

# Understanding the Role of Large Language Models in Personalizing and Scaffolding Strategies to Combat Academic Procrastination <sup>[1]</sup>

Presenter: Han-Shin (Henson) Chen

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# Introduction

- At least half of all college students have chronic procrastination
- Researchers have developed a range of interventions:
  - task completion
  - time management
  - personalized motivation

⇒ Often fail to capture nuanced factors:  
individual learning styles  
environmental influences

b/c the challenges lies in these factors are “subjective” & “difficult to quantify”



# And here comes the saviour: LLM?

What are the capabilities and incapacities of LLM?

Capabilities:

1. Act as personalized intervention tools
2. Dynamic interaction capabilities > generic survey / rule-based chatbots
3. Contextualize & integrate a broad spectrum of procrastination management strategies

Incapacities:

1. Lack the innate capacity to perceive users' emotional states
2. Hard to navigate the complexities and subjectivity of intricate social contexts (although this may change with future advancements)



All of the above define their research questions:

RQ1: How do users envision the role of LLMs in tailoring strategies for managing academic procrastination?

RQ2: What challenges or tensions might arise when using LLMs for tailoring strategies to manage academic procrastination?



# Related works

1. Application of LLMs in Academic Settings
  - a. Personalization & contextual adaptation
  - b. Ethical concerns

⇒ needs of careful design and implementation strategies when incorporating LLMs into academic environments

2. Interventions to Manage Procrastination
  - a. A large body of work on procrastination management has focused on enhancing self-regulatory skills
  - b. Use of reflection and reminders as mechanisms to promote timely action and adherence to deadlines
  - c. Direct technological interventions and the leveraging of social support



# Critiques of previous research

1. Their frequent inability to address the complex, individualized factors that contribute to procrastination

⇒ these issues could potentially benefit from the open-ended input capabilities of LLMs

Notable gap in:

- understanding how users might perceive and interact with these LLM systems
- how LLMs could enhance existing interventions
- what challenges and ethical considerations may be associated with their use



# Research Outline

1. Participants: 15 university students
2. they engage with a “functional technology probe”, specifically designed to incorporate strategies for managing procrastination.
3. Through individual interview & focus group → how they perceive the potential of LLM-based tools in mitigating academic procrastination.
4. Also consulted six experts from the fields of clinical psychology, education, and cognitive science to validate our findings and explore potential design challenges



# Design of the probe - SPARK

1. Self-generated Personalized Articulations and Reflections Kit (SPARK)
2. SPARK utilizes OpenAI's GPT-4 model to offer context-specific advice for managing procrastination
3. Primary goal was not to propose and validate its design, but to understand the features and affordances users would find valuable in such a tool.



**Imagine you have subscribed to a service that delivers daily text messages or pop-ups to your computer to assist you with managing procrastination. Here's an example message that could appear on your screen.**

---

Highlight the Value. Sometimes it's easier to avoid procrastination when we remind our selves of why we're doing a certain task, and how it aligns with our values, future goals.

Take time to think about the benefits of acting now - Will you feel more satisfied? Will this move you closer to your long-term goal? If the answer is yes, why not act now? The sooner you start, the sooner you will get the rewards!


Tell yourself, "IF I find myself delaying my goals, THEN I will remind myself why I'm doing these tasks and why they're important to do now."

[SEE A DIFFERENT MESSAGE](#)

**Figure 1: The screen through which participants saw the seed message**

**Table 1: Example Seed Messages. The psychological principles indicated by arrows were not part of the main text but are included here to annotate the different components of each message.**

