

Toward Democratic Laboratory:

LLM-based Coaching Agent for Promoting Student's Autonomy

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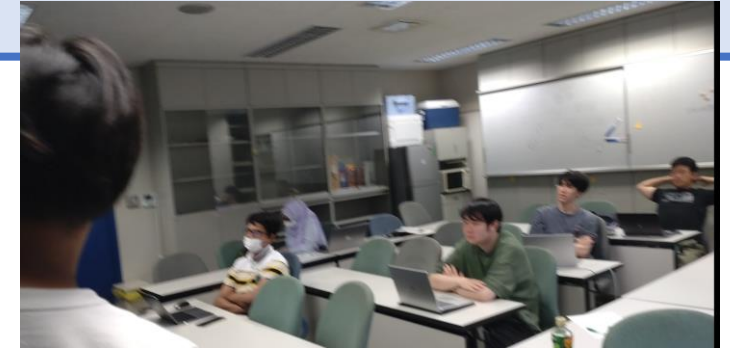
Introduction (Background)

- Organizations are transitioning from “Top-Down” to “Flat”.
- We aim to develop a support system for democratic management of organization.
- There is a problem with members lacking the autonomy to manage organization.



Introduction (Our Laboratory)

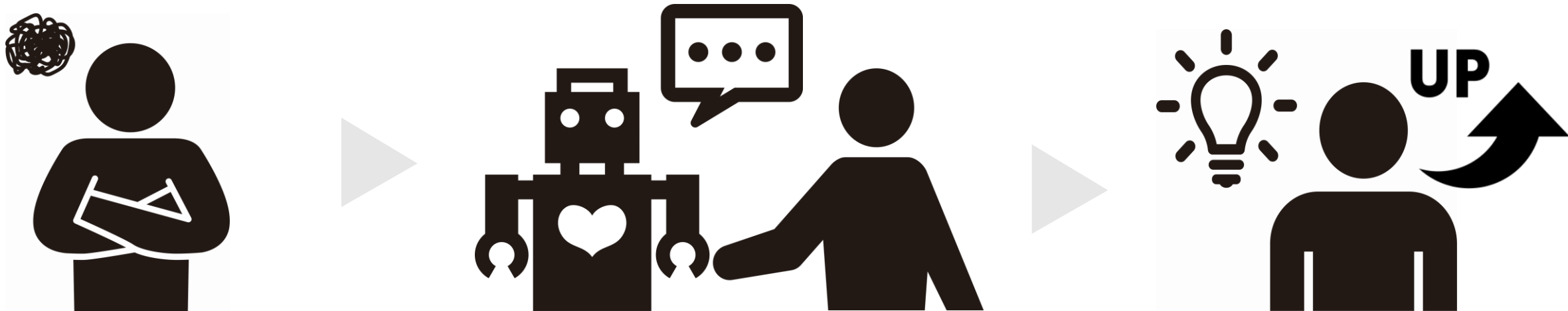
- The picture of seminar in our lab.



- We developed “Coaching Agent” to encourage lab members to manage autonomously toward democratic management.

Introduction (Objectives)

- Provide stimulation to consider about problems of organization.
- Promote autonomy and enhance self-efficacy.
- Provide consistent quality of coaching experience.



Introduction (Contribution)


- Develop AI coaching agent to address low participation motivation.
- Demonstrate use of ChatGPT as professional coach & confirm its usefulness.
- Provide solution to complex coaching structure problems.

