

AI-Generated Teamwork Skill Development Tool Application for Classroom and Workforce Implementation: A Social Integration Framework for Neurodiverse STEM Students

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Abstract/Problem Statement:

High-functioning autism (HFA), often categorized within the broader diagnosis of autism spectrum disorder (ASD), refers to individuals who exhibit characteristics associated with autism while possessing strong cognitive abilities and adaptive skills. These individuals may experience challenges with social interactions, communication, and sensory processing. In the realm of artificial intelligence (AI), the unique traits of HFA are frequently overlooked, both in representation and in the development of AI systems.

The growing trend of logistics-oriented jobs has led to increased hiring of high-functioning autistic candidates, primarily due to research highlighting their high proficiency in analytical tasks. However, alongside this proficiency, many individuals with HFA face challenges in social communication within workplace environments. This study aims to develop a machine learning (ML) platform to assist HFA individuals in interpreting social cues, particularly in formal settings. The project seeks to bridge the social communication gap for HFA individuals, fostering greater independence and social confidence.

The proposed platform will feature interactive training modules simulating various social scenarios, including everyday interactions and formal workplace conversations, such as discussions with coworkers, presentations to executives, and one-on-one meetings with managers. Using advanced ML algorithms, including Natural Language Processing (NLP) to interpret and analyze human language, and Automatic Speech Recognition (ASR) to convert spoken input into text while detecting tone, the platform will provide real-time feedback to enhance social communication skills. User testing and feedback will guide the platform's iterative development. Additionally, collaboration with speech-language pathologists and psychologists will ensure accurate interpretation of speech connotations and emotional contexts for HFA users.

Introduction:

HFA individuals often require support in interpreting social cues, managing emotional responses, and coping with sensory overstimulation. The term "social cues" encompasses body language, tone of voice, personal space, and authority dynamics. The proposed ML platform will provide interactive simulations to help users interpret these cues. For example, changes in tone or volume can indicate emotional states, and the platform will demonstrate how to respond appropriately. Starting with simple social scenarios, the modules will gradually introduce more complex interactions, helping users synthesize multiple social cues and develop adaptive social responses.

Overstimulation, particularly in high-pressure social or work environments, poses a significant challenge for individuals with HFA. Scenarios such as conference presentations or tight deadlines can trigger anxiety, leading to communication difficulties. The platform will include modules that simulate these high-stress situations, allowing users to practice coping mechanisms such as deep breathing and grounding exercises. Mastering these techniques will help users maintain composure and confidence during critical moments.

Timeline:

The project will begin with a two-week planning phase, defining project scope, identifying module components (e.g., social cue interpretation, stress management), and selecting programming languages for compatibility and efficiency. The next five months will focus on platform development, including three months of intensive coding using HTML, CSS, and JavaScript for front-end and back-end integration. Following development, the platform will undergo a month of user testing to gather feedback and identify potential improvements. The final month will address bug fixes and enhance user experience. After the website version is complete, the team will spend two and a half months transitioning the platform into a mobile app using Python, React, Flask, and SQL.

Survey Section: The survey will assess communication and listening skills in professional settings, focusing on three areas: comfort in workplace conversations, listening comprehension, and verbal communication. The first section evaluates comfort levels in different workplace scenarios, such as addressing conflicts or presenting to managers. The second section examines listening comprehension using video scenarios to interpret body language and tone. The final section assesses verbal communication skills, including clarity, professionalism, and delivery.

Survey Section:

This survey aims to assess key communication and listening skills in professional settings, broken into three sections: comfortability in workplace conversations, listening comprehension, and verbal communication. Each section focuses on crucial aspects of workplace interactions, helping to evaluate and enhance the participant's overall communication abilities.

The first section, *Comfortability in Workplace Conversations*, focuses on evaluating how comfortable participants are in different professional communication scenarios. Participants will be asked to reflect on their ability to engage in conversations with peers, whether discussing day-to-day work or addressing conflicts. For example, one prompt might ask, "How comfortable are you in addressing a colleague when a work-related issue arises?" Another question could focus on interactions with higher-ups, assessing the participant's ease in communicating with managers or supervisors. The goal is to gauge the participant's confidence when addressing work problems or giving presentations, allowing insight into areas where they might need support or development.