Number	Complete Message (and Associated Psychological Principles)
1	<p>Highlight the Value. Sometimes it's easier to avoid procrastination when we remind ourselves of why we're doing a certain task, and how it aligns with our values, future goals. → <b>Cognitive Insight</b></p> <p>Take time to think about the benefits of acting now - Will you feel more satisfied? Will this move you closer to your long-term goal? If the answer is yes, why not act now? The sooner you start, the sooner you will get the rewards! → <b>Value Alignment</b></p> <p>Tell yourself, "IF I find myself delaying my goals, THEN I will remind myself why I'm doing these tasks and why they're important to do now." → <b>Implementation Intention</b></p>
2	<p>Future Is Real. We can know something without realizing it - without it becoming "real" and relevant to our lives. When you procrastinate on exercising, you are likely aware of the negative consequences on your physical health, but you may not really care about it because the negative consequences can take fairly long to be detrimental. → <b>Cognitive Insight</b></p> <p>However, that day will come sooner or later. When you are about to procrastinate, think about the negative consequences and how they snowball. The task may not seem pressing now, but would it still be fine if you keep procrastinating on it? How would it change your life trajectory? The future is not far away, it is REAL. Don't leave guilt and regrets until it is too late. → <b>Psychological Flexibility</b></p> <p>Tell yourself, "IF I find myself putting off a task that doesn't seem pressing, THEN I will remind myself that things often don't seem pressing until it's too late. I will get started on the task." → <b>Implementation Intention</b></p>
3	<p>Own Yourself. Overcoming procrastination is about self-regulation. We know we shouldn't procrastinate, but we are unable or unwilling to regulate ourselves to act because procrastination provides immediate mood repair. → <b>Cognitive Insight</b></p> <p>When you are about to give in to feel good, always remind yourself - you are the owner of yourself, you can control yourself, and you should control yourself. You wouldn't wish to sacrifice something more important for immediate mood repair. You wouldn't let desires take control over you. → <b>Psychological Flexibility</b></p> <p>Tell yourself, "IF I find myself saying "I feel like it tomorrow", THEN I know it signals giving in, and I will just start on the task that I'm procrastinating." → <b>Implementation Intention</b></p>



# Interface Options to Generate Context Specific Messages by LLMs

1. open-ended text box where users could freely share details they considered pertinent
2. Offered instructions and sample inputs for open-ended response boxes
3. Options to specify:
  - a. the tone (formal vs. informal)
  - b. directness (direct vs. indirect)
  - c. length of the LLM-generated message (50, 100, or 150 words).
4. Basic query format:
  - a. “Adapt and rewrite [Seed Message] for [User Name], who is facing the following challenge: [User Situation]. The rewritten message should be [Selected Tone], [Selected Directness], and have fewer than [Selected Length] words. [Include instructions on applying the message in the situation].”
  - b. Participants also had the option to make open-ended requests to change the generated message as well as edit the message themselves

# Let's help you manage your struggles with procrastination

Please tell us your specific situation in detail.

You might want to describe instances such as 'I'm constantly postponing my work tasks' or 'I have a hard time starting my academic assignments.'

*If you could be more precise, that would be even more beneficial.*

For example, 'I have a project deadline in three days and haven't started yet' or 'I have a pile of unread books for my literature class, and I keep delaying reading them.' Providing this context will help us craft personalized strategies to help you manage your procrastination effectively.

Enter your situation here \*

I have 3 final exams in the next 2 weeks, each worth a huge part of my final grade. My grades are low and I can't afford to fail these, but I just can't get myself to study. I have 20 chapters to review, and I've only done 4. Yet, I have been watching TV shows and scrolling through my phone for 3 hours, trying to ignore the pile of work I know I will eventually need to do...

Include instructions on applying the message in my situation

Yes

Tone

Informal

Directedness

Direct

Length

100 words

[WANT TO EXPERIMENT WITH  
THE PROMPT THAT GENERATES THE MESSAGE?](#)

GENERATE THE PERSONALIZED MESSAGE



Hey there! I totally get it, studying for those final exams can be tough, especially when we're tempted by TV shows and phone usage. But here's the thing: we often think we'll feel more motivated to study tomorrow, but that's not always the case. Our feelings can be tricky forecasters! So, if you catch yourself thinking "I'll study better tomorrow," remember this: tomorrow's you might still feel the same way. And we don't want the distraction of TV shows and phone usage to keep haunting you, right? So let's do this today! Start with just one chapter and resist the urge to watch TV or use your phone. You got this!

[WANT TO EDIT THIS RESPONSE?](#)

[WANT TO MAKE MORE REQUESTS?](#)

**Write instructions on how you might want to further  
change this message**

Identify what you want to change in the message, such as a need for messages to look like a certain way. For example, you might want your message to look like a poem or a fairy tale. You might also write something like "I want the message to have emojis." or "I would like the message to be funnier."

Write down a clear request for a more personalized message, providing examples if possible.

[Write your request here](#)

Make this message sound more encouraging and improve grammar and spelling.

