

Designing an Intelligent Virtual Assistant for Preventing Bullying and Cyberbullying in Education

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Abstract

In educational settings where bullying and cyberbullying often go unnoticed, there is an urgent need for innovative solutions to tackle these issues. This article introduces the design of an intelligent virtual assistant focused on preventing bullying and cyberbullying in schools, acting as a valuable institutional resource. Powered by artificial intelligence, the assistant offers immediate support and guidance to students facing intimidation in both physical and digital environments. Through a tree-structured conversational design, advanced natural language processing, and behavior analysis, the assistant detects bullying patterns in both digital and in-person interactions, providing tailored resources to each user confidentially. The detection of bullying situations can be carried out by analyzing patterns in the students' responses. This is done by asking if they have witnessed or experienced similar bullying situations, inquiring whether the experience was personal or involved others, and whether the individuals affected were close friends or other people. These responses can generate alerts that will be assessed by the institution, allowing potential bullying cases to be identified and enabling the development of appropriate awareness and prevention strategies to effectively address the issue. Additionally, it includes interactive learning tools that foster socio-emotional and digital competencies. Serving as a reporting mechanism, it aids victims and witnesses of bullying, functioning as a protective and preventive measure against these harmful behaviors in educational contexts. Beyond its protective role, this tool also serves as an innovative pedagogical resource, addressing a complex social and educational challenge while raising awareness and promoting sensitivity around school and digital violence.

Keywords

Fluid Bullying, Cyberbullying, Intelligent Virtual Assistant, Educational

1. Introduction

The issue of school and cyberbullying represents a social and educational phenomenon that affects minors and adolescents, increasingly manifesting from an early age. Authors such as [1] indicate that approximately 30% of children in schools are involved in this phenomenon, either as victims, aggressors, or bystanders, leading to various negative consequences. These repercussions include poor social and academic adjustment, as well as the development of emotional disorders such as depression and anxiety. Furthermore, the impact of bullying extends to other contexts, affecting not only the social dynamics among young people but also the family environment and the community.

Bullying is an aggressive behavior characterized by its persistence and prevalence, posing a significant challenge in educational environments. This phenomenon has transcended into the digital realm, becoming a widespread issue that also impacts educational institutions, as it continues to manifest in various forms within these contexts [2]. These intimidations emerge in the closest environment, leading us to refer to this phenomenon as proximity bullying and cyberbullying. The threats that children face in their immediate surroundings are persistent and manifest in various forms (physical, verbal, psychological, and relational), with lasting consequences that underscore the need for research to understand and prevent this issue [3]. The effects of bullying transcend the school context, impacting academic performance, family and friendship relationships, as well as the psychological well-being and physical health of those affected [4].

Regarding peer victimization, [5] highlighted some features of computer-mediated communication that may trigger electronic aggression, such as user anonymity, the everyday use of online communication due to easy and permanent access to various applications, the continuous expansion of the audience, and the prevalence and incidence of harassment, gender-based violence, and discrimination in cyberspace. Recent research has analyzed the risk factors for adolescents using social networking and instant messaging, and the findings have shown the following: sexting (57%), cyberbullying (48%), spam, grooming, and malware (43%), addiction problems (33%), and other risks such as theft of personal information and spam (24%). Exposure to bullying and cyberbullying is associated with psychological distress, including anxiety, depressive symptoms, and suicidal thoughts; therefore, adolescents' well-being is affected by this issue. In conclusion, violent behavior and bullying among adolescents are a global challenge. Moreover, this bullying emerges in the closest environment, known as "cyberbullying by proximity", which has a significant dimension in other contexts, such as social and family settings. Educational institutions play a key role in identifying subtle

signs of bullying and are also responsible for defining these behaviors within school settings.

It is not enough to merely monitor and control this issue. As [6] states, it is essential to encourage our students to build healthy relationships and to promote learning about conflict management and peace in schools. This author links the safety initiatives implemented in educational institutions with effective conflict management practices and the creation of institutional policies that enhance the school environment, thereby fostering peacebuilding in response to the growing emphasis on bullying.

