Can Bullying Detection Systems Help in School Violence Scenarios?: A Teachers' Perspective

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Abstract

The advancement of technology has paved the way for sophisticated school violence detection and intervention systems. Existing researches, however, have come short of reflecting the goals and contexts of the target users: teachers, students, and parents. Therefore, we conducted interviews with 35 teachers about school violence and technology adoption. While there was wide consensus on the necessity of technology, the teachers pointed out the possible adverse effects of its adoption: greater burden on teachers, privacy concerns, and consequences of inaccurate algorithms. Based on the findings, we derived design implications in the stages of data collection, decision making, and data conveyance. These design implications could make a contribution towards shaping the design of school violence detection and intervention system from the teachers' perspective.

Author Keywords

User Centered Design; Wearable Computing; Education; School Violence; Thematic Analysis

CCS Concepts

•**Human-centered computing** → **User studies; Empirical studies in HCI;**

Introduction

Traditionally, physical bullying was recognized as a primary type of school violence. However, the prevalence of social networks and smartphones made our society witness a new form of school violence, *cyberbullying*. Through the anonymous nature of the internet, it is even more difficult to trace the perpetrators of cyberbullying [3].

At the same time, the advancement of machine learning technologies and wearable computing opened up new potential for a sophisticated school violence detection and intervention system (e.g., behavioural sensing and emotion recognition). Many researchers have tried to adopt these technologies to confront school violence, mostly focusing on students [1, 4, 5, 7, 8, 9, 10, 11]. However, we believe that teachers constitute another important target users for a school violence detection and intervention system. Because the teachers are the first persons to make a decision about the situation and subsequent intervention, it is important to reflect their perspectives into the design of such systems.

To help guide the user-centered design of a school violence detection and intervention system, we interviewed teachers to learn the way they detect/intervene school violence cases and their opinions about the adoption of technologies. To extract knowledge from the answers, we applied thematic analysis method [2]. Based on the results, we derived the design implications for school violence detection and intervention system from a teachers' perspective. We categorized design implications into data collection, decision making, and data conveyance process.

Related Work
Technical approaches to school violence
The majority of prior works on cyberbullying [7, 8] applied natural language processing on social media data. However, privacy concerns are inherent through the use of such methods, especially regarding the exposure of sensitive information about the users.

Existing works on leveraging users' motion data with action recognition to detect school violence episodes have predominantly focused on physical bullying [10, 11]. Also, researchers explored the possibility of adopting emotion recognition technologies, mostly based on heart rate and galvanic sensors [4, 5, 9]. The application of emotion recognition in the area of school violence is still in its early stage. Despite this, since the victims' negative mental states (e.g., anger, contempt, and fear) are most likely associated with school violence, emotion recognition has the potential to be leveraged as an important method for detecting school violence.

Brahnam et al. proposed a design of bullying detection/alert systems [1]. The suggested system leveraged various technologies, such as wearable computing devices, mobile devices, and state-of-the-art machine learning models. However, to improve the usability of the system, it is essential to take into account the opinions from its target users, which is not sufficiently addressed in the work.

Methodology

We interviewed 35 teachers about school violence. Based on the previous researches in the field of school violence, we identified five possible technologies that have the potential to mitigate school violence, such as wearable computing, indoor/outdoor localization, audio capturing, action recognition, and emotion recognition. During the interviews, we explained each technology to the teachers and recorded the teachers' opinions on them.

Participants We interviewed four elementary, thirteen

middle, seventeen high school teachers, and one former teacher (21 women, 14 men; age 27-60; experience 1-36 years; 2 Germans, 33 Koreans; all teaching in South Korea). Thirty teachers have experience as a homeroom teacher.

Procedure This study was approved by the university institutional review board. Then we sent recruiting documents to school principals. After recruiting participants, we conducted semi-structured interviews in their classroom or office. Due to time constraints, we conducted a group interview with 15 out of 35 participants (2-3 participants per session, a total of 6 sessions). We asked them about the school violence inside/outside of school, their detection/intervention methods, and obstacles to coping with school violence. Also, we explained the five possible technologies that can be used to detect school violence and asked for their opinions. After finishing the interview, we had a debriefing session, and each participant was rewarded with $8.6 (₩10,000). The entire study for each participant lasted for about an hour.

Data Collection We recorded every interview in an audio file. As a result, 22 hours of audio data were collected from a total of 26 sessions. We transcribed each interview based on collected audio data.

Analysis We used a thematic analysis method [2] to extract the themes from the 26 interviews. Three coders repetitively read and refined the transcripts. They generated initial codes from the interviews using open coding. Then, they clustered the codes to find patterns and create themes.