SAVE

[Edit the response here](#)

Hey there! I totally get it, studying for those final exams can be tough, especially when we're tempted by TV shows and phone usage. But here's the thing: we often think we'll feel more motivated to study tomorrow, but that's not always the case. Our feelings can be tricky forecasters! So, if you catch yourself thinking "I'll study better tomorrow," remember this: tomorrow's you might still feel the same way. And we don't want the distraction of TV shows and phone usage to keep haunting you, right? So let's do this today! Start with just one chapter and resist the urge to watch TV or use your phone. **You can do this!**

SAVE



# Draft an email to their future selves

## 1. Purpose

- a. encourage participants to prioritize their responsibilities and establish clear objectives
- b. facilitate reflection at various temporal stages of their goals, from the immediate future to more distant timeframes, thereby enabling incremental action planning
- c. prompted participants to consider their underlying motivations and anticipated achievements

## 2. LLM ready to help

- a. make open-ended requests for editing their drafts
- b. utilize provided keywords to conceptualize their future actions more effectively, helping individuals better align their actions with their core values and goals



# Write a message about your future self

How do you see yourself one week from now, having made progress with your procrastination? What about in three months? And in ten years? Envision your future self at these distinct stages. Think about the personality traits you may have strengthened, the goals you could have achieved, the improved relationships due to better time management, and your academic or professional accomplishments that you have made possible by overcoming procrastination.

My future self is...\*

The next two weeks are the final weeks of my school year. They will be hectic and stressful, filled with final exams, final projects, and the release of my final report card. At the end of these two weeks, I want to know that I have tried my best in studying for all 4 exams and walk out of the exams with a feeling of relief and satisfaction. For my final project, I want to have finished it 2 days before the deadline, unlike how I usually leave things until the last second. Finally, I wish that when I receive my report card in three weeks, my GPA is 3.5 or above to maintain on the Dean's List.

[NEED HELP IN DRAFTING THE MESSAGE?](#)

[NEED HELP IN IMAGINING THE FUTURE?](#)

## Email this to my future self

Email address \*

Date selector

09/05/2023



Basic time picker

07:58 PM



SEND

Consider providing detailed instructions about how you'd like your message to be improved. These could include changes in its style, format, tone, or the inclusion of specific elements such as emojis. For instance, you may want your text to have a more formal or conversational tone, require a grammar and typo check, or need it to resemble a certain writing style.

How can we help you? —

Help me sound more excited about the future.

SAVE

Select the following term that best describes your desired future:

- ☐ Successful: achievement, prosperity, impact, growth
- ☐ Happy: fulfillment, joy, gratitude, serenity, meaning
- ☐ Free: independence, autonomy, exploration, authenticity
- ☐ Exciting: adventure, novelty, growth, spontaneity
- ☐ Balanced: well-being, contentment, health, harmony
- ☒ Choose my own keywords

Insert list of keywords here \*

Independent: self-sufficient, self-made, liberated, bold

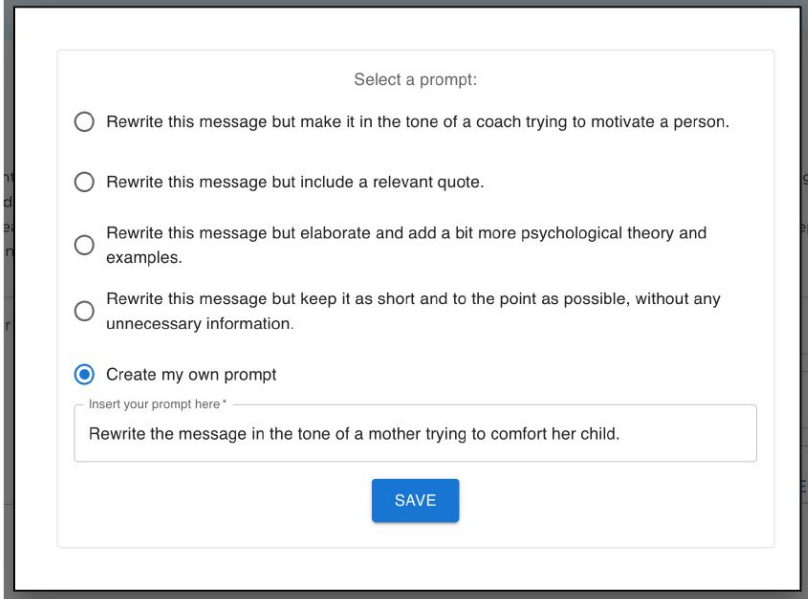
Our system will tailor your message according to the future you describe.

MODIFY MESSAGE





# Researchers enabled participants to create their own custom prompts, provided example prompts



Select a prompt:

- ☐ Rewrite this message but make it in the tone of a coach trying to motivate a person.
- ☐ Rewrite this message but include a relevant quote.
- ☐ Rewrite this message but elaborate and add a bit more psychological theory and examples.
- ☐ Rewrite this message but keep it as short and to the point as possible, without any unnecessary information.
- ☒ Create my own prompt

Insert your prompt here \*

Rewrite the message in the tone of a mother trying to comfort her child.

