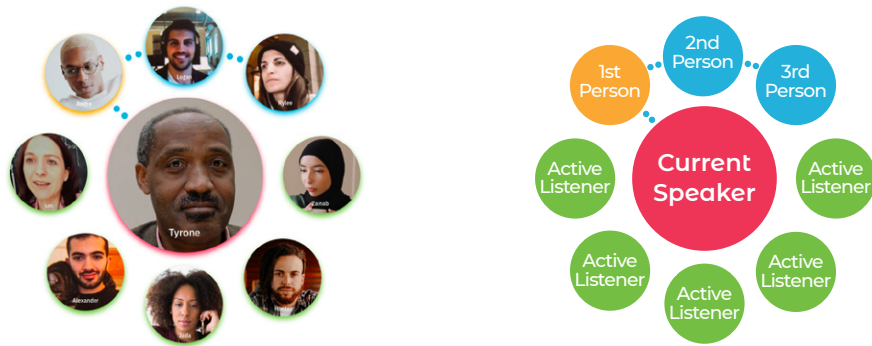


Figure 4.1.7.2. In Motion

Spaces will shift when one speaker is finished and the next person is able to speak.

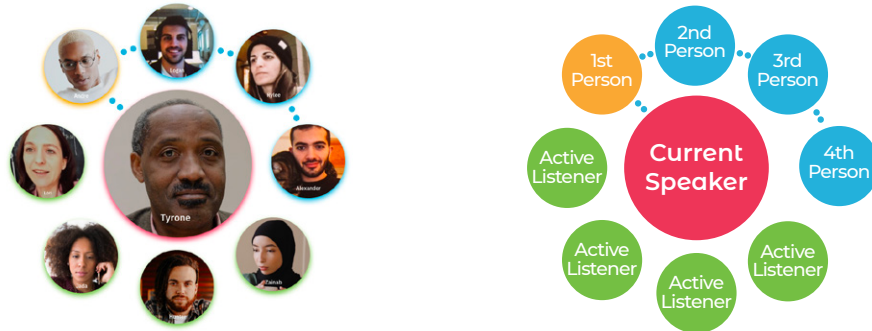


Figure 4.1.7.3. User Turn

If a user wanted a turn, their bubble will move from "Active Listening" to "Waiting in Line" and the connecting dots would extend.

4.1.8. Scale Exploration

Exploring how scale can foster empowerment to users who are often silenced.



Figure 4.1.8.1. Overemphasis

As users talk, their bubbles will grow and shrink based on how much of the conversation they are contributing to.

In this scenario, users who are unable to get a word into the conversation will naturally grow to give them more power to speak. However, some users who are naturally shy might have a sense of anxiety if they see their bubble grow. The slight growth could still encourage shy users to speak up. This also empowers non-shy users who aren't able to speak, the opportunity to speak as others see their bubbles grow. Shrinking bubbles calls attention to users who might contribute too much and encourages them to stop overpowering the conversation and gives a conversation turn to other users.



Figure 4.1.8.2. Overshadowed Conversations

As users grow to empower those silenced to speak up, bubbles move into hierarchical positions.

In this scenario, those who need a turn to speak will be towards the top in a clockwise position as our brains naturally connect to those positions in sequence. Those who are overpowering the conversation will be positioned towards the end of the clockwise sequence. The larger bubbles will slightly start to overshadow users who are overpowering the conversation, in order to empower them to be able to contribute equally to the conversation.



Figure 4.1.8.3. Scaling, Overshadowing, Overemphasis

Users who overpower the conversation towards the back of all the users, and push users who need a turn to speak towards the front so they are able to contribute.

In this scenario, the movements, scaling, and overshadowing would be extremely distracting for users to see bubbles constantly move. For PLC meetings, it's important for every user to be able to have the chance to speak and contribute to ideas. In moments of arguments, such as this scenario, this might make the environment awkward, but help others speak up to eventually distribute the power of the conversation evenly.

4.1.9. Combined Video and Workboard Visual Representation

Exploration with how a coordinated video feature can add or limit marginalization.

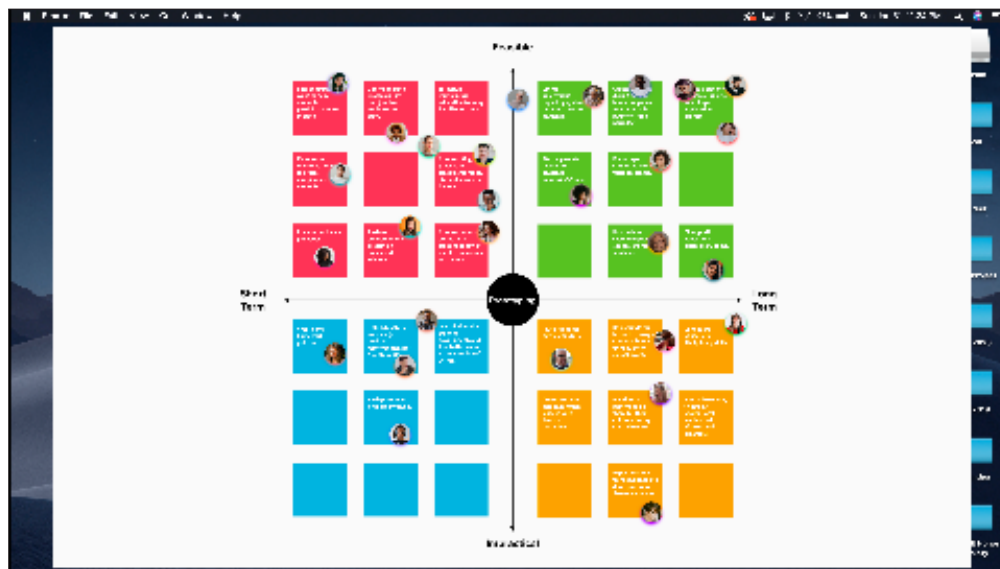


Figure 4.1.9.1. Live Video Cursors

User's cursors would be live video footage of them as they move around the board.

