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Pause, Reflect, and Redirect: An Approach to Empowering Youth to Be Safer Online by Helping Them Make Better Decisions

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Abstract: Stakeholders from parents to policy-makers are concerned about youth online safety. Present solutions are frequently punitive and often lack opportunities for youth to make mistakes and try again in a safe environment. This paper proposes a new framework, based on trauma-informed child psychology models and research by computer scientists and human-centered design scholars, entitled Pause, Reflect, and Redirect (PRR). The PRR framework offers three levels of intervention ranging from casual engagement to coached engagement with crisis response. To further develop and validate PRR as a framework, PRR was implemented within a web-filtering software that was installed in a public middle school comprising grades 6 to 8 (i.e., ages 11–14) in an urban charter district. Preliminary results from the deployment of the software suggest that it may help youth make better choices with respect to their online behaviors.

Keywords: adolescent online safety; parental control; decision making; education technology; artificial intelligence

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1. Introduction

Adolescent online safety is a priority for many worldwide, from youth and parents to educators and policy-makers (Caddle et al. 2024; Akter et al. 2024). Problematic Internet Use (PIU) has long been an issue for youth. Spada (2014) described PIU as excessive or poorly controlled preoccupations, urges, or behaviors related to internet use leading to impairment or distress in daily life. More recently, scholars have argued that PIU is not merely a behavioral addiction but a multifaceted impulse control issue with cognitive, emotional, and social dimensions (Schimmenti 2023). These patterns manifest in behaviors such as compulsive browsing, exposure to inappropriate content, online aggression, or disengagement from real-world responsibilities—behaviors that may have both immediate and long-term consequences. Since the rise of online schooling and restrictions prompted by the COVID-19 pandemic, with youth and their adult ecosystem navigating a more digitally centered life than ever before, PIU has increased (De France et al. 2022). Previous studies demonstrated the connection between PIU and adolescent mental health and wellbeing (Caplan 2010; Restrepo et al. 2020). Pappas (2021) noted that adolescents regularly exposed to explicit adult content online were up to three times more likely to be the target or perpetrator of dating violence in real life. The danger is especially acute for populations who are already vulnerable, including Black and Indigenous youth, youth of color, and minors in foster care (Badillo-Urquiola et al. 2017). Many existing approaches to mitigating PIU incorporate punitive restrictions or broad content blocking, which often fail to address the root causes of the problem or foster long-term self-regulation (Sweigart et al. 2025).

In contrast, this paper proposes a developmentally appropriate, trauma-informed, and psychologically grounded alternative to traditional punitive approaches. By intervening in real time and inviting reflection rather than shame or punishment, this approach aims to support adolescents in building the internal capacity to make safer, more thoughtful digital choices over time.

Despite evidence of the antecedents and consequences of PIU, the solutions to it remain limited. Current approaches to managing internet use rely heavily on blocking access and restricting use (Vargas et al. 2019). These punitive measures do not address the underlying issue—that PIU is primarily an impulse control disorder (Shapira et al. 2003; Schimmenti 2023)–and, as such, do not change behavior. Existing parental control software applications tend to treat every infraction with the same level of severity (Ghosh et al. 2020). Further, these systems frequently report data about youths' internet use to parents, teachers, and school administrators with limited or no context, potentially exposing youth from vulnerable groups (e.g., gay and transgender youth) to harm (Policy Statement of the Federal Trade Commission on Education Technology and the Children's Online Privacy Protection Act 2022).

Compounding the challenge of finding a solution, much of the research on this topic to date has been conducted in limited geographic areas (primarily the United States), with over 80% of the data self-reported by teens (Pinter et al. 2017). Pinter et al. (2017) further noted that less than 2% of the data analyzed in peer-reviewed studies come from educators; more than 85% of the existing studies consider only a snapshot in time with no longitudinal data; and often, researchers do not address the intersection of various risks, with most studies factoring in a single risk from a limited set, such as cyberbullying or exposure to pornography. A lack of design input from youth, behavioral health specialists, and educators has also hampered attempts to combat this problem (Ghosh et al. 2020). The need for more research and public policy initiatives in this space is clear and present, as is the need for evidence-informed tools that support youth in learning to safely operate in an increasingly online world (Ammari et al. 2015).

The purpose of this paper is to propose a new framework that integrates trauma-informed child psychology models with research by computer scientists and human-centered design scholars. This interdisciplinary approach seeks to create digital tools that prioritize the psychological safety and well-being of youth in online environments. The framework is demonstrated through its implementation in a software application designed to enhance online safety and engagement for adolescents. Students provided feedback on initial design provocations that were incorporated into the software application. The application was deployed in an urban charter middle school environment, where it was tested to assess its effectiveness in fostering positive digital interactions and supporting students' emotional and developmental needs.