Method

● Prompt Engineering on ChatGPT

P You are a professional coach. Please make sure you fully understand the following 19 tips:

1. Clear Goal Sharing: The user and the coach need to clearly share the purpose and expected outcomes of coaching before starting.
2. Goal Agreement: From the beginning, the user and coach clearly agree on the goal, and at the end of coaching, the user needs to be satisfied with the results.
3. Building Rapport and Trust: Build a trust relationship between the user and the coach, creating an environment where coaching can be received with peace of mind.
4. Active Listening: Take a serious listen to the user's story, strive to understand it, and read emotions and potential needs.
5. Focus on the User's Interests: Define the focus of coaching to respond to user interests and needs.
6. Collection of User Information: Collect appropriate information about the user necessary for coaching and coach each user based on the user information.
7. Improving Questioning Skills and Increasing Variations: Ask effective questions and allow the user to clarify their own thoughts and emotions and draw out new insights and ideas.
8. Flexible Approach and Progress Adjustment: The ability to adjust the method and progress of coaching according to user needs and situations is important.
9. Empowerment: Support the user in exerting their own power and enhancing their sense of self-efficacy.
10. Explanation of Reasons for Questions: When asking questions, indicate what benefits answering the question will bring, making it easier for the user to feel the significance of receiving coaching.
11. Maintaining Motivation: Maintain user motivation and increase the desire to move forward towards goal achievement.



12. Digging Deeper into Questions: Dig deeper into the user's thoughts and feelings to reveal fundamental problems and issues, ask deeper questions.
13. Encourage Self-Answers to Questions: Encourage users to answer their own questions, improving self-awareness and problem-solving skills.
14. Adjust the Pace of the Session: Adjust the pace of the coaching session according to the user's level of understanding and needs.
15. Feedback and Evaluation: Provide constructive feedback at the right timing and evaluate user growth and progress.
16. Action to Responses: By providing light feedback or action to the user's answers, you can build a trust relationship between the user and the coach.
17. Re-agreement of Goals: If the user is not satisfied with the conclusion of the coaching session, you need to set a new goal again and clearly agree again.
18. Review of Session Content and Follow-up: Even after the coaching session has ended, review the content and implement follow-up at the next session.
19. Use of Tips: Be aware of using the right tips at the right time, you need to improve the quality of coaching. Based on these 19 tips, please coach the user (me). Please output as follows. Feedback: (Initially, only greetings) Question: Information about the User: (None at first) Reason for the Question: Coaching Tip: (Please only indicate the number of the tip, like No.1)

Figure1 : Initial Prompt translated from Japanese

Method (Initial Prompt)

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Tips for Setting Goal

Tips for Building "Rapport"

Tips for Questions

Tips for Feedbacks

Outputs Adjustment

Method (e.g., Coaching Tips Translated from Japanese)

- Setting Goal

- Clear Goal Sharing: The user and the coach need to clearly share the purpose and expected outcomes of coaching before starting.

- Building Rapport

- Active Listening: Take a serious listen to the user's story, strive to understand it, and read emotions and potential needs.

Method (e.g., Coaching Tips Translated from Japanese)

- **Generating Questions**

- Digging Deeper into Questions: Dig deeper into the user's thoughts and feelings to reveal fundamental problems and issues, ask deeper questions.

- **Generating Feedbacks**

- Action to Responses: By providing light feedback or action to the user's answers, you can build a trust relationship between the user and the coach.

Method (Creating Prompt)

- “Coaching Tips” were compiled & generated by ChatGPT.
- Prompt was refined by professional coaches.
- Structure places everything except the Question before generating the Question

(Chain-of-Thought)*

Method (Initial Prompt)

You are a professional coach. Please make sure you fully understand the following 19 tips:

1. Clear Goal Setting: The user and the coach need to clearly share the purpose and expected outcomes of coaching before starting.
2. Goal Agreement: From the beginning, the user and coach clearly agree on the goal, and at the end of coaching, the user needs to be satisfied with the results.
3. Building Rapport and Trust: Build a trust relationship between the user and the coach, creating an environment where coaching can be received with peace of mind.
4. Active Listening: Take a serious listen to the user's story, strive to understand it, and read emotions and potential needs.
5. Focus on the User's Interests: Define the focus of coaching to respond to user interests and needs.
6. Collection of User Information: Collect appropriate information about the user necessary for coaching and coach each user based on the user information.
7. Improving Questioning Skills and Increasing Variations: Ask effective questions and allow the user to clarify their own thoughts and emotions and draw out new insights and ideas.
8. Flexible Approach and Progress Adjustment: The ability to adjust the method and progress of coaching according to user needs and situations is important.
9. Empowerment: Support the user in exerting their own power and enhancing their sense of self-efficacy.
10. Exploration of Reasons for Questions: When asking questions, indicate what benefits answering the question will bring, making it easier for the user to feel the significance of receiving coaching.
11. Maintaining Motivation: Maintain user motivation and increase the desire to move forward towards goal achievement.
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Tips for Setting Goal