The second section, *Listening Comprehension*, is designed to evaluate how well participants can interpret both verbal and non-verbal cues in different social contexts. This section uses short video clips of real-life work situations, requiring participants to analyze scenarios by interpreting body language, tone of voice, and other social cues. Key points include understanding body language, recognizing if someone is uncomfortable through their posture or facial expressions, and interpreting tone to grasp whether someone is joking, being sarcastic, or serious. For instance, a scenario might involve a team meeting where a colleague's tone and body language suggest frustration, and the participant must explain how they would respond. Additionally, questions will assess the participant's ability to recognize authority dynamics, manage eye contact appropriately, and adjust to changing social contexts—all critical skills for successful workplace interactions. Empathy, reading social contexts, and turn-taking in conversations are emphasized, as these allow for more effective and respectful communication in diverse professional environments.

Finally, the Verbal Communication section focuses on the clarity, professionalism, and delivery of spoken responses. Participants will be given a work-related prompt and asked to respond verbally, demonstrating their ability to communicate professionally and effectively. This section is graded on multiple factors, including the use of filler words, tone, pace of speech, and body language. For example, a participant might be asked to explain how they would present a project to a client. Their response would be evaluated on how clearly and concisely they convey the information, avoiding excessive filler words like "um" or "like." In addition, the participant's tone should be appropriately professional and adjusted for the scenario—neither too formal nor too casual. Body language, such as maintaining good posture and appropriate gestures, will also play a role in how they are graded.

User Profiles: To enhance user experience and provide personalized training, the platform will include customizable user profiles. Each user profile will allow individuals to set personal goals, track progress, and receive tailored feedback based on their unique communication challenges and strengths.

Example User Profiles:

1. **Alex - The Analytical Professional** Alex is a 28-year-old data analyst who excels in logical problem-solving and pattern recognition. He consistently receives praise for his technical skills but struggles with social interactions at work, particularly during team meetings and presentations to upper management. Alex finds it challenging to interpret non-verbal cues, such as facial expressions or changes in tone, and often feels anxious when responding to spontaneous questions.

Through the platform, Alex sets personal goals to improve his public speaking and active listening skills. He starts with basic modules that simulate one-on-one conversations, gradually building confidence for more complex scenarios, such as presenting to executives. By adjusting the difficulty level, Alex practices responding to questions on the spot, learning to read body language, and refining his communication style. Over time, he gains confidence in professional interactions and enhances his leadership potential.

2. **Emma - The Creative Collaborator** Emma is a 22-year-old graphic designer who recently started her first job at a marketing agency. She is highly creative and detail-oriented but often struggles with understanding workplace dynamics, particularly authority hierarchies and group discussions. Emma finds it difficult to navigate meetings where multiple people speak at once, and she often hesitates to share her ideas, fearing misinterpretation.

Emma's user profile focuses on enhancing her participation in collaborative settings. She selects modules that help her recognize social hierarchies, practice turn-taking in conversations, and understand subtle cues like sarcasm or humor. By participating in simulated team meetings, Emma learns to express her ideas confidently while effectively responding to feedback. She also practices writing concise, professional emails, boosting her overall communication skills. With continuous progress tracking, Emma gains confidence in team settings, leading to more active participation and stronger workplace relationships.

Scenarios:

In a professional setting, communication is important for the sake of collaboration in solving challenges and articulating ideas confidently, to make sure that team dynamics are strong and productive. For example, during team meetings, employees with HFA, like Alex, can do very well in preparing their

thoughts beforehand and presenting them in an organized and coherent manner. From his notes, Alex does an excellent job of analyzing where the bottlenecks in the workflow are and gives practical solutions for overcoming inefficiencies, such as shared task trackers. Not only is this well prepared, but it really encourages problem-solving and a culture of accountability within the team. By inviting feedback during discussions, Alex can further refine his ideas to make sure that what he suggests is aligned with the team's goals. They respond to questions confidently, suggesting making a draft for tools like Trello or a spreadsheet to improve the team's workflow. By ending their input with an openness to further feedback, Alex creates a team-oriented atmosphere where no team member feels ignored or unappreciated.