This scenario imitates how people move around a physical room. Users might have difficulty adapting to cursors moving in conjunction with live video from bubbles.

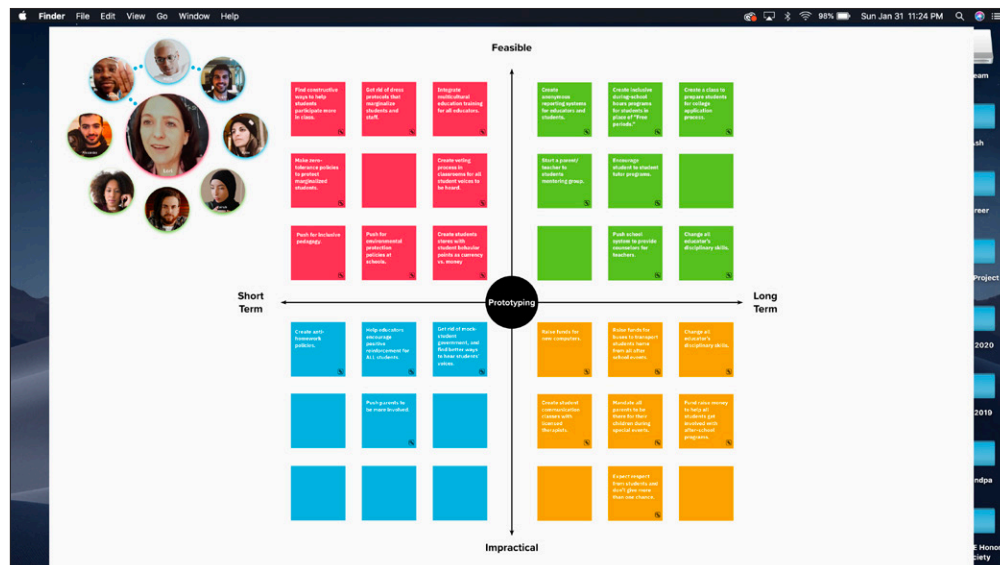


Figure 4.1.9.2. Circular Motion Display

The coordinated virtual video feature is placed at the top left corner of the screen, and sits on top of the digital workspace.

This scenario focuses on a “turn-taking” feature to help mitigate marginalization and empower all voices and ideas to be heard during PLC meetings.

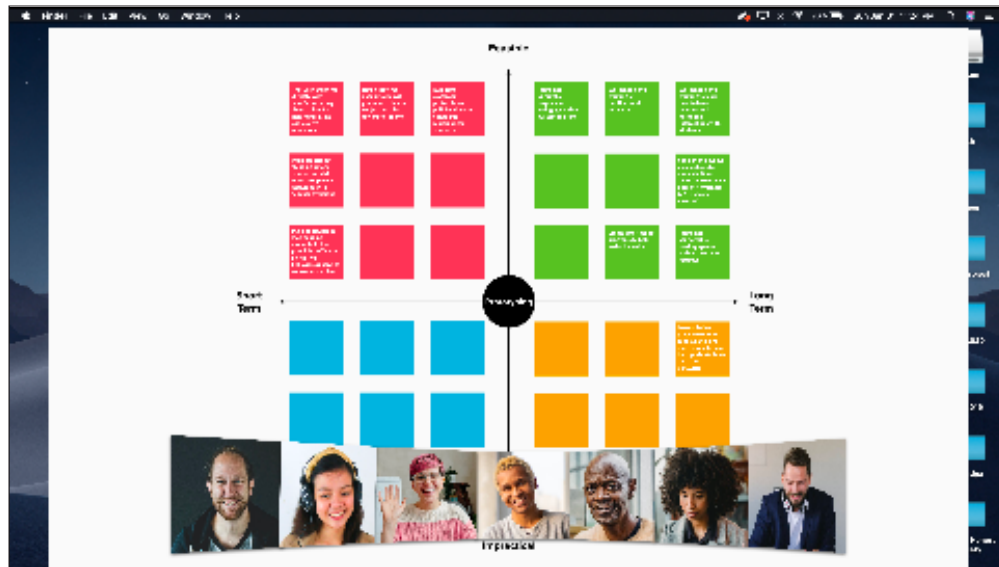


Figure 4.1.9.3. Theater Screen Display

The display gives users a sense of feeling as if they're in a movie theater.

This exploration was inspired by the idea of sitting 3D people in a 2D space, and users face each other as if they were in a 3D space (such as sitting around a table or sitting in a semi-circle). This can help connect users with their cohorts similarly to how people converse better sitting across the table from each other.