The implementation of a chatbot to address bullying and student well-being can be a key tool as an institutional resource in educational centers [7]. Therefore, we have developed a chatbot that, through tree-structured conversations, guides users using a question-and-answer format that adapts to their responses, providing support and assistance in conflict resolution. This intelligent virtual assistant becomes an effective guide, offering the appropriate informational resources to address concerns about personal issues or those of peers.

Moreover, this system is designed on a confidential and accessible platform, allowing students to report instances of bullying without fear of being identified, facing retaliation, or being stigmatized. Students can express their problems by talking to this assistant, which facilitates the identification of bullying indicators and factors within the educational center. By utilizing an intelligent virtual assistant, we can streamline the reporting process, making it easier for students to communicate their concerns and seek support.

The data collected through interactions with chatbots can inform school policies and interventions by highlighting patterns and trends in bullying behavior. By analyzing this data, schools can develop proactive measures to address bullying and improve the overall well-being of their student body, creating a safer and more inclusive educational environment. Therefore, the integration of chatbots not only represents technological advancement but also a necessary step towards promoting a supportive and responsive school culture. This allows educators and counselors to focus on providing direct support to the students who need it most, ensuring that resources are used effectively to maximize the positive impact on the school community.

2. Statement of the Problem

An Intelligent Virtual Assistant is a tool powered by artificial intelligence (AI) designed to interact naturally with users, providing real-time responses, solutions, and assistance. Commonly implemented through chatbots or voice systems, these assistants are programmed to process natural language and understand users' needs, facilitating rapid and efficient problem-solving. In the educational and social spheres, Intelligent Virtual Assistants play a fundamental role by providing personalized support, guidance on sensitive issues such as bullying, and helping students, teachers, and families navigate various complex situations. Their ability

to adapt and learn from interactions makes them valuable tools for improving accessibility, inclusion, and efficiency in managing social issues, promoting a safer and more equitable environment.

Virtual assistants are revolutionizing education by providing personalized and accessible support to both students and teachers. These systems not only answer questions and clarify complex topics but also offer additional resources that enhance the learning experience. Moreover, they ease administrative burdens, enabling educators to focus more on teaching and less on bureaucratic tasks. By tailoring their responses to the unique needs of each student, virtual assistants promote more inclusive and effective learning, helping to bridge educational gaps and fostering a dynamic, collaborative, and innovative learning environment. Their ability to identify and address individual strengths and weaknesses ensures more balanced and fulfilling academic development for every student.

Multimodal conversational agents have established themselves as an effective alternative for developing human-machine interfaces, providing a more engaging and human-like interaction between students and the system [8]. This interface will incorporate a chatbot with a 3D avatar, where conversations will take place through closed and semi-closed questions and answers. This will allow for content updates and the creation of new chats, with the flexibility that the interaction can be linear (like an explanation) or relational (based on a decision tree), depending on the user's responses.

The chatbot is designed to provide responses to students from various educational institutions using the application, who may have been bullied or witnessed instances of school bullying. The goal is for this tool to serve not only as a technological support for the detection and prevention of school bullying through social networks but also to gather data throughout the conversations that can contribute to research on these cases, always respecting the ethical and deontological code of the study framework.

Furthermore, the chatbot will be available for integration into the website of any educational institution in Spain, facilitating student access through this channel. Its purpose is to become a useful tool for the detection and prevention of school bullying in educational centers, characterized by the following elements: Dialogue environment: An interactive and user-friendly space for users; Response insertion: The ability to update and personalize the responses provided; Tagging: Classification of interactions to improve tracking and analysis; Establishment of linguistic patterns: Identification of trends and behaviors in conversations; Formalization of conversations: Clear structuring of interactions to facilitate understanding; Database and reports (Data Analytics): Collection and analysis of data to generate reports that support research and the development of prevention strategies.

The innovative project will be structured into several phases that will facilitate the identification and examination of bullying indicators, as well as the various issues associated with students' well-being. This will allow for the exploration of

tree-structured conversations in the intelligent virtual assistant.