This scenario marks one of the 4 main modules we hope to tackle with our product. Our 4 main modules are "Presenting work to higher ups such as directors", "How to talk to a manager one on one", "How to talk in a managerial role", and finally "How to share in a team meeting".

With Presenting work to higher ups such as directors, our scenario we have planned to use is: "During a quarterly review meeting, you need to present the results of a recent project to the directors, highlighting the key achievements, challenges faced, and future steps, all within a 10-minute timeframe." With the scenario we plan to get through these 3 main points:

1. Physical composer: We want members to be able to talk and communicate with proper control of body language, allowing for a sensation of confidence instilled in others observing their presentation.
2. Engaging Presentation: The next thing we want our members to do is to be able to communicate not just by memorization, but for them to have the EQ to involve directors in such presentations. This ability will allow them to build genuine connections with directors and allow them to have strong relationships with upper management.
3. Clear and Concise Communication: With the 2 main statements above we want members to have the ability to do all that while staying clear with their words, allowing for swift meetings with directors and allowing for them to have their thoughts not strung out.

Our next module we have is "How to talk to a manager one on one". We have 3 prompts for this scenario: "Write an email with less than 150 words on setting up a meeting with your manager", "Record yourself having a conversation with your manager about issues you are seeing with your team", and "Record yourself having a conversation with your manager to see where you can improve, and how you can elevate your career" .

1. "Write an email with less than 150 words on setting up a meeting with your manager". With this scenario we want to continue the practice of having concise but meaningful words. We also want to help our members to have proper email etiquette.
2. "Record yourself having a conversation with your manager about issues you are seeing with your team". Having the proper EQ to be able to bring up flaws in a team or flaws in a process the team is using is important in having good team chemistry. We do not want our members to dwell on the flaws a person or process may have, instead we want them to point out the problem and elaborate on the solution.

3. "Record yourself having a conversation with your manager to see where you can improve, and how you can elevate your career". This scenario will be very crucial when working with HFA as asking about flaws you currently have and being able to react to them will require an emotional maturity that could possibly elevate the productivity of these members. Though they might be great, the insight from their managers could possibly get them to the next level. In this scenario we will look to get our members to realize that the feedback given to them is not personal but constructive and that they should be able to take this and have non-aggressive reactions to these comments. We also want them to not zone out of these meetings, but for them to be able to answer key takeaways after the meetings so that they can improve their skills.

Next, "How to talk in a managerial role". We wanted to focus on 3 main points:

1. "Active listening and empathy": People with HFA may find it difficult to interpret non-verbal cues like tone of voice, facial expressions, or body language, which are essential for understanding team members' emotions or concerns. We want our members to actively listen by focusing on the words being said and asking clarifying questions if unsure about the speaker's intent. Use structured methods, like written feedback or follow-up emails, to ensure mutual understanding. Scenario: "During a one-on-one meeting, Taylor says, 'I've been juggling a lot lately, and it's getting tough to keep up.'"

2. "Adapting Communication Styles": A good manager will be able to communicate with his team in different ways to each member. We want our members to realize and to observe and communicate with each member differently. Our planned prompt will address this issue by giving our members different scenarios of people on their team and having them record to them how they would give them feedback.

3. "Encouraging open Feedback and Collaboration": One challenge we hope to tackle is having our members feeling comfortable in creating an open environment for feedback and collaboration might feel challenging due to difficulties with spontaneity and group dynamics. We want our members to foster collaboration and for them to create systems and ways to communicate with each other, like having anonymous forms, or even having a small group discussion.

Our final module is "How to share in a team meeting": Often in team meetings there are moments of spontaneity. Members may struggle with being able to share their brilliant thoughts. We hope to allow our members to be able to create sentences that share their thoughts without getting jumbled or mixed up, allowing for concise and well interpreted thoughts. Our planned scenarios if for them to enter their field they would be working in, then we would present them with a potential problem that the meeting is about, and the member would then have to respond with a solution they have created and explain without having their members being confused.

In conclusion, this survey provides a comprehensive look at a participant's communication skills in various workplace settings. Through detailed assessments of comfort, listening comprehension, and verbal communication, it highlights areas for improvement, ensuring participants are well-equipped to engage in effective and professional communication across different scenarios.

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