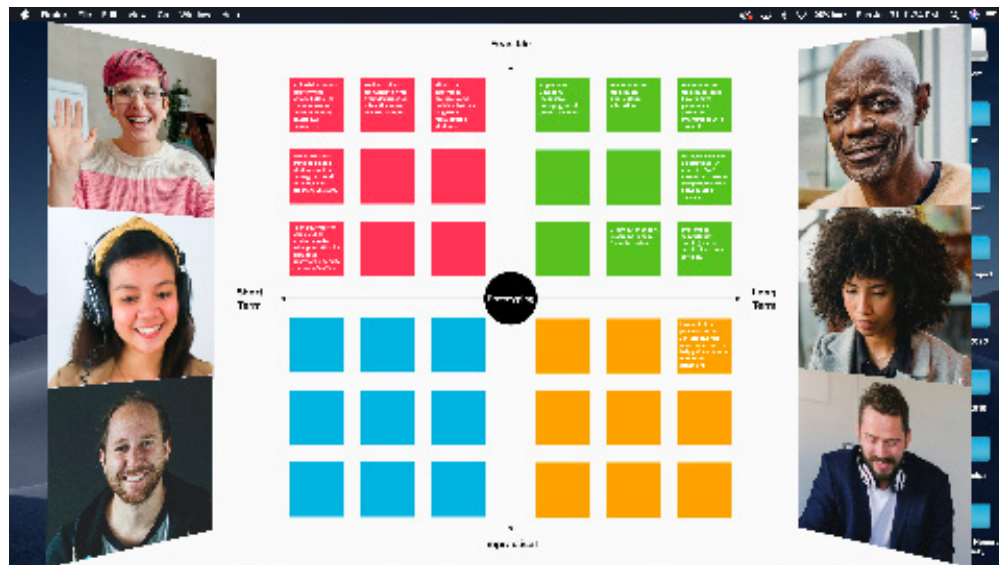


Figure 4.1.9.4. More Defined 3D Space

This display heightens the 3D space and angles users to view each other as if they were sitting across a table from each other, with the workspace being that table.

In this scenario, their cursors would be their displayed image taken at the beginning of the meeting.

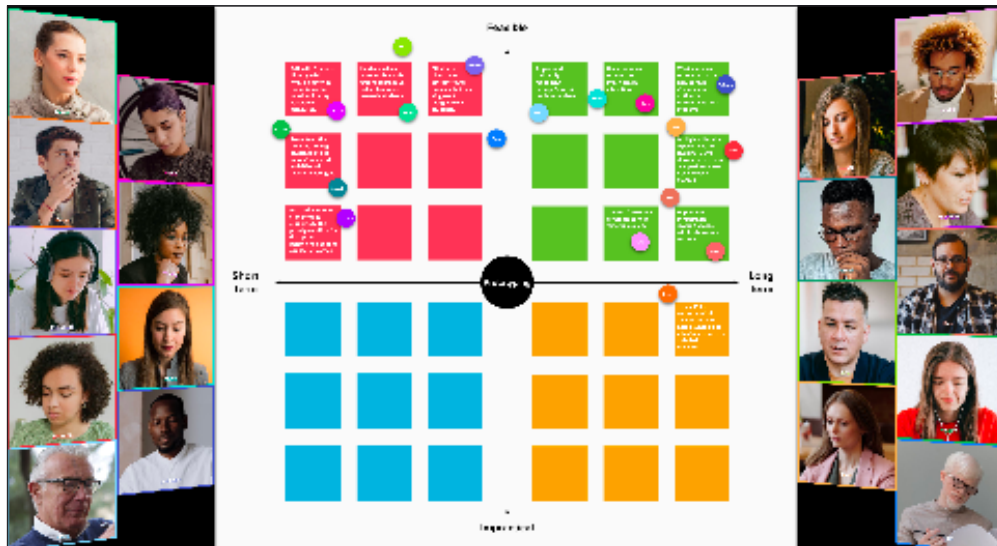


Figure 4.1.9.5. 3D Large Group

A PLC meeting that suits the needs of a larger staff has users' screens stacked on top of each other in this 3D scenario. Users' screens are highlighted in the color of their cursor. Users' cursors also have their names written in circular spaces, which allows users to face each other and collaborate on an enlarged workbook.

This design fully uses the screen space and doesn't force users to toggle between two screens. As the screens are turned slightly inward, this creates an illusion of a group being in a 3D room-type setting.



Figure 4.1.9.6. Interconnected

Users' screens surround their digital workspace.

The layout creates issues with the workspace being too small, although users would be able to zoom in if necessary. Users' screens are highlighted in the color of their cursor. Users' cursors would be their displayed image taken at the beginning of the meeting.

4.2. JUDGMENT

4.2.1. Exploration of how a messaging tool can create an environment for users to feel safe sharing their ideas amongst their peers.

How will a messaging tool enhance empathy processes between educators and their cohorts, and why?

Creating features that prompt constructive feedback from peers will allow users to have more collaborative accountability towards the tasks they need to achieve, rather than developing judgment and biases towards their cohorts.

One study found that users were not as willing to share their presence information, compared to using the feature that shows they have read messages that were sent to them or that they sent to their peers (Khalil, Ashraf, et al. 2019). Users that didn't want to use the indication of reading messages, wanted to reply on their own time, while other users thought it was important that their professional peers read and understood what was sent to them (Khalil, Ashraf, et al. 2019). A compromising alternative could be to eliminate the feature that shows if users have read messages, and use an icon that secures that the message was delivered.

