

## **Sensing school community needs: a co-designed, personalized mental health app for high school students, parents, and staff**

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The need to scale proven approaches towards the mental health care of students in under-resourced, urban public school districts grows increasingly urgent. To help address this challenge, we are developing Connectd for Schools, a mobile app aimed at providing personalized digital and local resources towards the mental health needs of high school students, parents, and teachers in large, urban school systems. The app builds on an established community partnered participatory approach to the design, development, and deployment of resilience-focused prevention interventions for school populations, co-designed by school and academic partners. This novel approach is designed to deploy a personalized and localized privacy-preserving, community sensing technology within a large, urban public school setting to three distinct audiences, with the potential for improving linkage to established behavioral health care pipelines. Along with the opportunities of this app come some challenges: scaling participatory design, the potential for mislabeled data, and community trust. The release of Connectd for Schools will occur in Fall of 2022; we share how we got to this point, and the next steps ahead.

CCS CONCEPTS • Applied computing • Law, social and behavioral sciences • Psychology

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## 1 INTRODUCTION

Students enrolled in under-resourced, urban public school districts often experience a higher than average level of adverse childhood experiences (ACEs), such as child abuse or witnessing domestic or community violence [14]. These stressful life events can result in emotional and behavioral problems and are also associated with negative school outcomes, including higher absenteeism and lower grades and graduation rates [6]. Furthermore, since the COVID-19 pandemic, the level of stress experienced by students in under-resourced communities has been compounded with unprecedented financial and health impacts and disruption to their education, school routines, and socialization. Emerging research demonstrates heightened mental health problems and risk for suicide among youth during the pandemic [9].

In certain communities, schools are an ideal hub to provide mental health, health, and social services to students and families who face increased barriers to care [8]. Schools have begun adopting whole-school, multitiered systems of support, including delivering school-wide preventive interventions. However, few schools have the tools necessary to address the stress and trauma that students in under-resourced communities often experience.

One particular classroom resilience intervention, the FOCUS Resilience Curriculum (FRC), has been shown to improve social and emotional well-being, especially empathy and problem solving. [5] During the pandemic, this curriculum was found to be feasible and acceptable in its online delivery to students and parents in a large urban school district, by school clinicians, who were guided by the UCLA staff that developed the techniques [12]. While delivering the FRC has been helpful, there has been an inherent challenge to scale its deployment, customize its utility within a particular school, and personalize to the role (student, parent, or staff) and specific needs (e.g., mental health, social determinants of health).

To address this challenge, we are developing the Connectd for Schools mobile health app. Our work builds on past experience developing a highly configurable health app platform [2] to capture the mental health status of patients and families, while providing access to on-demand digital resources. We previously deployed the platform to veterans with PTSD and their families [1, 4], health care workers at risk for burnout, and prospective foster families. Each of these are communities with specific needs related to mental/behavioral health. Connectd for Schools is the latest variation, focused precisely on the unique and diverse needs of high school students, school staff, and parents.

This paper describes our work as we reach a key milestone: the pending deployment of the app to its first set of high schools. We describe how we took a community-oriented, participatory design approach within a common architectural template. We also discuss the opportunities and challenges of this type of school-based wellbeing app. We also describe how our system lends itself to future iterations that can build on continued community feedback, and how the app could potentially address a major challenge: safely routing the most worrisome cases to existing behavioral health care pipelines.

## 2 APPROACH

### 2.1 Community Partnered Participatory Design

We leveraged a *community partnered participatory design* approach [3, 10] when building the app, which included school staff (authors JA, CT) as part of the content design team and input from administrators, students, staff, and parents throughout the app development. In contrast to approaches where technologists huddle and then release something for others to use, the emphasis of this community partnered participatory design is on including community members from the outset, incorporating both their feedback and actual artifacts (e.g., resources), to help shape the app in ways that make it compelling and relevant for that community stakeholder. The overall idea is to design something that the community actually wants and needs – versus hoping that the community will simply adopt what is designed. In the case of our application, participatory design activities have included:

- Historical collaboration in local schools between mental health researchers, school officials, parents, and students.
- Coordination with key school system advisors to help make certain choices about content and application features. Two members of our team have decades of experience working in school systems.
- Including video stories from actual parents, teachers, and former students (filmed with consent)
- Showing design prototypes to student and parent focus groups, to gather feedback and ideas for new content.

These participatory design activities played a key role in defining the application template described below, building on decades of partnership between UCLA and local schools/districts to which we will deploy the app. We are committed to gathering new resources, pathways, and ideas from student, parent, and staff focus groups and co-designers in the future.