2. Foundational Frameworks

Researchers have identified essential behavioral skills that contribute to youth online safety.

2.1. Safety Strategies for Youth Online

Wisniewski et al. (2017) proposed the Teen Online Safety Strategies (TOSS) framework, which highlighted the importance of addressing the underlying elements that contribute to unhealthy online behavior by teens. Skills related to emotional intelligence—self-awareness, self-regulation, and situational awareness—are crucial. Tools intended to promote adolescent online safety must begin by building up the abilities of teens to understand their feelings and reactions to online content as well as the nature of the content itself and its

unspoken agendas. Pairing the TOSS framework with a trauma-informed approach to behavior correction offers a potential approach to supporting youth in using the internet beneficially as part of their schooling.

2.2. Trust-Based Relational Intervention (TBRI)™

Most evidence-informed models in clinical child psychology are focused on therapeutic interventions and activities (Lawton and Flynn 2022), making it challenging to translate them into an online environment. Trust-Based Relational Intervention (TBRI)™ is a trauma-informed child psychology framework that provides a means for adult caretakers to connect with youth on a level that fits the severity of the offending behavior and fosters an environment where youths can continuously try to improve their behavior (Purvis et al. 2011, 2013). Although Purvis et al. (2009) created TBRI to be used by adult caretakers in face-to-face interactions with youths exhibiting situationally inappropriate behavior, the framework's structure allows it to be integrated into a software workflow. TBRI has four levels of intervention: Level 1—Playful Intervention; Level 2—Structured Engagement; Level 3—Calming Engagement; Level 4—Protective Engagement (Parris et al. 2015; Purvis et al. 2014, 2015).

Playful Intervention is the first level of TBRI, and is designed to keep interactions open. Rather than having a caretaker issue a declarative statement that a child has done something wrong, it encourages a slightly tongue-in-cheek response such as, "Are you asking me or telling me?" (Parris et al. 2015). Interestingly, this type of approach is something that many parents do with their children naturally. The TBRI framework aims to have approximately 80% of all problematic behavior addressed at this level. The second level of TBRI is known as Structured Engagement. Purvis et al. (2013) intended for adult caretakers to use this approach in response to youths who do not modify behavior as the result of a first-level, playful intervention. The adult caretaker should respond more firmly by acknowledging the persistence of the inappropriate behavior and offer the youth an opportunity to redo the behavior or to disengage from the situation. The third and fourth levels of TBRI address threats of violence and violent behavior on the part of youth in real life (McKenzie et al. 2014). Figure 1, below, depicts the 4 levels of TBRI.

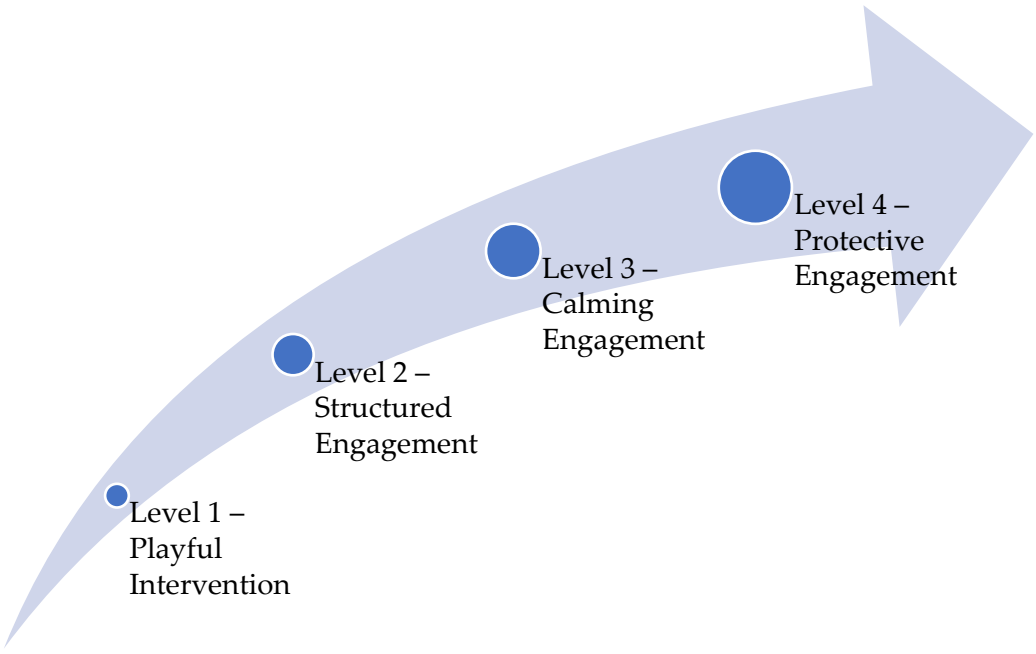

Figure 1. The 4 levels of TBRI.