Result
We collected 26 interviews and extracted 11 themes (Table 1). We focused on recurrent codes in the interviews. Each theme appeared in at least half of the participants' answers.

Relying on indirect indicators and students' reports
The majority of the teachers made suppositions based on the students' external cues (e.g., facial expressions), their own experiences, and intuitions. Then, they verify the bullying incidents by using the report of the victims or their classmates. P18 and P33 said, *"If I happen to sense a strange atmosphere among the students when I get into the classroom, I call the children and ask what happened."* Another participant remarked, *"I could figure out students' mental state through their facial expressions."* (P22). Nevertheless, there are cases where the character of the student is rather introverted. In these cases, it becomes more difficult for teachers to identify bullying episodes. P32 remarked, *"I remember one case where everyone thought they were best friends, but after several years, we happened to find out that the child was actually involved in a severe bullying episode.".* Also, due to the prevalence of smartphones among students, it is challenging for teachers to detect and intervene in school violence by solely relying on indirect indicators. P24 said, *"Nowadays, students make usage of SNS services daily, so it is even more difficult for us to notice bullying incidents."*

Indirect over direct intervention
Some of the teachers explained that direct interventions could evoke adverse effects on the students. Students may react sensitively and feel that teachers do not have confidence in their abilities to solve the situations. For this reason, teachers showed a cautious attitude towards direct intervention. P15 mentioned, *"When I walked up directly to the victim and said, 'Hey, you have a problem.' it was not well received by the student since it makes an allegation towards her. Consequently, she lost trust in me as a mentor."*

Most teachers preferred indirect methods. They gently approached the students and tried to find possibilities to listen

Themes	Codes
Conduct of consultation	Having a teatime with students, Gently approaching student, Ask opinions of other teachers
Depend on observation	Observe class atmosphere, Observe facial expressions
Receiving reports from students (victims or classmates)	Ask the classmates, Report from the victims
The imbalance between work and life	24 hours shift, Inner conflict, Privacy intrusion, Increasing stress
Difficulty of noticing student's mental problem	Introverted, Difficulty of self expression, Suppression of feelings
Passive observer rather than an active conciliator	Wait and see, Do not take sides, Problems solved by students, Leave problem
Physiological responses of mental states	Eating disorder, Speak less
Exclusion from group activities	Skipping meals, Having difficulty to find team
The expression of mental states	Depressed facial expression, Steadily lying on the desk
Unusual behaviors	Frequent absence, Late to school, Poor academic achievements
Strange atmosphere	No responses from classmates at the time of presentation

Table 1: Extraction of 11 themes that describe teachers' intervention methods, their relied cues, and encountered obstacles

to them. P16 reported, *"When I sense that something is wrong with the student, I begin to observe her a little more. Honestly, immediate intervention is not always desired by teachers. Oftentimes, I let some time pass and wait and see."* P32 also said, *"I first try to see, is there a possibility that the students can resolve the problems by themselves. If not, I intervene directly."*

Teachers' reactions towards technologies
We asked for the teachers' opinions about the five technologies (Table 2). Usually, wearable computing devices, such as a smartwatch, are considered as an unobtrusive method for collecting sensor data. However, teachers evaluated that wearable computing devices could be actually thought of as an obtrusive approach to students. Participants also pointed out the high price tag of the device and the possibility of damage.

The teachers agreed on the usefulness of action recognition. However, they remarked a gradual decrease in physical bullying. Instead, the frequency of verbal and cyberbullying increased. Consequently, teachers showed interest in emotion recognition as a reference for consultation and as an indicator of verbal and cyberbullying incidents. At the same time, they pointed out that emotion recognition may cause privacy concerns among students and parents. Participants also expressed their concerns about the negative effects of incorrect recognition of emotion.

Technologies	Opinions
Wearable Computing	Obtrusive, Expensive, Concerns about breakage or loss
Action recognition	Rather less useful
Emotion recognition	Useful, Creepy, Privacy issue, Labeling effect, Concern about the accuracy
Indoor/outdoor localization	Familiar, Practicable for children
Audio capturing	Useful, Privacy issue

Table 2: Teachers' general opinions about technologies

Additionally, they said tracking the location of students appears to be more applicable to primary school children. In contrast, the middle and high school students would not likely accept the exposure of their current location to their parents. Therefore, the localization technology may not be applicable for students of higher grades. The teachers were not disinclined to the collection of audio recordings if there were consents. They mentioned that with the aid of audio data, it is possible to make a direct judgment about the current situation of the student.