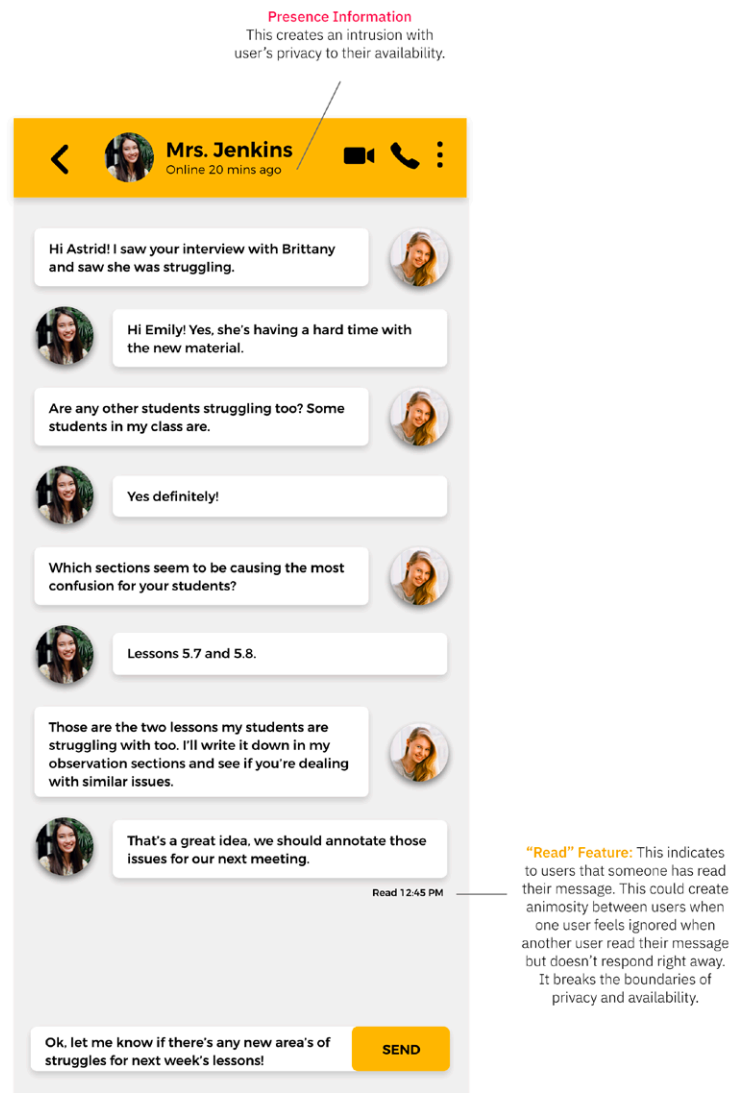


Figure 4.2.1.1.a. Rethinking Modern Messaging Layouts and Features
The elimination of presence information.

Eliminating the presence information feature that indicates if a user is online or offline, would allow users their privacy for their availability. Some users want to avoid confusion nor promote wrong expectations of their available time (Khalil, Ashraf, et al. 2019).

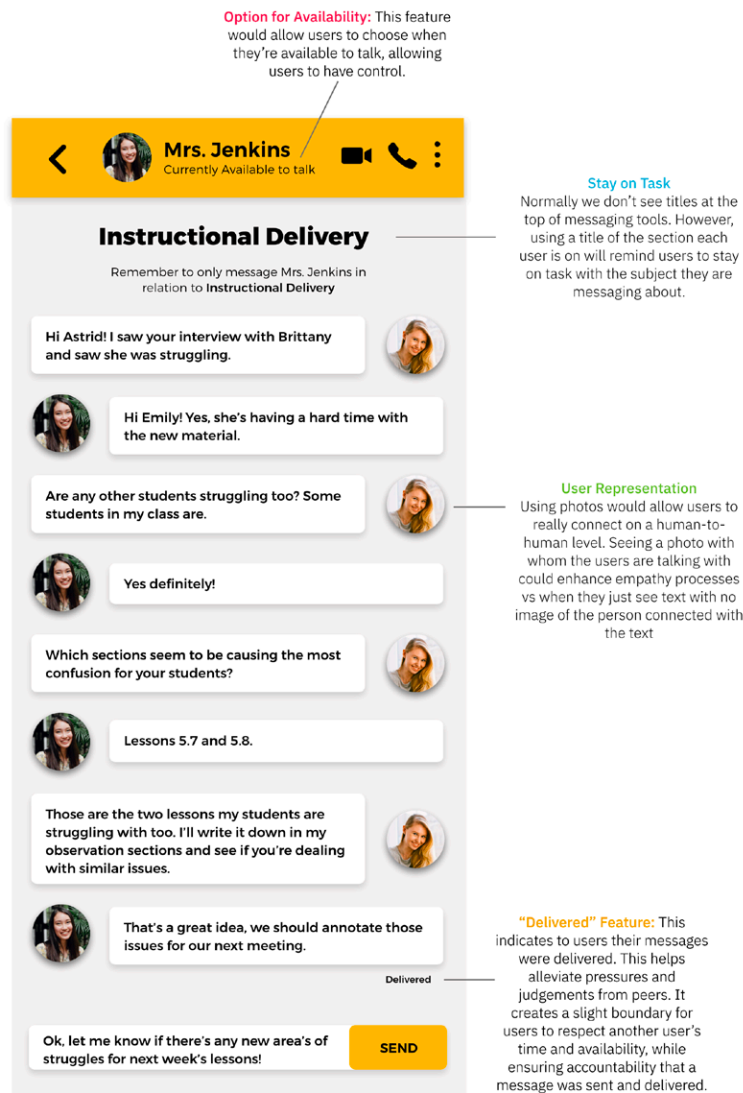


Figure 4.2.1.1.b. Rethinking Modern Messaging Layouts and Features
Online presence expectations.

Society has developed this expectation for users to respond to work-related messages when seen "online" when they might not be available. The expectations of work should be left at work, and users should not have societal pressures of having to respond to work-related messages on their off time. A messaging tool on a virtual platform for PLC meetings does not have a use for an indication feature of whether users are online or offline.

4.2.2. Storytelling the Scenario

Between meeting one and two during the student empathy data collection phase, when educators want to communicate their ideas with each other, they open their mobile apps.

