

Growth Mindset Emojifier Multimodal App

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Abstract

The study introduces the Growth Mindset Emojifier Multimodal App (GMEMA), a novel application designed to improve educational feedback by including Growth Mindset and emojis. Using OpenAI's AI models, GMEMA provides emotionally nuanced feedback to boost student engagement and foster growth mindsets. The application's capabilities extend to the automated creation and assessment of Java quizzes, delivering personalized feedback that blends motivational phrases and chosen emojis to match students' achievements. Preliminary observations indicate that incorporating emojis into educators' feedback significantly heightens students' emotional engagement and comprehension, illustrating the profound impact of emotional AI on educational practices.

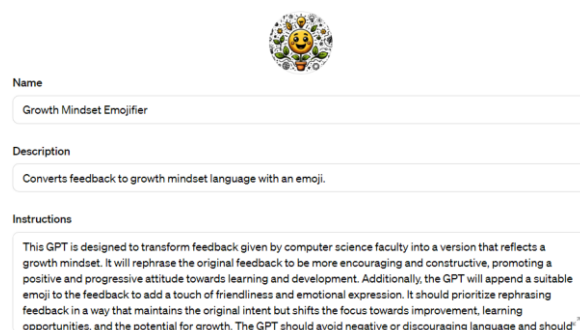
Introduction

The Growth Mindset (GM), rooted in Dweck's (2009) pedagogical framework, emphasizes enriching educator-student communication with positive affirmations like 'Practice makes perfect,' a concept further explored by researchers such as Ng (2018) and Kwak (2021, 2022) among others. Our innovation, the Growth Mindset Emojifier Multimodal App (GMEMA), melds GM principles with emojis via an AI-driven platform to enhance student engagement and outcomes. Utilizing OpenAI's models, including ChatGPT-4-Vision and DALL-E 3, GMEMA is designed to deliver emotionally engaging and personalized educational feedback. In development, it aims to autonomously create and assess programming quizzes tailored to each student's performance while supporting various input and output formats through its advanced AI capabilities.

Initial and Related Work

The study began with obtaining the necessary approvals to involve students and adhere to ethical guidelines. A survey showed a positive response from over 150 students to emoji-enhanced instructor feedback, laying the foundation for

further investigation (Kupershtein, Kumar, et al., 2023). Following this, the "Growth Mindset Emojifier" GPT, powered by ChatGPT-4-Vision, was developed to produce emotionally resonant feedback tailored to quiz scores, exploring the impact of language models on enhancing feedback.



The screenshot displays the configuration page for a custom GPT. At the top is a circular profile picture of a smiling face with a crown. Below it are three input fields: 'Name' containing 'Growth Mindset Emojifier', 'Description' containing 'Converts feedback to growth mindset language with an emoji.', and 'Instructions' containing a detailed paragraph about the GPT's purpose and guidelines. The instructions text reads: 'This GPT is designed to transform feedback given by computer science faculty into a version that reflects a growth mindset. It will rephrase the original feedback to be more encouraging and constructive, promoting a positive and progressive attitude towards learning and development. Additionally, the GPT will append a suitable emoji to the feedback to add a touch of friendliness and emotional expression. It should prioritize rephrasing feedback in a way that maintains the original intent but shifts the focus towards improvement, learning opportunities, and the potential for growth. The GPT should avoid negative or discouraging language and should'

Settings of the Growth Mindset Emojifier Custom GPT.

The custom GPT generated feedback varying with quiz scores, aiming to motivate and encourage GM traits in students, leveraging the engaging power of emojis.

%	Emojified Feedback generated by the model
57	Good start with 57% in your Java quiz! 🌱 Keep practicing and focus on improvement. You're on your way! 🍌
63	Good effort with 63% in your Java quiz! 🌱 Keep practicing and learning. You're on the right track! 🍌
75	Great work on 75% in your Java quiz! 🌱 Focus on the challenging areas for even more growth. Keep it up! 🍌
85	Well done on 85% in your Java quiz! 🌱 Continue to build on this strong foundation. Great effort! 🍌
96	Incredible job with 96% in your Java quiz! 🌱 Keep exploring new challenges to further your skills. You're doing great! 🍌
100	Outstanding with 100% in your Java quiz! 🌱 Keep up the amazing work and explore new challenges. Superb achievement! 🍌

Initial test of the Growth Mindset Emojifier

As can be seen from the image above ChatGPT-4 can generate emojified feedback based on the test scores.