2.3. Theoretical Foundations for Behavior Change

In addition to TBRI, which provides a foundational trauma-informed approach, other theories of learning and behavior change are essential to consider when formulating a comprehensive framework to support youths in making better decisions online. Social cognitive theory highlights the importance of self-efficacy (Bandura 1977, 1986, 1991). For meaningful change to occur in the online habits of youth, they must believe they can make better choices when it comes to their use of the Internet. Offering youths immediate opportunities to try again without stigma or automatic punishment may provide a way to support them in practicing self-efficacy.

Additionally, constructivist learning theories suggest that that youths actively build knowledge through interaction with their environment (Ültanir 2012). This supports the idea that behavior change is best fostered by cultivating environments where youths can actively construct meaning from guided, real-time digital experiences. The theory of progressive education emphasizes that learning is most effective when youths engage actively with real-world experiences and are given opportunities to reflect, experiment, and grow within environments that support autonomy and moral reasoning (Dewey 1938). In the context of youth online safety, this might look like allowing youths to make mistakes in a low-stakes digital environment and learn from real-time feedback. Piaget (1952) posited concepts of assimilation and accommodation, suggesting that learning occurs when youths encounter new information that either fits into their existing understanding (i.e., assimilation) or forces them to revise their mental models (i.e., accommodation). Incorporating elements of this approach could include providing contextually relevant, in-the-moment interventions, creating better conditions for cognitive adjustment. Similarly, the theory of the Zone of Proximal Development asserts that learning happens most powerfully in the space between what youths can do on their own and what they can achieve with adult guidance (Eun 2019; Mueller and Fleming 2001; Vygotsky 1978). Mirroring this scaffolding through a model that offers increasing levels of support aligned with a youth's needs and developmental readiness may support online behavior. Considering approaches that empower youth, as espoused by educators like Maria Montessori, also offers insight. Montessori believed that youth thrive when given structured independence and the chance to correct their own behavior through exploration in prepared environments (Montessori 1967; Ültanir 2012; Weinberg 2011). Rather than simply telling youths what not to do, a system that promotes online behavior change might incorporate a core Montessori principle: that self-discipline emerges through supported autonomy.

3. Bringing TBRI into Online Safety Software

We propose Pause, Reflect, and Redirect (PRR) as a framework that translates the principles of TBRI, along with insights from constructivist, developmental, and motivational theories, into the online safety arena, supporting youths through guided reflection, social scaffolding, and experiential learning. PRR has 3 levels of intervention: Level 1—Casual Engagement; Level 2—Coached Engagement; and Level 3—Crisis Engagement. These levels align with elements of the four levels of TBRI and draw on the key skills required by adolescents and identified in the TOSS framework. By providing opportunities to learn through feedback, knowledge sharing, and dialogue with trusted adults, youths are empowered to make better online choices in the future. These interventions conform to what the TBRI framework presents as the "IDEAL response" (Purvis et al. 2013, p. 375). For engagements to be impactful, correction must be linked to the behavior in real time; be directed at the behavior and not the youth; be measured and proportional; and offer an immediate opportunity for a redo, providing an opportunity to try again in the moment. Figure 2 presents the 3 levels of PRR and their correspondence with the TBRI framework.