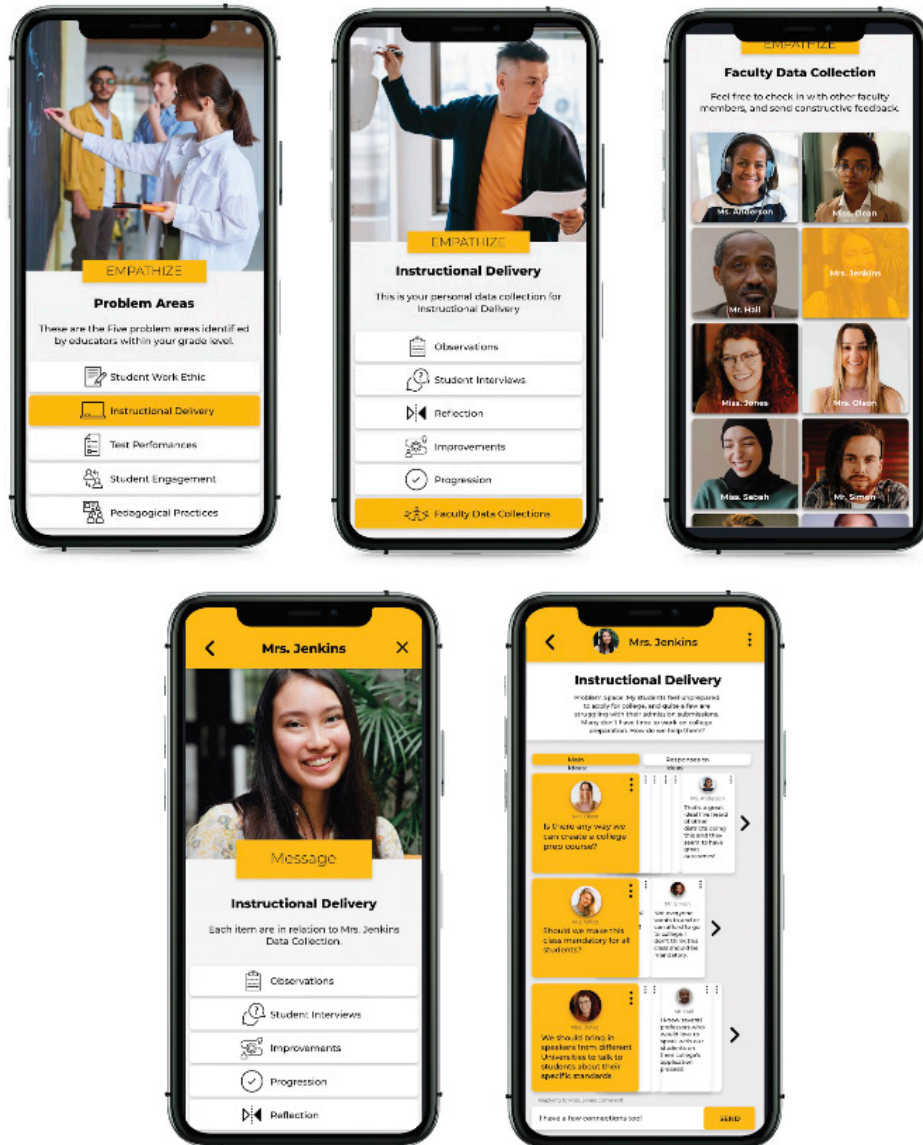


Figure 4.2.2.1. Re-image Messaging tools
Storytelling the new scenario.

Users pull up the “Problem Area” menu. In figure 4.2.2.1, they click on “Instructional Delivery.” They then click on “Faculty Data Collection” and find the educator they want to help contribute ideas with. They then click on “Message” to see that particular educators’ message group board for their specific “Instructional Delivery” category question. From that point the educators can contribute to the main ideas by posting a sub-question off one of the main ideas. They can also post their own main ideas based on the original educator’s question.

4.2.3. Problem Space

Users need to be able to define their problem space and ask others for their inputs and ideas within the problem space. This would be written out at the top of the mobile application.



Figure 4.2.3.1. Group Empathy Data Contribution Messaging Board

Group VS Individual Messaging Tool: The more hands-on and inclusive educators are, the more rich ideas will come! This messaging feature organizes content to make it easier for educators to collect empathy data to bring back to brainstorming phases. This messaging tool is more conducive to the organization of ideas rather than simply communicating.

Content Organization: In messaging apps, oftentimes ideas are not organized, causing a user to have to scroll through messages in order to see the original ideas. Users organizing their comments from Main ideas to Subcategories during data collection can become confusing. This feature in figure 4.2.3.1. automatically creates a guide for users to be able to record their main solution points and leave sub-comments for those ideas.

Creating organized content areas in group settings limits online workplace harassment through group accountability and user self-awareness. Although users cannot be forced to withhold personal judgments, guiding users to focus on the relatable content can limit users from influencing their personal judgments towards their cohorts.

Swipe Right to View: Within Figure 4.2.3.1. In order for users to view sub-comments to the right of the main ideas, users will swipe right to pull each “card”. This movement creates a natural flow motion for the users, as most users naturally pull mechanical features within mobile devices.

4.3. SAFETY AND COMFORT

4.3.1. Exploration of how the structural forms of comment sections can create a sense of safety for users and allows them to feel comfortable when interacting with their cohorts during high school PLC meetings.

Does hierarchy, content display, and user information play crucial roles in user safety and interaction?

Privacy is important on a virtual platform. Users generally have the natural inclination to feel safe and secure when using any online platform. However, with the variety of different virtual platforms comes the multitude of different ways virtual platforms have tried to create privacy settings and features. Some of these settings and features can help users hide personal information to secure their privacy but also allow users to share their information to improve their communication with their peers (Rashidi et al., 2016; Staddon, 2009). Users unintentionally share their private information and activities on social media platforms (Khalil, Ashraf, et al. 2019). However, doing so can lead to serious consequences such as job loss (Rashidi et al., 2016; Staddon, 2009).

Creating privacy features within comment sections on a virtual platform for PLC meetings is crucial for creating a safe space to foster ideas without judgment and to enhance empathy processes. Building in privacy features can allow users to feel comfortable sharing their ideas without compromising their safety of workplace harassment when sharing their raw initial ideas. If anonymity is created for all users within these spaces, it can also open the door for online workplace harassment as users aren't able to identify who could potentially harass them.