The design of conversation and interaction flows is a crucial phase in the creation of chatbots, as it determines how they will interact with users. This stage involves creating a detailed script that defines how the chatbot will respond in different situations, anticipating user questions or requests and providing coherent and relevant answers. In addition to conversation flows, the chatbot's personality is crafted, adjusting the tone (formal or informal) and the structure of responses to align with user expectations. According to *The Ultimate Guide to Conversational Design-Landbot* [9], conversational design must be natural and fluid to ensure a satisfying user experience.

We have opted for a tree-based conversational system for our chatbot, which allows us to structure interactions clearly and efficiently, making navigation easier for both users and the chatbot itself. In this system, each interaction branches into different options, anticipating the user's questions or requests and guiding them through a predefined flow of coherent and relevant responses. This approach not only enhances efficiency by reducing ambiguity in responses but also ensures a smoother and more satisfying user experience.

Moreover, this method enables us to precisely define the chatbot's personality, set the appropriate tone for responses, and design a consistent interaction structure, ensuring that communication aligns with the project's objectives. The tree-based system also facilitates the personalization of interactions by tailoring responses to the specific needs of each user.

The chatbot will include escape room activities, which will be conducted in groups through the tool itself and will conclude with an evaluation survey. These activities are designed to foster problem-solving in contexts of bullying and cyberbullying. The immersive experience in the metaverse will recreate bullying situations, and the chatbot will facilitate the development of an evaluation protocol.

Students will access the escape room via a QR code on their mobile devices and, in groups of five, will analyze and resolve the presented situation. If they witness a case of cyberbullying during the activity, the intelligent educational virtual assistant will guide them through different pathways with targeted questions, helping them find the best solution to address the identified problem.

3. Main Results

The chatbot is designed to operate on an accessible and flexible platform that allows customization according to the specific needs of each educational institution. This platform not only provides an intuitive interface for users but also enables administrators to easily modify the chatbot's questions and answers (**Figure 1**). This way, the content can be updated and adapted based on emerging dynamics and issues within the school environment. This modification capability ensures that the virtual assistant remains relevant and effective, providing accurate and appropriate responses to students' concerns, as well as facilitating the incorporation of new topics or changes in bullying prevention policies. As a dynamic re-

source, the chatbot becomes an ever-evolving tool that adjusts to the changing needs of the educational community.



Figure 1. Chatina-UNED. Imagenes Plataforma CIBERPROXY UNED.

Building on the theories of authors such as [10] [11], we focus on rule-based chatbots that are meticulously crafted by outlining and designing potential interaction sequences expected to occur between the system and the user. Their pathways are guided by predefined rules, resembling a decision tree. In line with these authors, the methods used to schematically represent the “conversational” elements of chatbots typically involve branched structures that illustrate pre-mapped content based on rules or corpus-based dialogue graphs. For our chatbot addressing bullying and cyberbullying, we have chosen to utilize decision trees mapping (Figure 2) out anticipated routes a user might take when interacting with a chatbot.

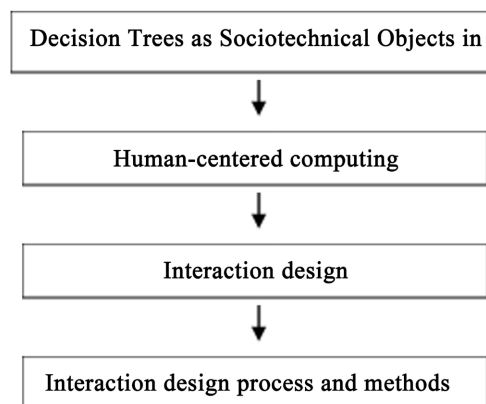


Figure 2. Decision trees as sociotechnical objects in chatbot design [10].

This tree map guides (Figure 3) the user through a series of questions and answers, providing support and resources tailored to their responses.