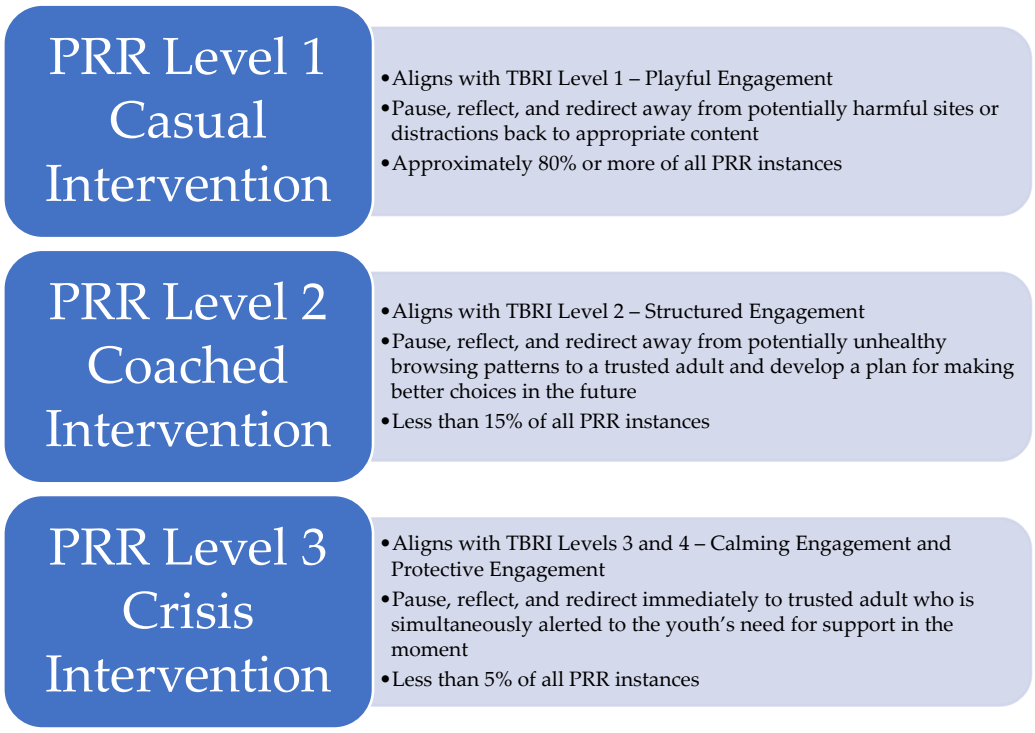

Figure 2. Alignment of the 3 levels of PRR with the corresponding levels of the TBRI framework.

TBRI Level 1 (Playful Intervention) calls for meeting youth with only the level of firmness required to redirect them from potentially harmful behavior to something more appropriate (Purvis et al. 2009). Converting this approach into online safety software, PRR Level 1 works by providing a casual response to a young person testing the bounds of their online access. When a youth visits a site that is potentially harmful or situationally inappropriate (e.g., going to an off-topic website during classroom instruction) (Junco 2012), they are met with a gentle prompt in the form of a question (e.g., "This isn't schoolwork, is it?"). Under stress, the brain releases the neurotransmitter cortisol (Braisby and Gellatly 2005). Although cortisol can boost energy in the short term, helping a person to react in a fight-or-flight situation, it can negatively affect cognitive function and inhibit sound decision-making and critical thinking (Hambley 2020). Managing the stress that behavioral interventions create for youth is important for allowing them to make positive choices in those situations (Purvis et al. 2013, 2015; Parris et al. 2015; Panksepp 2000). Because this approach does not trigger a stress response, as studies have shown that existing internet blocking and restricting software often do (Badillo-Urquiola et al. 2020; Biernesser et al. 2021), it creates an opportunity for youth to learn. This learning is an essential element for fostering a change in youths' online behaviors that benefit their social and emotional wellbeing (Caddle et al. 2024; Lazarinis et al. 2020). Generally, the reasons why individuals—both adults and children—successfully change behavior are well understood: they believe they can do it and that doing so will improve their lives (Rothman et al. 2004). PRR is intended to give youth the confidence that they can make better online decisions and the knowledge that doing so will be to their benefit.

Design Provocations

Design provocations were developed to simulate how youth would engage with the new software, providing insight into their interactions, perceptions, and potential challenges. Grounded in the PRR framework, these provocations served as speculative scenarios or prototypes designed to elicit authentic responses from users, encouraging

them to explore, question, and critique the system in a way that reflects real-world use and uncovering usability patterns, trust dynamics, and potential barriers. Figure 3 presents a visual representation of a PRR Level 1 response.

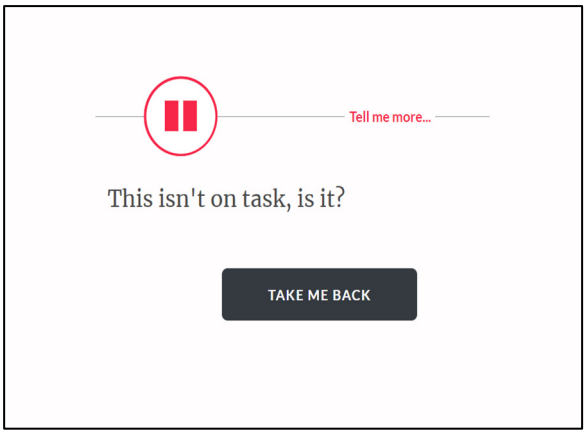

Figure 3. Conceptualization of a PRR Level 1 screen.

By providing a concise explanation of why the system intercepted a particular site, youths can understand how they might make a better choice in the future (Ghosh et al. 2018). Further, by offering an immediate opportunity to try again, youths build up a belief in their ability to make better choices. For example, a youth trying to access explicit content might be informed about the relationship between viewing this content and real-life dating violence or the exploitative nature of how this type of content is produced (Peter and Valkenburg 2009; Rostad et al. 2019). Figure 4 presents an illustration of the "Tell me more. . ." educational feature.