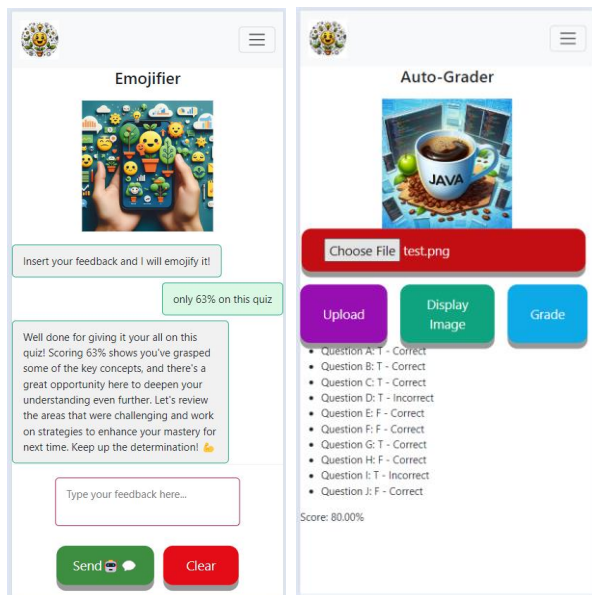
The effectiveness of the feedback was assessed against the GM literature (Dweck, 2019; Yeager, 2019; Abduljabbar, 2022) and studies on emojis in sentiment analysis (Devlin et al., 2018; Eisner, 2016; Steel, 2020; Kim, 2022). This included examining the potential of using Large Language Models and Transformer architectures for generating GM-focused content (Liu, 2019; Raffel, 2020), highlighting the innovative intersection of AI technology and educational psychology in enhancing student feedback.

The GMEMA App

The Growth Mindset Emojifier Multimodal App (GMEMA), currently in its prototype stage, is designed as a dynamic web app using Next.js front-end framework using Node.js platform. It consists of four integral components:

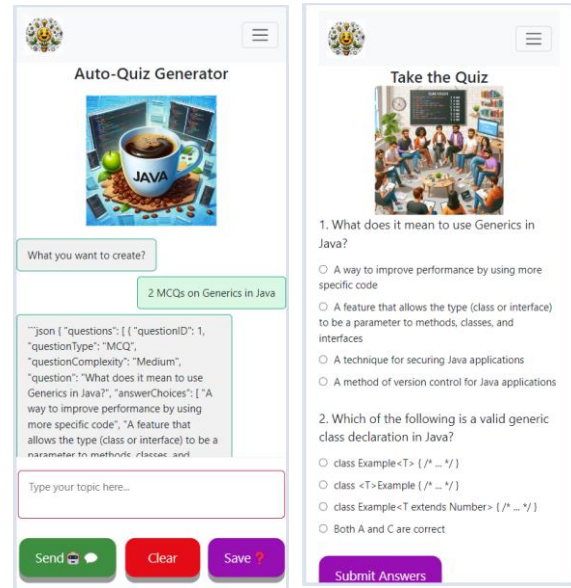
The Main Components of the App

Module	Description
GM Emojifier	Utilizes ChatGPT-4 to enrich educational feedback with GM and appropriate emojis.
Auto-Quiz Generator	Tailored for custom Java-based programming courses, it automatically creates quizzes that are aligned with the course content.
Take Quiz	The page lets students answer the most recent Auto-Generated Quizzes
Auto-Grader	Automatically evaluates student results on Java quizzes and provides immediate grading and feedback on their performance based on the image.



GUI of the GMEMA

These components work in tandem to create a holistic educational tool that not only automates certain aspects of the teaching process but also ensures that feedback is constructive, personalized, and emotionally engaging. The prototype of the app, detailed below, showcases these functionalities, highlighting its potential to transform educational feedback mechanisms.



GUI of the GMEMA (continue)

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Algorithm 1: Growth Mindset Emojifier Component
1. Initialize OpenAI client with API key.
2. On server request:
  a. If POST "chat":
    - Extract user message.
    - Send message to OpenAI for processing, including context for GM feedback transformation.
    - Append suitable emoji to AI's response based on sentiment analysis.
    - Update chatHistory with user message and AI's response with emoji.
  b. If POST "reset", clear chatHistory and reinitialize with GM welcome message.
  c. If GET "history", serve current chatHistory.
  d. If GET "stream", set up streaming of OpenAI responses, appending emojis real-time.
3. Ensure emojis are contextually relevant, leveraging OpenAI's sentiment or content understanding.
4. For unsupported methods, respond with 405 Method Not Allowed.
  
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High-level Emojifier's Pseudocode

Current Results and Future Work

The research substantiates the efficacy of the OpenAI AI models in generating feedback that aligns with the growth mindset (GM) framework. This study reaffirms the potential of incorporating the principles delineated by Dweck (2009) coupled with suitable emojis within AI-generated feedback mechanisms. The app performance supersedes previous GM recommender systems, prompting its exclusive use in the current module. Future work includes improving the app's capabilities and further enhancing emojified feedback, quiz generation, and grading modules. Future versions of the app will introduce text-to-speech and speech-to-text modalities by integrating state-of-the-art technologies such as OpenAI's Whisper AI model, thereby enhancing interactivity and expanding inclusivity of the app.

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