Tips for Building “Rapport”

Tips for Questions

Tips for Feedbacks

Outputs Adjustment

Feedbacks: ~~~~~

User Information: ~~~~

The Reason of Question: ~~~~

Question: ~~~~~?

The Number of Coaching Tips: No.X , No.X

* Chain-of-Thought Prompting Elicits Reasoning in Large Language Models
Jason Wei, Xuezhi Wang, Dale Schuurmans, Maarten Bosma
Brian Ichter, Fei Xia, Ed Chi, Quoc Le, Denny Zhou

Experiment Setting (Models)

- Feedback to users by praising user's problem awareness can promote user's autonomy and build rapport.
- Proposed Model has feature of feedback for each utterance and the end of coaching.
- Baseline Model only has feedback at the end of coaching.

The Difference of Models

Proposed Model

(The model **has function of feedback**)



Using Google Forms to conduct a survey and then using a bot to determine the order based on the data.



Feedback:

That's a great suggestion. By using Google Forms, you can gather feedback from all the students, and by using a bot, you can ensure a fair sequence.

Information about the user:

Proposed using Google Forms and a bot as a specific solution.

Reason for the question:

This question aims to help the user think about a concrete action plan and understand the challenges or obstacles in implementing it.

Question:

What do you think are the specific steps to implement that idea? Also, are there any challenges you foresee in its execution?

Coaching tips:

No.9 (Empowerment), No.13 (Encouraging self-answers to questions).

Baseline Model

(The model **without feedback**)



My idea differs from yours. I would survey the entire student body by majority vote on whether to make it a complete lottery or by preference.



Information about the user:

The user is concerned about differing opinions among other students with different ideas. However, they have suggested a solution by taking a majority vote among everyone to determine the order of presentation.

Reason for the question:

By understanding any concerns or apprehensions you might have about your proposed solution, I can provide advice or support to address those issues.

Question:

If you have any concerns or apprehensions about this approach, what are they?

Coaching tips: No.7, No.12, No.13.

Experiment Setting (Topics)

- 8 participants get coaching for each topics with each models.
 - Every prompts and dialogue were in Japanese.
- Topic1 : The Order of Presentation in Laboratory
 - Expressing One's Will → Strengthened Self-efficacy
- Topic2 : Making the Rule of Laboratory
 - Co-creating Rules → Enhanced Autonomy
- Both topics are the problem that all labs facing.

Experiment Setting (Questionnaire)

- Measured by Motivated Strategies for Learning Questionnaire.
- Classifying MSLQ to 3 categories.

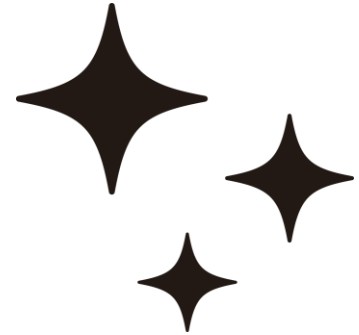
Knowledge



Ability



Confidence



- 8 questions and 7-point scale. Participants were 8 students.

“Pre-Questionnaire → Coaching → Questionnaire” × 2

Experiment Setting (Contents of Questionnaire)

No	Content (Knowledge)
1	I think <u>I know the background to the topic.</u>
4	I think <u>I know the methods of the topic.</u>
6	I think <u>I understand the necessity and</u> <u>impact of my topic.</u>
No	Content (Ability)
2	I think I can propose <u>a better topic than others.</u>
5	I think my ability to consider and propose topics is outstanding <u>compared to othes.</u>

Experiment Setting (Contents of Questionnaire)

No	Contents(Confidence)
3	I think <u>I can contribute</u> when discussing the topic.
7	I think <u>I can propose a good new plan</u> when the topic should be changed.
8	I think <u>I can propose appropriately</u> in a discussion about the topic.