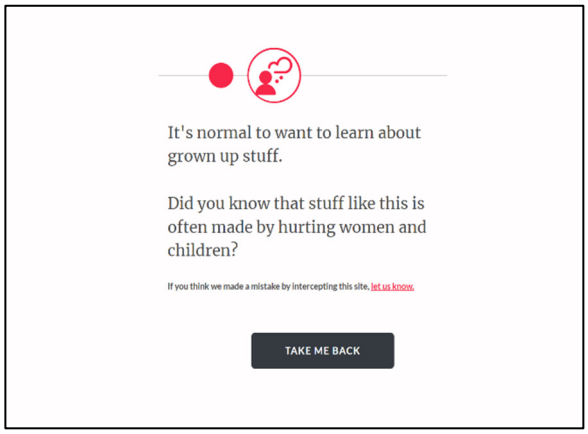

Figure 4. Representation of PRR Level 1 screen with in-the-moment education via "Tell me more . . ." feature.

If a young person is persistent in trying to access inappropriate material or consistently wandering off-task during classroom instruction, they will trigger a PRR Level 2 response from the software. In this case, the young person will encounter a more formal intervention that redirects them to an interactive chat or a message to a trusted adult, like a parent or teacher, to develop a plan to make better choices online. This is like the second level of TBRI (Purvis et al. 2009). The aim of Coached Engagement is to give the young person a more structured approach to their online behavior in communication with a trusted adult caretaker. In keeping with TBRI principles (Purvis et al. 2013), PRR Level 2 has the natural consequence of limiting a student's browsing to only educational sites until the behavior

that resulted in the PRR Level 2 trigger is addressed with an adult. Figure 5 presents the flow of interactions for a young person in PRR Level 2.