SAVE

**Figure 4: Prompts to generate personalized messages**



# Participants

## i. Probe Users:

1. 15 university students (10 women, 5 men)
2. several racial groups (8 Asian, 4 White, 2 African American, 1 Mixed-Race)
3. between the ages of 18 and 25, mean age  $21.6 \pm 0.6$
4. residing in North America
5. recruited through email invitations and social media calls
6. **self-identified as at least average procrastinators, scoring 24 or higher on Irrational Procrastination Scale (IPS)**
7. refer to these participants as P1–P15



# Participants

## ii. Domain Experts:

1. 6 experts (3 women, 3 men)
2. 2 racial groups (5 White and 1 Asian)
3. refer to these experts as E1–E6
4. recruited through email invitations and social media calls
5. All of them had post-graduate degrees from diverse fields including:
  - a. clinical psychology (E1 and E2)
  - b. learning and education (E3–E6)
  - c. cognitive psychology (E4 and E6)



# Procedure

1. Collect feedbacks through both individual interviews (P1-P10) and focus group discussions (P11-P15)
2. Using Google Meet platform
3. Steps:
  - a. Participants were given a brief overview of the study's objectives and a walkthrough of the SPARK tool
  - b. Participants were then instructed to share their screens as they explored SPARK on their own for 10 minutes (or more if requested)
  - c. Participants were invited to give their thoughts on the utility of the tool and potential features they would find beneficial individually or in the focus group
  - d. Researchers apply thematic analysis to extract themes from the interview and focus group transcripts
  - e. Interviewed the experts to solicit feedback on these findings (45-60 mins)

# Findings


Table 2: Breakdown of themes from participant (P) and expert (E) responses.

Themes	Codes	Number of Individuals Mentioned
Aspirations for structured action steps	Need for direct solutions	13P + 2E
	Step-by-step guidelines	10P + 4E
	Structuring recommendations	10P + 3E
	Overreliance	2P + 5E
	Adaptive breakdown	3P + 2E
Deadline-driven instructions	Reliance on deadlines	12P + 4E
	Use of calendars	7P + 2E
	Documenting goals	8P + 5E
	Need for reminders	7P + 4E
	Diversity in motivation	2P + 4E
Guided versus unguided questions	Varied levels of guidance	6P + 5E
	Providing multiple layers of features	7P + 3E
	Flexible engagement	3P + 2E
Concerns and boundaries in providing emotional support	Need for emotional support	9P
	Limitations of LLMs in addressing emotions	1P + 6E
	Clear disclaimers	5E
Providing support on the use of LLM-based tools	Examples and instructions	5P + 4E
	Collaborative elements	4P + 2E
	Feedback to LLMs	5P + 1E



# Findings

1. Aspirations for Structured Action Steps
2. Deadline-Driven Interactions
3. Guided Versus Unguided Questions
4. Concerns and Boundaries in Providing Emotional Support
5. Providing Support on the Use of LLM-based Tools



# 1. Aspirations for Structured Action Steps


## i. Participants

### 1. 👍

- a. generally appreciated the flexibility by giving them a greater sense of control over their interaction with the probe
- b. raised potential ideas for additional customization features
  - i. switch between action-oriented and suggestive tones
  - ii. instructions links to studies or relevant websites

### 2. 👎

- a. excessive number of options might be overwhelming
  - i. suggestions: present basic customization features on the main page and more advanced options on a separate page
- b. Unstructured or expansive tasks
  - i. suggestions: tasks appear more manageable when presented in a clear, step-by step sequence
  - ii. psychological benefits to seeing a concrete action plan → could feel fulfillment upon completing individual steps for larger tasks



## 1. Aspirations for Structured Action Steps

### ii. Experts

1. Also underscored the value of offering users assistance in breaking down larger tasks, but highlight risk to overwhelm students with too comprehensive plan  
⇒ Detail the imminent steps while providing a broader outline for later tasks
2. Concerns about fostering over-reliance on the tool
  - a. The danger lies in spoon-feeding them precise answers or solutions
  - b. crucial for students to develop their own thinking and information-gathering skills
  - c. False sense of accomplishment: students might follow every instruction and still wonder why their outcomes don't match their expectations.