Noticeably, the teachers voiced concern that the adoption of technology might place an additional burden on them. As a result, the teachers were uncertain about the adoption of the technology for school violence detection and intervention: *"I think teachers will encounter an extra burden if the school violence detection and intervention system which integrates these technologies is introduced (e.g., Sending too many notifications and a full exposure of the students' sentiments)."* (P17). Likewise, the teachers expressed their anxiety about the possibility that the system can be used as a piece of evidence for a lawsuit towards them. Also, the students' parents might use the data provided by the system to accuse the teacher. For example, P24 said, *"I am concerned that this system will be used as evidence to hold the teacher accountable in litigation."* P26 also stated, *"If the parents receive a warning notification or look through the data of their child, they might accuse or criticize us for not intervening at that time."*

Discussion and Design Implications

The purpose of our study was to develop a better understanding of the teachers' perspectives towards technology adoption to mitigate school violence. We found that they mainly rely on indirect indicators to detect school violence. Also, the teachers preferred indirect to direct intervention

methods. Notably, we found that the teachers acknowledged the necessity of technology to tackle school violence. However, the teachers were concerned about the potential adverse effects of adopting such technology. This coincides well with the stated result [6] which reported teachers' negative attitude towards the usage of technology in the classroom. Based on those results, we derived proper design implications for a future system.

Considerations on data collection

To apply school violence detection and intervention algorithms, data collection process should be preceded. The usage of a wearable device constitutes the most desirable way to collect data from students to apply to technologies. However, teachers pointed out that the current off-the-shelf devices are too obtrusive and expensive. These drawbacks may expose victims to bullies or deepen the inequality between rich students and poor students even more. Therefore, the wearable device for the system should be inconspicuous to other students. It is desirable that these wearable devices should be unobtrusively placed under the clothing. Also, the price of the device should be affordable for students and should be durable.

Also, the participants expressed their concern about the possible adverse effects of biometric data collection. They agreed on the fact that leveraging biometric data and machine learning techniques could help to make a more accurate judgment about school violence situations. Despite this, the leakage of data may cause privacy concerns in the views of students. Therefore, consent from the parents and students is needed, and dealing with students' sensitive biometric data requires high carefulness and attentiveness.

Considerations on decision making process

Despite machine learning techniques demonstrating reasonable accuracy, participants highlighted the imperfect-

ness of technology. The teachers were anxious about the usage of the system because they might run into undesired situations due to improper interventions. Since these inappropriate interventions could lead to devastating consequences, some of the teachers remain skeptical. Instead, teachers preferred to have the authority to make the final judgment regarding issues revolving around school violence. They insisted that an adequate grasp of the situation should precede an intervention. In this context, it is not desirable that a system put pressure on the teachers and force them to intervene. Instead, to make more precise decisions, the school violence and intervention system should rather be utilized as a reference system and convey essential information to assist the teachers' decision-making process. Also, instead of just utilizing the result of the system as an ultimate basis for decision-making, the teachers' experiences and the information provided by the system should go hand in hand.

Another important design implication is not to place further burdens on the teachers. The teachers pointed out that oftentimes, there is an imbalance between work and life due to their high responsibilities. Participants were anxious that the adoption of technologies might place additional burdens (e.g., intrusion into their private life and increased stress). Such burdens could act as a significant hindrance to mitigate school violence. In this context, determining the appropriate moments to send the warning signals is one of the most crucial issues of developing a detection and intervention system. However, in the case of severe situations, there is a necessity for the system to notify the teachers.

Considerations on data conveyance

To support the teachers' decision-making process, the school violence detection and intervention system should convey necessary information (e.g., mental states, actions, locations, and surrounding sounds) as user-friendly visualizations. The teachers showed a positive reaction to the visual representation of students' mental state to make a proper judgment about school violence situations. Despite this, the full exposure of these data could cause privacy concerns in the views of students and parents. Therefore, the system should only expose partial information about the students to the teachers. Exposing students' mental state in an abstract way (i.e., showing the duration of negative or positive emotion of a student and aggregation of the emotions in the class) could demonstrate a feasible approach to reduce the privacy concerns. By demonstrating a partial representation of the students' mental states, it would be most likely sufficient for the teachers to make a judgment about the school violence situation.

Conclusion

We interviewed 35 teachers to extract design requirements for a school violence detection and intervention system. We extracted design implications that can be applied to the future system. Our next step will involve developing a prototype based on the insights obtained in this research. During the interviews, the majority of teachers pointed out that students, parents, and teachers might have a different view. In this sense, we are planning to conduct interviews with students and parents as well to reflect their opinions about school violence detection and intervention systems.

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