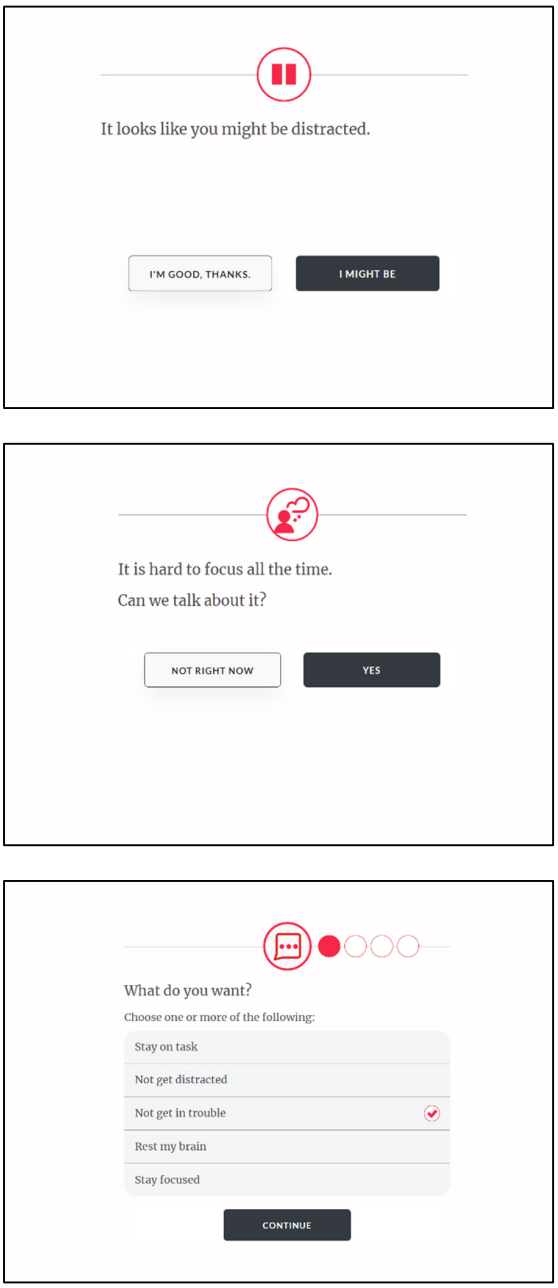

Figure 5. *Cont.*

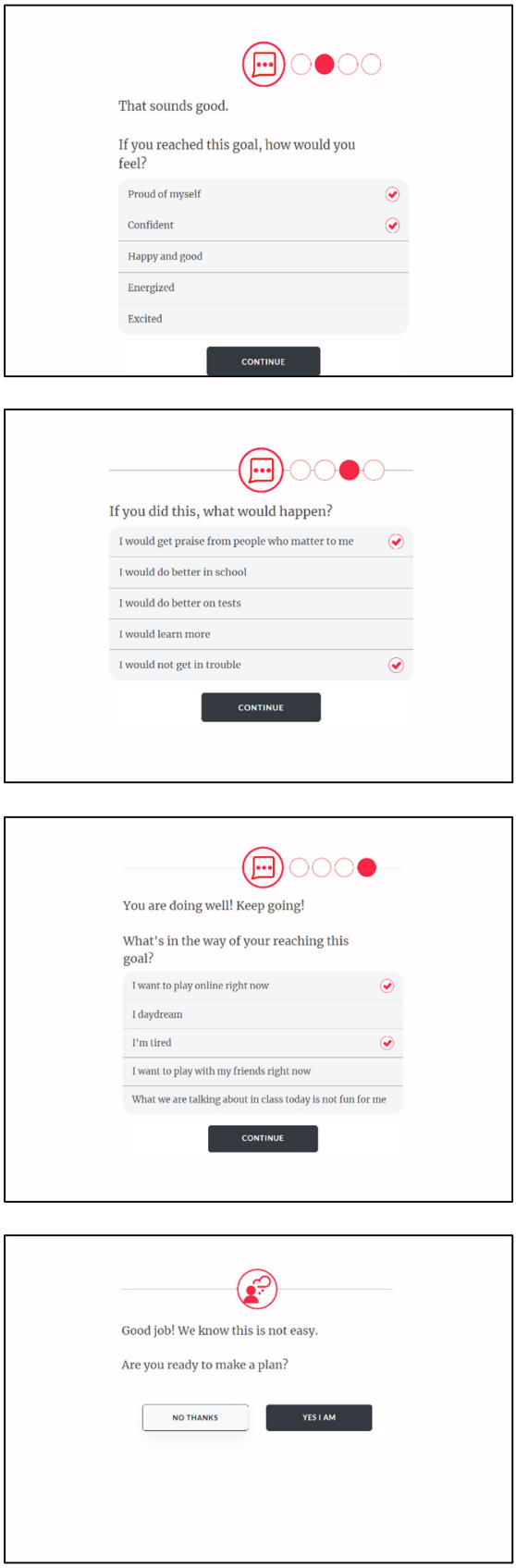

Figure 5. Example flow of interactions for a young person in PRR Level 2.

Adapting Levels 3 and 4 of TBRI into the online safety realm proved initially challenging. Software is not well-positioned to manage situations of imminent threats of harm

to oneself or others autonomously (Biernesser et al. 2021). In rare circumstances, such as when a young person is seeking weapons, promoting violence, or searching out means of self-harm online, PRR Level 3 works by immediately redirecting the youth to a trusted adult caretaker and providing access to resources, like suicide prevention helplines. Figures 6 and 7 illustrate a potential flow related to the PRR Level 3 intervention.

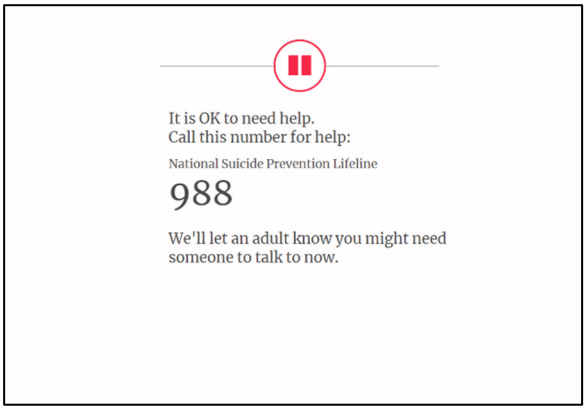

Figure 6. Representation of PRR Level 3 intervention for detection of self-harm risk.

Figure 7. Representation of PRR Level 3 intervention mobile device alert for detection of self-harm risk.

Gentle prompts at all levels of PRR create pauses for youths as they navigate the online world where they can consider, and potentially predict, the outcomes of their actions. Research suggests that, from an early age, when youths are given opportunities to silently pause, they are able better to appreciate context and consequence (Read et al. 2019). There is no sound incorporated into PRR because of the benefits that silence provides in grounding youth and creating an environment for decision-making (Dulčić 2021). Each level of PRR offers youths an opportunity to pause, enabling them to consider the situation and their actions.

4. Methodology

The implementation of the online safety software was designed as an exploratory field study to examine whether real-time, developmentally sensitive digital interventions could support youth in making better online choices. Specifically, the study aimed to address the following research questions:

(1) How can tiered, behaviorally supportive interventions reduce instances of inappropriate or off-task online activity among middle school students?
(2) How do students respond to different levels of intervention in terms of self-correction and engagement with trusted adults?