4.3.2. Content Display, User Information, and Hierarchy



Figure 4.3.2.1. Empowering Original Ideas

The focus on original ideas.

Hierarchy of content can empower original ideas to stay in the forefront of educators' minds during brainstorming sessions, so their original ideas aren't lost behind sub-comments and ideas. Hierarchy and user privacy safety tools combined can also contribute to marginalized voices by covering up the identity of the original commenter with identities of sub-commenters.

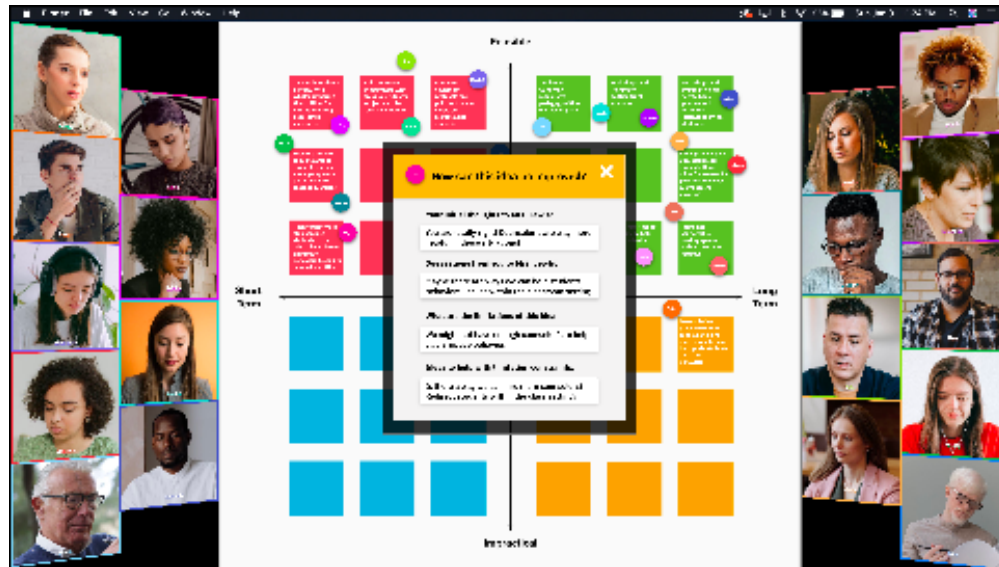


Figure 4.3.2.2. Guided Prompts

Every time a user wants to comment on the work board, a prompt box would appear to help guide users to stay on task. The prompt boxes will also ask if the message being written is following the constructive feedback guidelines provided.

Some examples of those guidelines would be but are not limited to: How can this be improved? What is helpful with this idea? What are the limitations of this idea? What are some alternative options? Suggestions and Limitations? These prompted questions would enhance empathy with positive reinforcement within the communications processes between users. Prompt boxes could help improve communications between users by limiting open-ended interpretations to suggestions users are making to their cohorts. They could also give users opportunities to enhance empathy with positive reinforcement and stay professionally accountable. These prompt boxes also allow users to connect as a team by building off of each other's ideas and feedback, which brings forth the supportive essence of what PLC meetings are about.

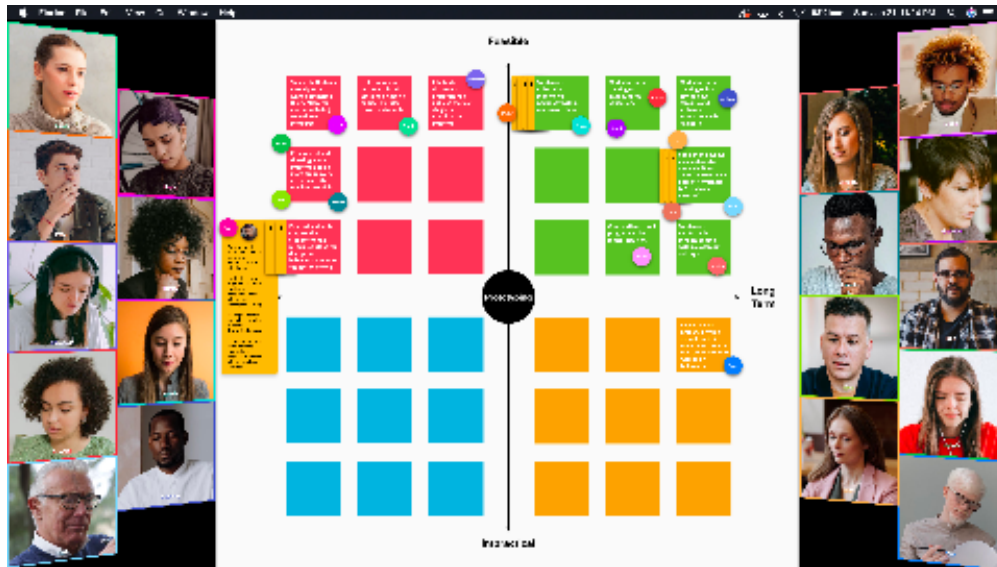


Figure 4.3.2.3. Stacked Comments

Scenario One: Users click on the three-dot menu to pull the comment sections to view.

The stacked comments create not only an organized content display of ideas but also connect the users as a team when communicating with feedback. The initial commenter's identity is hidden to allow users to feel more comfortable posting initial solutions when ideating. However, sub-comment feedback shows the identity of commenters so they stay accountable, helpful, and on track with their feedback.

In this hierarchical design, the person who gives the original origin of an idea might be overshadowed by the secondary commenters. Despite this design trying to be encouraging to users to share ideas without judgment by not revealing the original commenter's name nor face, the secondary commenters' faces appear. This means original commenters won't receive credit for their ideas and contributions. Other commenters might also judge other cohorts for not contributing enough, by not seeing their cohorts' faces on their original main ideas.