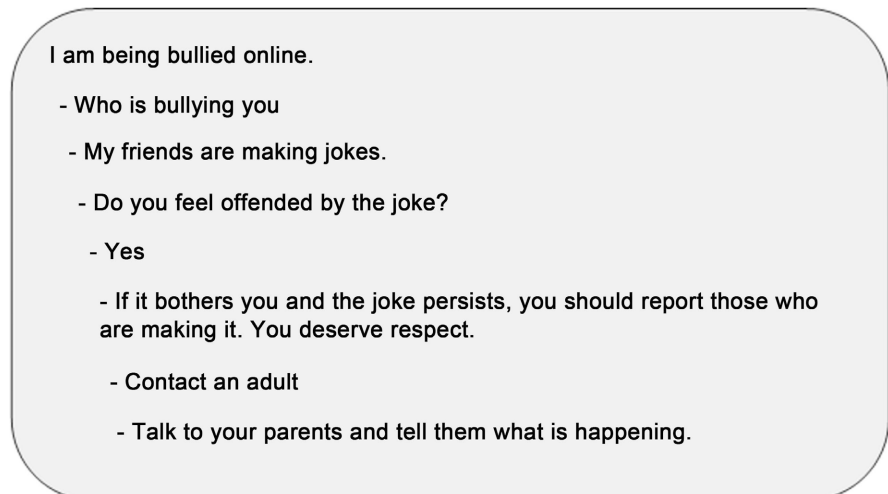


Figure 3. Example of tree-conversation Chatinai [7].

A chatbot has been developed to serve as an effective conversational tool for detecting and preventing bullying in educational settings. This chatbot is characterized by the following elements [7]:

- Dialogue Environment: An interactive space that facilitates communication between the user and the assistant.
- Instant Response: The ability to provide immediate and relevant responses to the user's concerns.
- Tagging: Identification and classification of topics and types of interactions for better conversation management.
- Linguistic Pattern Analysis: Examination of language structures to enhance the chatbot's understanding and response capabilities.
- Structured Conversations: Implementation of a framework that ensures coherent and effective interactions.
- Data Analytics and Reporting: A system for collecting and analyzing data to generate reports, facilitating the evaluation and continuous improvement of the service.

Data collection will be anonymous, with no personal information collected, limited only to gender, age, country, and city. In accordance with the research ethics code, the necessary permissions for data collection will be obtained from the school authorities and the families, ensuring compliance with ethical and legal procedures.

Data collection will be carried out through the escape room activities, which can be conducted in the classroom. Additionally, the selection trace will be analyzed to assess the decision-making process. At the end of the activity, a survey will be included in which students will evaluate the tool and its usefulness in problem-solving. Below, in **Figure 4**, you can observe: there is a visual representation of an escape room with a virtual assistant as support:

- An escape room environment with clues and visual challenges.
- A virtual assistant represented as an avatar or chatbot on the screen, providing

guidance or questions.

- Decision-making elements, such as answer choices or alternative paths, which will be selected by the students.

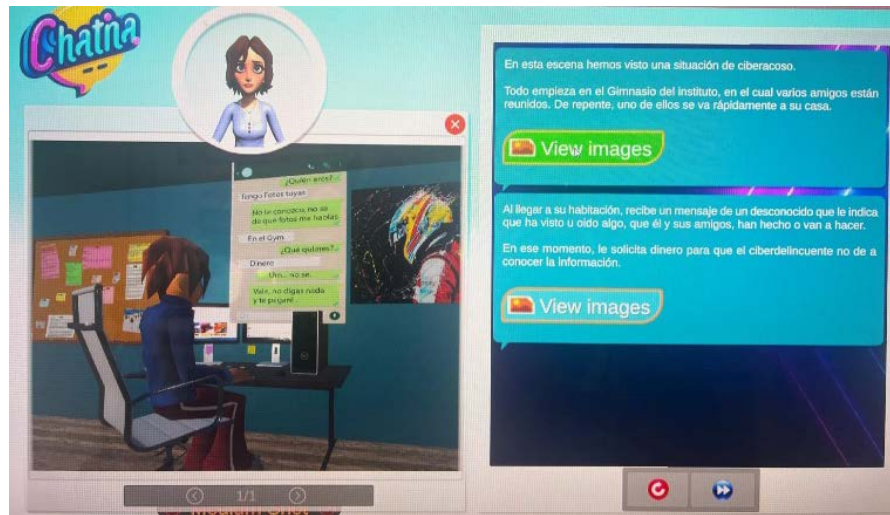


Figure 4. Solving problems in Scape Room-Metaverse.