## 2. Deadline-Driven Interactions

### i. Participants suggestions:

1. integration with platforms such as Google Calendar, MS Teams, Slack into their daily workflow
2. Allow specifying task deadline
3. Allow users to set task priorities and provide estimates for completion times, tailoring the tool's reminders to their individual needs

### ii. Experts opinion:

1. Agree but emphasized **diverse motivational needs people require at diferent times**
2. LLM response inspired by *WOOP* (wish, outcome, obstacle, plan) goal-setting model
3. Presenting an array of motivational prompts → user can select the resonating one



### 3. Guided Versus Unguided Questions

i. Participants' opinions:

1. Varied when discussing the nature and quantity of questions the tool used to probe users for more information
2. Some participants advocated for a guided approach featuring a sequence of open-ended questions
3. Other participants were concerned that a sequence of questions could serve as a **new avenue for procrastination**

ii. Experts' suggestions:

1. Employing contextual variable like the timing & user's schedule to fine-tune how the LLM elicits more information
2. Support providing longer interaction, but recognize users have options for shorter interaction



## 4. Concerns and Boundaries in Providing Emotional Support

- i. Both participants and experts recognized discussions of procrastination could often lead to revelations about mental states, including symptoms of anxiety and depression
- ii. Participants' suggestions:
  - 1. Tool could be proactive in inquiring users about their emotions and the possible culprits behind negative feelings
  - 2. Providing resources to manage serious issues like depression
- iii. Experts' opinion:
  - 1. Concerns that LLMs taking on roles akin to therapists
  - 2. Model could dispense advice appealing to users but lack clinical validity
  - 3. Tool should clearly communicate their limitations in providing therapeutic support



## 5. Providing Support on the Use of LLM-based Tools

- i. Participants' suggestions:
  - 1. adding a collaborative element so that users could help one another optimally use the tool
  - 2. providing feedback on the advice generated beyond input to the LLM → star-rating system
- ii. Experts opinion:
  - 1. Tools need to explicitly distinguish the contexts in which they can be helpful from those in which they cannot
  - 2. Make sure users are fully aware of the tool's capabilities and limitations



## Discussion

- a. **RQ1:** How do users **envision** the role of LLMs in tailoring strategies for managing academic procrastination?
  - i. breaking down larger tasks into more manageable components
    - 1. balance between providing structured guidance and maintaining adaptability
  - ii. Effective deadline management should encompass more than just scheduling; it needs to take into account the comprehensive context of a user's life
    - 1. Integration of calendar / health apps
    - 2. dynamically generate a ranked task list + *effort estimator*
  - iii. Broader psychological need for collaborative support in combating procrastination
    - 1. Communal repository: access a variety of strategies and solutions that have been effective in managing tasks and deadlines
    - 2. Shared prompt library: users could view and contribute diverse examples of prompts and the corresponding responses generated by the LLM



## Discussion

- b. **RQ2: What challenges or tensions** might arise when using LLMs for tailoring strategies to manage academic procrastination?
  - i. The need for LLM-based tools to acknowledge and validate user-expressed emotions without crossing into the territory of clinical or therapeutic advice
    - 1. carefully defining the scope and limitations of the tool
  - ii. Concerns about the potential for students to become over-reliant on LLM-based tools
    - 1. Balance between providing guided assistance and fostering independent problem-solving skills
    - 2. Generating *independent exploration prompts* that encourage problem-solving strategies (e.g. think critically...)
  - iii. Allowing Flexible Engagement
    - 1. In some instances, users may prefer a set of structured questions to shape their responses
    - 2. Allowing users to maintain a minimal level of interaction even when they are not fully engaged



## Discussion

### **c. Contributions to Human-LLM Collaboration**

- i. Highlight nuanced way that users engage with LLM-based tools
- ii. Underscoring the potential for LLM to act as collaborative partners in personal and academic development
- iii. The concerns of the tool raised about emotional support challenges, and balance between guidance & independence
- iv. Point out growing awareness of the ethical responsibilities inherent in deploying AI in sensitive areas like mental health
- v. Advocating for a cautious & well-informed ethical approach of AI



## Limitations & Future Work

### Limitations

- a. All participants residing in North America → geographical and cultural context may have influenced their perspectives
- b. Using technology probe and not conducting longitudinal study without researcher oversight
- c. Situated in the domain of academic procrastination → might not directly translate to other behavioural or psychological areas

### Future Works

- a. Include a more geographically and culturally diverse participant group
- b. Longitudinal deployment
- c. Broaden the scope: assess the efficacy of LLM-based tools in tackling a diverse array of challenges





# Reference

[1] A. Bhattacharjee et al., “Understanding the Role of Large Language Models in Personalizing and Scaffolding Strategies to Combat Academic Procrastination,” May 2024, doi: 10.1145/3613904.3642081.