Figure 4.3.2.4. Stacked Comments

Scenario Two: Users click on the pencil box and stacked comments appear. The comments are organized the way they were written within the prompt box in order to keep track of subcategories.

Although this scenario is well organized with keeping track of ideas, it can create a messy visual appearance on the work board space if too many comments are clicked at once.

In a hierarchical sense, the last commenter stands out the most and is overshadowing the other commenters. In a scenario where a cohort might not have been paying attention and contributed at the very end of a brainstorming session on multiple original ideas, that commenter's face will be seen the most and thought to be the one contributing the most. When in reality, the other commenters below their comment had contributed equally and if not more than the last commenter.

4.4. EQUITABLE AND ACCURATE STUDENT EMPATHY DATA

4.4.1. Exploration of virtual voting tools and why they need to be anonymous.

How can this tool help guide professional educators in defining their classrooms' educational needs? How can this tool help educators determine what kind of equitable and accurate type of student empathy data?

4.4.2. Anonymity

A voting tool can be used to keep educators on track with each task at hand while organizing data to create accurate results. Anonymity is important to integrate within voting tools. Peer pressure creates stress and inaccurate results (Falchikov, 2004). Anonymity reduces the sense of peer pressure, anxieties towards failure, and creates positivity towards cohorts (Vanderhoven, E., Raes, A., Schellens, T., Montrieux, H. 2012).

4.4.3. Voting Prompts

The voting tool could help educators define their educational needs by giving prompt boxes for educators to fill out data and sort the data into categories. These voting prompts would be used for the following areas: exploring shared issues, determining the types of empathy data to collect, helping educators define their Needs Statements, brainstorming solutions, and determining which solutions should be tested within the classroom setting.

4.4.4. Exploring Shared Issues

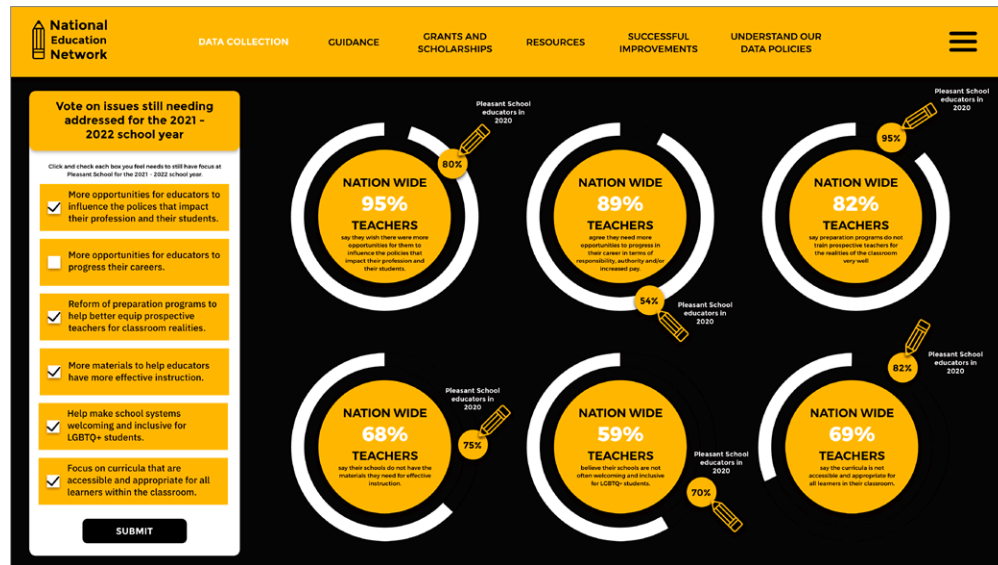


Figure 4.4.4.1. First time using Human-Centered Processes and Empathetic Design at PLC meetings

A system would present overarching pain point themes from a national school network system.

Educators would vote on whether the presented issues are pain points they have seen within their own school, and if these pain points need to be addressed. A voting tool would show a prompt of generated general pain point topics. Then educators would be able to submit specific issues within the general pain point areas of discussion. Educators would then vote on types of student empathy data to collect.



Figure 4.4.4.2. Past meetings

In conjunction with showing nationwide overarching pain point themes, the system would also show the top pain points from that particular school's prior year.

Showing the school's pain points from the previous year would help educators see if these issues were resolved post the prototyping sessions, and if they still need to be resolved. These topics would be voted on to see if they need further addressing.



Figure 4.4.4.3. Voting During Ideation

Once educators have ideated ideas for their brainstorming sessions, the virtual voting tool would be used to vote for educators' top solution ideas to focus on for their prototyping stages.

The virtual voting tool should be used to help guide educators to determine the final solutions they would implement within their classroom settings. The data would be sent out on a national level through an educational network that would keep the user's personal information private but show the educational system the common challenges schools face across the nation.

5. DISCUSSION

5.1. DESIGN PRINCIPLES

Through this investigation, I used the design concepts of human-centered processes and empathetic design, while conceptualizing the designs of coordinated video platforms within digital workspaces, group messaging tools, structural forms of comment sections on digital workboards, and virtual voting tools. These design concepts and features intended to help guide educators to follow step-by-step phases for creating empathetic curricular plans within high school Professional Learning Community Meetings. The following principles emerged from this investigation.