It is essential to design a set of interdisciplinary questions for the development of the chatbot, involving professionals from areas such as pedagogy, psychology, security, and health. This approach allows for a more holistic understanding of the various aspects of bullying and cyberbullying, ensuring that the responses and guidance provided by the conversational assistant are comprehensive and effective. Collaboration between these experts ensures that the chatbot is not limited to technical or educational aspects but also considers emotional, social, and legal dimensions, offering holistic support to students and facilitating more robust preventive and educational interventions. Additionally, this project includes the collaboration of the National Police, who advise us on matters related to criminal law, enabling the chatbot to offer efficient responses, such as guiding students on how to report these situations to the appropriate authorities.

4. Conclusions and Suggestions

4.1. Discussion

Schools play a fundamental role in the detection and prevention of bullying. The manifestations of this behavior not only affect students but also shape the culture and reputation of the institution itself. According to [12], there is a clear distinction between two types of school environments: “A safe and nurturing environment, where the school community feels physically and psychologically protected, contributes to the development of students as responsible and intelligent members of society.” In contrast, “a school where bullying is common becomes a breeding ground for negative and antisocial behaviors, which is detrimental to the psychological and physical development of students.”

Further research corroborates that educators' efforts to eradicate bullying have had modest results [13]. Therefore, it is crucial for teachers to commit to innovation and training in this area, as they are the ones who can integrate new strategies into the academic environment [14]. In this context, the implementation of an intelligent virtual assistant can be a valuable tool. This type of technology not only facilitates the early detection of bullying situations but also provides an accessible channel for students to report incidents and seek support.

The proposed chatbot assists in answering users' questions, demonstrating the effectiveness of ensemble learning methods such as random forests. This approach has proven to be particularly effective when applied to features extracted from a prepared dataset on bullying and cyberbullying. Additionally, the conversational method has shown promising results in other educational research studies, highlighting its potential as a valuable tool in this domain [15].

This virtual assistant can be more effective than traditional interventions due to its immersive approach with technology, allowing students to participate in simulations within the metaverse. Unlike a conventional talk about cyberbullying, this tool enables students to interact and take an active role in decision-making, providing a deeper and more realistic experience.

By leveraging tools such as a virtual assistant, educators can enrich their context and develop innovative actions that enhance the teaching and learning process. This technology can serve as a complementary resource that fosters a safer and more respectful school environment, empowering students to become agents of change in the fight against bullying.

Future research on this tool will focus on developing more learning scenarios and improving the tool's accessibility, with the aim of maximizing its impact and effectiveness in preventing school bullying. Additionally, efforts will be made to enhance this tool to ensure its availability in educational institutions, making it a widely accessible resource for schools.

4.2. Conclusions

The aim of this Conversational Intelligent Assistant is to turn it into an institutional and educational resource for educational institutions. This chatbot is designed to provide support to students from various schools who have been victims or witnesses of bullying. The intention is for it to not only serve as a technological tool for detecting bullying but also as a preventive and immediate intervention resource, fostering a safer and more supportive school environment.

We underscore the critical need for developing institutional resources that implement positive interventions, including the integration of tools such as chatbots in today's digital landscape. These strategies are instrumental in preventing cyberbullying and facilitating reporting mechanisms. By leveraging this conversational tool, we can provide essential support and guidance to both students who are victims of bullying and those who witness these acts and are able to report them.

In conclusion, the chatbot developed in this project stands out as an innovative

solution tailored to offer effective assistance to students across various educational institutions who have experienced or witnessed bullying. Beyond serving as a technological resource that enhances the detection and prevention of bullying incidents in digital contexts, this virtual assistant is adept at collecting pertinent data throughout its interactions. This data collection not only enriches our understanding of bullying dynamics but also contributes significantly to future research initiatives in this area, all while adhering to the established ethical and deontological principles of the study. Therefore, the chatbot emerges as a vital component in fostering safer school environments and promoting the overall well-being of students.