## 2.2 Application Architecture

Connectd for Schools is a cross-platform mobile application that operates on a highly configurable and adaptive platform that enables content developers to deliver resources on demand or via push notification. Once we deploy, the system will use natural language processing (NLP) and collaborative filtering techniques to identify increasingly relevant content. We can roll this capability out gradually because the app obtains content feeds from an adaptive, cloud-based service.

Each deployment of the application is an independent *configuration* of a common “application template”, infused with the results of the participatory design process. The template consists of: onboarding questions, behavioral health related check-ins (e.g., wellbeing), thematic pathways, a library of digital and directory-style resources, and a schedule of notifications (resources, check-ins, affirmations/inspirations, etc.) Instances of the application vary per school, per role (student, staff, or parent), and language. For example, the English version of the app for students at school X will be different than the Spanish version for parents at school X, and likely different than the English version of the app for students at school Y. While this approach allows the app to be very context-aware and sensitive to the needs of its user, it does present a configuration management challenge for the content team.

Over time, the app will gradually learn how to personalize for that particular user using NLP and collaborative filtering techniques. For example, if the student chose to view a pathway about communication and browsed a category on grief, the app might recommend content based on those terms/phrases (i.e., locating those phrases in other content). To do this, an analysis component will use a standard *tf-idf* cosine similarity technique for content similarity detection, and this will allow us to provide a set of resources (or even a whole pathway) personalized for the user. Similarly, the app could recommend a previously unseen / new pathway to a student based on other students who demonstrated similar interests (i.e., user-user collaborative filtering).

All data to/from the app is securely transmitted via REST API to a cloud-based service that stores and manages such information. No personally identifying information (PII) is transmitted, as the app is used anonymously. The content and organization of the app is driven by the API; the idea is that the images and other types of contextual information the user sees are indeed important in terms of engagement and relevance, and so those can be custom per user role, school, and language. Retrieval of content via API also allows the application to automatically evolve as new content is developed and relevant resources are identified. Our team of content/domain experts simply add new assets and associate it with one or more school communities; the cloud-based API can then immediately route this to the app.

### 2.2.1 Pathways

A pathway in the app is a thematic grouping of resources, stories, tips, and take-aways in a deliberate order. The goal of a pathway is to explain why a subject is important, provide a real story so that the user is engaged and can relate, offer a set of tips to help users address the challenge, and then leave the user with a set of concise takeaways. For example, Figure 1

shows a pathway we constructed for students called “In my feelings” It starts off by describing the topic and why understanding your emotions are important. Scrolling down a bit reveals a student-recorded video – the story part of the pathway - shown in the right side of the figure. The goal here is to better engage users with a peer-oriented story (i.e., students are likely more interested in listening to other students, not to adults). The pathway then includes tips and takeaways that offer solutions. The last tip and initial takeaways for the “In My Feelings” pathway is shown at left in Figure. At right is the same pathway (thematically), but for parents (and in Spanish). Our pathways cover grief/loss, managing emotions, feeling calm, building social support, and getting better sleep.

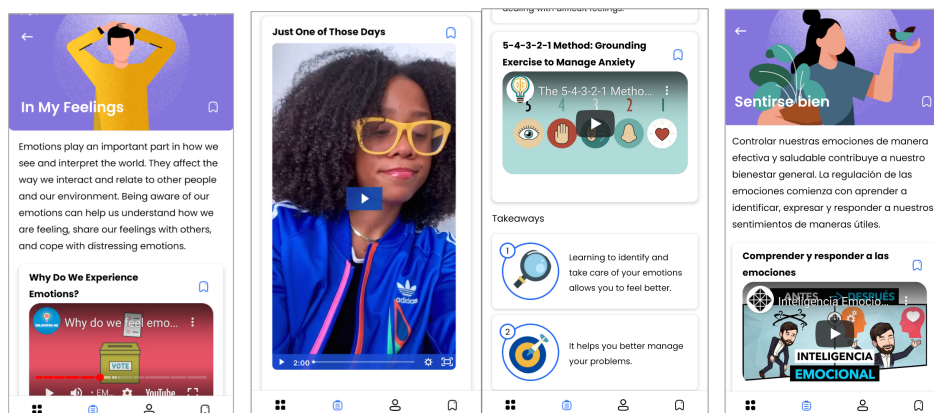


Figure 1: Sample pathway from top to bottom, with Spanish version at far right

### 2.2.2 Check-ins

As with other types of data, Connectd for Schools allows for a customized set of check-ins to be deployed to various schools, roles of users, and languages. The initial check-ins we have built cover Wellbeing (based on the WHO-5), Sleep (based on a PROMIS sleep screener), and Community Health (based on a Social Determinants of Health screener)

A check-in works as follows: the Connectd for Schools cloud component sends a scheduled push notification to each user when a given check-in should be issued. Each check-in asks a short series of questions, and ends with an evaluation (green, yellow, or orange), before following up with specific tips and suggestions on how to address issues the check-in may have revealed. A few screens from our wellbeing check-in are shown below.