Empower those who are Marginalized within Design Spaces. Designers should design with purpose. The most fundamental design concepts using scale, depth, visual representation, placement, color theory, and hierarchy can all play a role within marginalization. Designers should not take fundamental concepts for granted and should make sure these concepts help empower users who are marginalized. Designers can empower those who are often silenced within video platforms and digital workspaces through fundamental design concepts. They can empower ideas that are often overlooked but are needed within spaces such as Professional Learning Community Meetings. As I visually explored study one, I saw how different fundamental design concepts had contributed to marginalization, even concepts that I tried to create in order to mitigate marginalization had sometimes added to it. The contribution to marginalization was especially seen in Figure 4.1.4.3 (p. 30). as I explored the concept of enlarging an ego-centered person; I realized the inverse consequences of creating a negative emotional response of “feeling small” to those who represented marginalization within that study. By readjusting my mindset from initially drawing attention to those who overpowered the conversation, to giving power to those who might be marginalized, there were fewer consequences.

Virtual Video Displays Should Open Communication. Toggling back and forth between digital work boards and video platforms can hinder communication processes. This activity can limit empathy processes between educators and their cohorts during virtual brainstorming sessions when they are not able to work and see each other. Virtual video displays as seen in Figures 4.1.9.4 (p. 39). and 4.1.9.5 (p. 40). show how opening the communication between educators as they collaborate creates a connection between educators within their workspaces. It also creates an illusion of a physical collaboration room while they are within a virtual space.

Design with User Safety in Mind. Users need to feel safe and comfortable within any online space. The concept of safety and comfort can allow users to open up their ideas within digital workspaces. Designers are able to use hierarchy and design content displays to help users feel safe in their digital spaces. Anonymity can be helpful when creating comfort and safety for users, but it can also hinder accountability and create an environment open to harassment.

Designers must look at the limitations of anonymity. Anonymity does not have to function as an “all or nothing” concept. As seen in Figure 4.3.2.3 (p. 50), designers can purposely use anonymity in specific areas to help keep users safe as they share their initial ideas, but then remove anonymity to create a safe space and hold accountability.

Guided Prompts can Enhance Empathy with Positive Reinforcement. Guided prompt boxes can help users reimagine their feedback in constructive ways during brainstorming and ideation sessions. By holding users accountable for their shared feedback, guided prompt boxes can also enhance empathy processes through positive reinforcement as users share feedback. The prompts given in Figure 4.3.2.2 (p. 49), gives the same constructive feedback guide for everyone to follow, which shows users what to expect with the forms of the feedback given, and limits the notion of someone trying to actively harass another colleague. However, harassment could still happen within these formats, so designers will still need an anonymous reporting feature.

Virtual Voting Tools Must be Anonymous for Accuracy. Peer judgments and pressures can cause inaccurate results when voting on ideas during Professional Learning Community Meetings. Virtual voting tools must remain anonymous for the user's safety and accurate results during every deliberation process. As seen in Figure 4.4.4.1 (p. 53), empathy towards educational issues can be created through the use of anonymous voting tools at the classroom level as well as the wider national level, e.g., through an educational network. Educators' voices can be seen and heard through the visual results of deliberation processes.

5.2. FUTURE WORK

All of the key design concepts and creations were limited from the lack of user testing due to the Covid-19 pandemic. Every concept would need to be tested through several iterations to understand the limitations and successes of these ideas. Although extensive research was the foundation of these concepts, these concepts are also limited to my interpretations and design ideations. Outside of user testing, a diverse design team collaborating on these ideas for future works would be ideal. Human-centered processes and empathetic design is based on the collaboration processes of diverse teams and groups.

These design concepts were centered around digital platform spaces for Professional Learning Community Meetings. I would be interested in learning how and if these design concepts could be used during in-person meetings, as most educational environments will move to in-person meetings after the pandemic. Nevertheless, there will always be schools using virtual platforms and virtual Professional Learning Community Meetings. All of these design concepts and explorations can be explored further.

During the visual exploration of how messaging tools can create environments for users to feel safe sharing their ideas among their peers, I saw how limited my solutions and ideas were from my influence of current messaging technology displays. Although I tried to push the boundaries of an organized group messaging feature, I would be interested in how messaging tools between one individual and another could create safe environments to share ideas. There is an inclination to redesign current messaging tools in which users have dealt with multiple safety issues and pain points since the creation of these tools. There could be further exploration on whether the foundation of messaging tools can be completely redesigned to address and limit current safety issues and pain points.

The exploration of how voting prompts could guide professional educators to define their classroom educational needs is a concept I would like to investigate further. All educators should have a voice during deliberation processes that affect their teaching practices and students. A notion that a network could connect educators across the country to share similar pain points and concerns, as well as solutions to shared pain points, would foster improvements within the educational system. The system could enhance empathy processes and allow educators to open the conversations to inclusiveness and diversity within their brainstorming and ideation sessions. Diverse group collaborations bring more ideas to the table, as well as outside perspectives that can bring insight within shared educational pain points. These voting tools can also include student voices within Professional Learning Community Meetings, as many deliberations and decisions affect their learning outcomes and classroom environments. These concepts can be explored further. Based on research these concepts are needed within the educational space. Designers can play a huge role in the creation of this networking concept if they collaborate with educators who are knowledgeable in this space.

5.3. CONCLUSION

Designed digital spaces can guide professional educators to follow step-by-step phases for creating empathetic curricular plans during high school Professional Learning Community Meetings.

Data, research, and investigation should be the foundation of any designed tool, otherwise designed tools can lead to further marginalization of silenced communities and unsafe digital environments.

There is a great need for an educational networking system that could enhance communication and empathy processes between educators within a classroom setting with other educators across the nation. This concept started within a voting tool space, but could also greatly benefit educators in their collaborative efforts.

The investigations gave insight into the multiple possibilities digital platforms present for guiding educators through human-centered and empathetic processes. This investigation further points to future work within this educational design problem space, and designers could pursue these investigations further with the collaborative efforts of a diverse team of designers and professional educators. The design concepts resulting from this investigation show how empathy processes and human-centered design are greatly needed within educational collaboration platforms.

6. REFERENCES

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