This study was conducted in a public middle school serving grades 6–8 (ages 11–14) in an urban charter district. Approximately 85% of the school's students qualify for free or reduced-cost lunch under the Richard B. Russell National School Lunch Act (79 P.L. 396, 60 Stat. 230). Table 1, below, presents basic demographic data on the school's student population.

Table 1. Pilot school demographics.

Enrollment by Race/Ethnicity	
Black	44.7%
Hispanic	42.1%
White	9.2%
Asian	2.6%
Two or more races	1.3%
Enrollment by Student Group	
Economically disadvantaged	69.1%
Special education	26.3%
Emergent bilingual	6.6%

The software, which replaced the school's existing web filtering system, was installed on all school-issued Chromebooks used by students during the 2022–2023 academic year. The intervention ran for five weeks and included the real-time tracking of student attempts to access off-topic or restricted websites during classroom hours. Data were collected via server logs indicating the total web activity and the number and level of software-triggered behavioral interventions. The design was observational and non-intrusive; no identifying information about students was collected, and all interventions were part of the school's routine device usage policy. Parents were informed by the school in advance of the use of the new software, offered opportunities to ask questions, and provided written consent for their children to use the school-issued devices and installed software.

In addition to quantitative clickstream data, informal feedback was gathered from the school's principal regarding specific incidents (e.g., a Level 3 alert) and student responses. Because the focus was on exploratory insight and system behavior, the study did not include structured interviews or surveys, though such tools are recommended for future follow-up studies. The school's leadership team approved the pilot, and all procedures were aligned with the school's standards for digital learning and data privacy.

5. Software Implementation and Results

A third-party software firm developed the application. The software was implemented as a Chrome browser extension installed on student Chromebooks, allowing it to monitor and respond to web activity in real time during school hours. It tracked URLs entered manually, clicked links, and search engine queries, triggering one of three levels of intervention based on the behavioral context. The extension used a combination of rules-based filters and machine learning models to detect attempts to access inappropriate, off-topic, or potentially harmful content. These models were optimized for on-device performance using the ONNX format and included classifiers for toxic language and visual content such as firearms or explicit imagery. Although the third-party app developer created a separate Chrome extension capable of monitoring email and messaging platforms, that component was not part of the pilot deployment and was therefore excluded from this study.

The purpose of the software product was to provide opportunities for students to pause, reflect, and redirect themselves back on task during classroom learning while using

internet-enabled devices during the school day. The school's information technology personnel installed the software on all 77 students' school-issued Chromebooks on the first day of the 2022–2023 school year in place of the school's existing web filtering software. The pilot ran for 5 weeks. Although the software was deployed on the devices of 77 students, not all students were active users each week. For disciplinary, health, and other reasons, the number of students using devices at school varied by week. Table 2, below, shows the number of active student users of the software by week.

Table 2. Active student users by week.

Week	
1	77
2	73
3	75
4	73
5	71

In the first 5 weeks of the product's implementation, the number of attempts by students to access off-topic or inappropriate online content during classroom instruction decreased by approximately 58%. Table 3, below, presents the number of clicks on website links (i.e., uniform resource locators, URLs) triggering a PRR response by the software.

Table 3. Website clicks and PRR triggers.

Week	Total URLs Clicked	Total Clicks Triggering All PRR Levels	Clicks Triggering PRR (All Levels) as a Percentage of Total URLs Clicked
1	23,925	984	4.11%
2	5594	211	3.77%
3	37,286	884	2.37%
4	47,714	906	1.90%
5	41,692	718	1.72%
Overall increase/(decrease)			(58.13%)

Distinguishing between URL clicks triggering the lowest level of PRR intervention (i.e., PRR Level 1–Casual Intervention) and those triggering higher levels of response, the data show that about 77% of student users did not trigger a PRR response beyond Level 1 during the 5-week period. This finding is consistent with the TBRI framework's expectation that approximately 80% of problematic behavior is corrected at the lowest level of engagement. Approximately 23% of student users triggered a PRR Level 2 intervention during the period. Of the 18 users who triggered a PRR Level 2 intervention, only two repeated the offending browsing behaviors after having their access restored by a teacher. This information indicates that 17 students chose to change their behavior after the PRR Level 2 intervention.