The app contains a wide array of digital resources that can be utilized when recommending solutions for the user, based on their check-in score, including videos, websites, documents, audio (e.g., meditations), and so forth. These can be drawn from our generic wellbeing library or customized based on the district/school.

Similarly, the app contains a “directory” of local resources, much like a traditional phone book. Note that recommending specific local resources becomes more actionable for mobile phone users – in particular - because the user can easily leverage app/phone features to call or get directions/navigation to the facility – immediately. Furthermore, directory resources can also be highly localized; for example, one of the first schools we will deploy to has provided us with a list of resources (e.g., food security), which we can include in the app, just for that school.

A key consideration of check-ins is who to send them to and how often. For now, we have decided that we will rotate the sending of the WHO-5 and the PROMIS every few weeks, and send them to all users. In contrast, the Community Health screener does not necessarily make sense to deploy more than once or twice in an academic year (we are still

debating this) and is not necessarily appropriate for students (so we will avoid them for now), based on the types of questions (which can imply home ownership, etc.).

### **3 OPPORTUNITIES**

#### **3.1 Inferring needs of school communities**

Collecting wellbeing and related check-in responses from students, parents, and staff allows schools, districts, and others to better understand the aggregate needs of a school community, even in real-time. For example, a wellbeing survey given to staff might detect a decrease in overall wellbeing for staff, and this may be tied to a particular event at the school (e.g., a stressful event on campus); school officials can potentially quantify the magnitude of the problem and possibly address the issue more quickly or more precisely than without knowing that information. The fact that staff could understand that the administration is “aware” of their stress may be helpful (i.e., “they understand us”) and increase morale, while reducing conflicts. This type of anonymous, aggregate data can allow administrators to allocate needed resources more effectively.

It is important to note that resource utilization is an indirect form of sensing community needs. For example, if a videos on grief or a social media risks pathway are very popular resources in the app at a particular school in the past few weeks, that school can focus on providing more app-based and in-person resources that help address the interest and potential issue, and the app can potentially detect the effects of such interventions. For example, if social media bullying resources are popular within the app, the school can potentially provide greater in-school support and communication on that topic to students and their families. Such awareness has been previously shown to be insightful in projects like StudentLife [13]

#### **3.2 Highly personalized resources to promote self-care**

Connectd for Schools represents an opportunity to deliver a highly personalized experience based on user role, language, school, onboarding questions, and actual use. This mainly benefits the user: we provide relevant resources for the user, even at the outset – just by knowing which school, which language, which role, and the answers to the onboarding questions. Not only do we know what resources might be relevant, but we may be able to compute what orderings of resources would be most relevant; since the number of resources can be large, and screen real-estate is at a premium, this can be a significant benefit. Getting as much information “above the fold” can potentially lead to higher engagement.

It is important to note that the personalization extends beyond the resources themselves. The check-ins and notifications can also be driven on a personalized basis. For example, if the app consistently notices that check-ins about sleep provide no worrisome results, such check-ins may be asked much less frequently. Similarly, the notification schedules for the app can be highly personalized; if the app identifies that a particular user likes to complete check-ins or investigate pointers to resources most times, then the notifications can be inferred to be desirable, in contrast to a user who never taps on them. For this latter user, perhaps push notifications are minimized, to reduce possible annoyance.

#### **3.3 Safe handoff to behavioral health care pipelines**

A huge potential opportunity for an app like Connectd for Schools is to help route students, families, and staff to care. The app serves as a first line of awareness. It allows users to self-serve, explore, and engage in casual screeners which can help administrators sense the needs of the community. However, for serious individual cases, the app can also be a bridge to established care pipelines, and provide immediate background information to health providers, so that those providers are not starting from scratch. Thus, the app represents another opportunity to route those who need care to trusted providers.