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This virtual assistant has a Digital File Evidence Record registered on the blockchain at the National University of Distance Education (UNED). This feature ensures the integrity and security of the collected information, providing a reliable mechanism for tracking incidents of bullying and cyberbullying. By utilizing this technology, it ensures that the data is immutable and easily accessible for the professionals responsible for addressing and managing these situations. Acknowledgements to the National Citizen Participation Unit (National Police), partner in this project, and to Six 3D, the development company.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- [1] Evans, C.B.R., Fraser, M.W. and Cotter, K.L. (2014) The Effectiveness of School-Based Bullying Prevention Programs: A Systematic Review. *Aggression and Violent Behavior*, **19**, 532-544. <https://doi.org/10.1016/j.avb.2014.07.004>
- [2] Smith, P.K. (2016) Bullying: Definition, Types, Causes, Consequences and Intervention. *Social and Personality Psychology Compass*, **10**, 519-532. <https://doi.org/10.1111/spc3.12266>
- [3] Stassen Berger, K. (2007) Update on Bullying at School: Science Forgotten? *Developmental Review*, **27**, 90-126. <https://doi.org/10.1016/j.dr.2006.08.002>
- [4] Brank, E.M., Hoetger, L.A. and Hazen, K.P. (2012) Bullying. *Annual Review of Law and Social Science*, **8**, 213-230. <https://doi.org/10.1146/annurev-lawsocsci-102811-173820>

- [5] Shariff, S. (2008) Cyber-Bullying: Issues and Solutions for the School, the Classroom and the Home. Routledge. <https://doi.org/10.4324/9780203928837>
- [6] Bickmore, K. (2013) Policies and Programs for Safer schools: Do “Anti-Bullying” Measures Obstruct Peace-Building Education? *Ibero-American Journal of Educational Evaluation*, **6**, 37-71.
- [7] Sánchez Romero, C (2023) Development of Technological and Institutional Supports in Overcoming School Cyberbullying: APP CYBERSAFE SCHOOLS. In: *Interactive Didactic Materials for Inclusive Education: SMOOC, Gamification, Artificial Intelligence, and Immersive Experience*, McGraw Hill España, 173-182.
- [8] Sánchez Romero, C (2025) Inclusive and Digital Literacy: Promoting Inclusion in Education through Technological Resources in Socio-Educational Contexts. In: González, C., Luz, M., Lorenzo, G., Manuel, J. and Sánchez Romero, C., Eds., *Educating with Didactic- Technological Resources*, UNED, 61-107.
- [9] Jassova, B. (2021) The Ultimate Guide to Conversational Design. Conversation Design for Chatbots: The Ultimate Guide. Landbot.
- [10] Castle-Green, T., Reeves, S., Fischer, J.E. and Koleva, B. (2020) Decision Trees as Sociotechnical Objects in Chatbot Design. *Proceedings of the 2nd Conference on Conversational User Interfaces*, Bilbao, 22-24 July 2020, 1-3. <https://doi.org/10.1145/3405755.3406133>
- [11] Griol, D., Molina, J.M. and Callejas, Z. (2016) Incorporating Android Conversational Agents in M-Learning Apps. *Expert Systems*, **34**, e12156. <https://doi.org/10.1111/exsy.12156>
- [12] Olweus, D. (1994) Bullying at School. In: Huesmann, L.R., Ed., *Aggressive Behavior*, Springer, 97-130. https://doi.org/10.1007/978-1-4757-9116-7_5
- [13] McGrath, H. (2009) New Perspectives on Bullying. *Australian Journal of Education*, **53**, 306-307. <https://doi.org/10.1177/000494410905300308>
- [14] Bryan, C. and Clegg, K. (2006) Innovative Assessment in Higher Education. Routledge. <https://doi.org/10.4324/9780203969670>
- [15] Mondal, A., Dey, M., Das, D., Nagpal, S. and Garda, K. (2018) Chatbot: An Automated Conversation System for the Educational Domain. 2018 *International Joint Symposium on Artificial Intelligence and Natural Language Processing (iSAI-NLP)*, Pattaya, 15-17 November 2018, 1-5. <https://doi.org/10.1109/isai-nlp.2018.8692927>