During the period, only one student triggered a PRR Level 3 response. The intervention was triggered by the software intercepting the student user searching for a modern gun. In an interview with the school's principal who received the alert from the system and subsequently spoke with the student, we learned that the student was curious about the gun that appeared in a popular video game. From a conversation with the student, the principal determined that the student was not seeking to obtain the weapon and was not a threat to others. The principal explained that although the alert did not uncover a potential threat to the school, the intervention was valuable because it allowed for a

dialogue with the student about situational awareness. The student came to understand how classmates might feel if they observed the student searching for the weapon and demonstrated empathy toward them. Additionally, the student also recognized that the search was not an appropriate use of classroom time.

6. Discussion

The preliminary findings from this 5-week pilot suggest that developmentally aligned, trauma-informed digital interventions may reduce instances of off-task and inappropriate online behavior among youths in a school environment. Approximately 77% of students were able to self-correct their behavior at the lowest level of intervention, consistent with expectations from the TBRI framework, suggesting that most problematic behavior can be redirected through low-stakes engagement. This outcome reinforces the relevance of trauma-informed principles in designing educational technology, while also supporting theories of constructivist and progressive education that prioritize reflection and autonomy. The structure of the PRR framework allowed students to engage with feedback in a non-punitive, real-time manner, aligning with cognitive models of behavior change and motivational learning theories.

In addition to a reduced incidence of undesirable online activity, qualitative feedback from educators suggested that the software prompted constructive conversations between students and adults, particularly in the one observed Level 3 incident. The student involved was not penalized but instead guided toward greater situational awareness and empathy, a result that exemplifies the social–emotional learning goals underlying this framework. Taken together, the data and educator insights suggest that youth-facing interventions rooted in trust, feedback, and reflection may hold meaningful potential for addressing core challenges in adolescent online safety.

7. Limitations and Avenues of Future Inquiry

Although the results of this pilot are promising, we acknowledge several limitations. First, the study was conducted at a single school site over a relatively short period. We believe the findings are likely transferrable, but not necessarily generalizable (Carminati 2018). Second, no formal qualitative or survey data were collected from students, teachers, or parents, which constrains our understanding of how the software was perceived by its users. Third, the intervention was limited to school-issued Chromebooks and school hours; thus, it remains unclear whether students delayed or displaced problematic behaviors to contexts outside of the monitored environment. Follow-up studies should consider surveys, interviews, or diary studies to assess behavior continuity and perception beyond the classroom. Fourth, although the system complied with school privacy standards and did not collect personally identifiable information, the emotional impact of certain prompts, particularly those addressing sensitive topics, merits further study. Trauma-informed co-design approaches with youth advisors may help to ensure that the content remains developmentally appropriate and emotionally safe across contexts. Future research should also explore longitudinal outcomes, variations in effectiveness across different age groups or school settings, and how PRR-style interventions can be adapted for use on personal devices or integrated across broader educational platforms. Expanding the scope and depth of inquiry will be essential to fully understand the ability of this approach to improve digital safety and well-being at scale.

8. Conclusions

As digital environments become increasingly central to adolescent life, new approaches to online safety must move beyond solely applying punitive and restrictive measures. This

study introduced the PRR framework, which integrates trauma-informed principles with behavior change and learning theories to support youth in making safer, more thoughtful online decisions. Preliminary implementation in a middle school setting demonstrated that online missteps may effectively be addressed through low-level, non-punitive interventions, reinforcing the value of developmentally aligned, real-time feedback.

The PRR approach offers a promising alternative to traditional filtering software by fostering reflection, emotional regulation, and social connection—key ingredients in sustainable behavior change. Schools, educational technology developers, and policy-makers seeking to improve adolescent digital safety should consider tools and systems that emphasize guided self-correction over surveillance or control.

Future iterations of this framework should continue to center youth voice, expand to other platforms and devices, and include mixed-method evaluations that capture both behavioral outcomes and lived experience. The growing complexity of online risk requires collaborative solutions grounded in both human development and design ethics. PRR represents one such step toward a more compassionate, empowering model for helping youth navigate the digital world. We encourage educators, designers, and policy-makers alike to invest in tools and frameworks that prioritize reflection, relationship, and real-time learning—key components of digital safety that supports, rather than surveils, youth.

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Institutional Review Board Statement: Not applicable. The company who partnered with the schools worked together to obtain parental consent and student assent prior to the pilot implementation. To ensure privacy and confidentiality, the information provided to the research team through a data usage agreement was fully anonymized. Therefore, the secondary analysis of the dataset was considered non-human subjects research for the purpose of this paper.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

Conflicts of Interest: The authors directly involved in the design, analysis, and reporting of this research have no financial interests in the company for which the software was developed. However, author Aahil Valliani is a teenager who became the CEO of the software firm that created the original software tested in the article AFTER the software was created and tested. The software firm is now an open-source initiative. Therefore, while he has a financial interest in the software, his interests did not influence the outcomes of this research. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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