For example, consider use of the app by Martha, an 11th grader at school. She is currently being harassed by other classmates on social media because of her relationship with another student at the school. Her stress, anger, and despair increase with the harassment, and she becomes a risk for self-harm. If Martha has access to the app, she may one day (earlier in her situation) receive a push notification about “managing relationships”. This piques her interest because of its relevance and the app provides a pathway that provides resources. The app also decides to send a check-in about relationships and social networks to anyone who has explored that pathway. Martha takes the check-in, and it results in a concerning score. Martha does nothing at the time, but as the harassment continues, she remembers the app and looks in the directory for possible resources. She sees a listing for a crisis center and the app offers to connect her to the center via phone or email. When it does, the app can ask for Martha’s consent to transmit her information, and only then ask if she wants to provide her name (or remain semi-anonymous).

Enabling users to store personal health interests and data in the app without co-locating it with personal information (e.g., name or email) provides security for the user and potentially allows them to be more open/honest in their usage. Longer term, we have developed a range of ideas about how this anonymous information can be used to guide the user towards the most relevant care providers, and – when/if the time is right – enabling the user to safely transmit that data.

## **4 CHALLENGES**

### **4.1 Scaling participatory design**

Ideally, the actual software design would also have included direct input from parents and students, not just school staff. However, it is challenging to include more roles earlier in the process because of the time required to schedule and include them at various points of design, and also – in particular for students – to engage them during the academic year. With a longer timeline and proper consent (for students), it would be interesting to consider how the application might be different.

To balance timeline/consent/consistency concerns, we instead chose to develop a common application template with the help of our academic partners and core school staff, and then solicit content feedback (in focus groups) from specific users of different roles as well as from school system officials. We received feedback from 9 students ranging from 9<sup>th</sup>-12<sup>th</sup> grade who were representative of the population that will be served by the app at the partnered school. We also received feedback from parents of students in a focus group conducted in both Spanish and English. Doing this allowed to also seek validation on the template we devised, but did not close the door on feedback to this template. For example, a daily affirmation/inspiration notification, suggested by students, is being added to the application based on their input. Students and parents also suggested ideas for future pathways and requested Spanish translation for their student peers in the future.

The challenge scaling participatory design also relates to the level of personalization we wish to offer. The more context-aware the app is (sensitive to roles of users at various schools), the more stakeholders we need to include. At some point, certain patterns will emerge, but it is nevertheless challenging to manage a large amount of community input on app design.

### **4.2 Device usage / mislabeling**

Another issue we have encountered is the impact of having multiple users share devices. Ideally, every user would use the app on a single device. This would mitigate many of the “sensing concerns” related to anonymous use. We could collect a rich set of data on a single device, even though we do not know who that person is, and this could allow the app to perfectly capture user needs and interests.

Unfortunately, users do sometimes share devices, particularly in under-resourced communities. For example, many families do not have their own computers, and many school-aged children do not own their own phones, despite the

apparent ubiquity to those less experienced in working with these communities. Making matters more confusing is that devices issued by the school district, such a Chromebook, might be used by both parents and student. This introduces potential data mislabeling issues; is the check-in being done by the student or by the parent?

### 4.3 Anonymity and community trust

Although we provide an anonymous, self-serve experience, it is not clear how much users actually *trust* the app to keep their information secure and de-identified. In discussion with school officials, there was concern about the onboarding questions indirectly revealing the person. Users are not technical experts and just because we do not ask for a username and password does not prevent the community from suspecting that we are secretly monitoring them. This may be a barrier to use, reduce responses to check-in prompts, and so forth. It is not clear how to achieve that trust.

We ultimately may need to survey the community to better understand perceptions about the app. Perhaps better onboarding information or endorsements by agents of trust (community members) can better mitigate these suspicions. While technologists may be able to be easily assured of privacy/protection features because of their technical background, it is a separate matter to prove that to users.

## 5 CONCLUSION

We have described Connectd for Schools, a mobile mental health app that helps provide resilience-oriented resources to students, parents, and teachers, as a way to mitigate the behavioral health needs in a large urban school system. The app is highly configurable per the school needs, and personalizes content based on role, language, and interests.

Our work on the app thus far illustrates the promise that such an app represents as far as community sensing, personalization, and handoffs to established care pipelines. However, it comes with the challenges of scaling participatory design, dealing with data labeling issues, and the hurdle of true community trust. Our hope is that we can achieve the best of all possible worlds: real-time, privacy preserving school community sensing, a relevant, self-care app for every role we serve, and a mechanism that ultimately promotes better preventative care and handoff to trusted pipelines of care.

Connectd for Schools is a work-in-progress, and we recently received approval to release to an initial set of schools. We anticipate that several other schools will start using the application during Fall 2022 before considering a wider deployment in Winter and then Fall of 2023. The experience of these initial schools will help inform the relevant districts/officials on the feasibility of the rollout and the feedback/perceptions by students, staff, and parents.

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