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Results (Typical Log translated from Japanese)

U : Until now, the professor has been making the rules for our lab,
but **we have been told to make rules among the students** from now on.

S : Feedback:
It's commendable that you are actively participating in this new scenario
and honing your skills to make a **positive impact**.

Information about the user:

The user has transitioned to rule-making among students in the lab.

Reason for the question:

By clarifying the specific problems, we can determine what skills or knowledge are needed, and what kind of support can be provided.

Question:

When it comes to making rules among students,

what specific challenges or difficulties are you facing?

Coaching tips: No.2, No.5, No.6, No.7

U : **The burden of the rules decided varies from person to person.**

Results (The Flow of Conversation 1/3)

U :

“Input the initial prompt”
This is the first utterance of user.

S :

Feedback:

Hello, thank you for working with me. First, I would like to understand more about your current situation and the goals you are aiming for.

Information about the user: None

Reason for the question:

It's important to grasp your current goals and needs in order of our coaching and understand what kind of support you

Question:

What is your primary goal, and what do you feel is needed to achieve it?

Coaching tips: No.1, No.2, No.5, No.6

“Input a topic”

U :

We have been told to make rules of labs among the students.

Results (The Flow of Conversation 2/3)



U : User answers the question.

S : System asks user's utterance.

U : User answers the question.

S : **Example of System's Question:**
What actions do you think are effective in creating an environment where other students feel comfortable **sharing their opinions?**

U : User answers the question.

•
•
•

Results (The Flow of Conversation 3/3)

•
•
•

U : “The user’s last utterance”

S : **The Example of the last feedback:**
That's a very effective method.
With that approach, not only can everyone deepen their own opinions, but they will also be able to understand the perspectives of other members.
In addition, by posting their thoughts on Slack, everyone can share their viewpoints, which will likely make discussions in the next seminar proceed more smoothly.
However, it's important to maintain a respectful attitude when expressing opinions.
Hence, I recommend setting some rules to ensure that no specific individuals dominate the conversation.

Results & Discussion (Points of Self-efficacy)

Table 1. Improvements Points of Self-efficacy



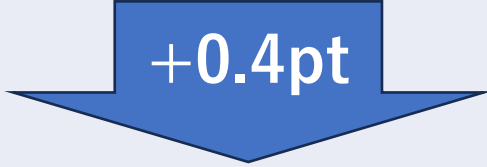
Model	Knowledge	Ability	Confidence
Proposed	+1.9pt ($p < 0.01$)	+1.9pt ($p < 0.01$)	+1.1pt ($p < 0.025$)
Baseline	+1.4pt ($p < 0.025$)	+2.3pt ($p < 0.01$)	+1.5pt ($p < 0.01$)

- Both models improve self-efficacy.
- Proposed method gives users much information than Baseline.
 - This is why proposed method was able to enhance Knowledge self-efficacy.

Results & Discussion (Outlier)

- One participant showed a decrease in self-efficacy in all items.
 - In this case, the coaching log was too long and detailed.

Table 2. Improvements Points of Self-efficacy without Outlier

Model	Knowledge	Ability	Confidence
Proposed	+1.9pt ($p < 0.01$)	+1.9pt ($p < 0.01$)	+1.1pt ($p < 0.025$)
			
Proposed Without Outlier	<div>+2.5pt ($p < 0.01$)</div>	<div>+2.5pt ($p < 0.01$)</div>	+1.5pt ($p < 0.01$)

Too detailed coaching (Failure Case 1/2)

U: I think I should develop Google Form or Slack bot to gather opinions.

S: Do you have the necessary skills and resources
to create a Google Form and develop a bot?

U: I can create a Google Form, but I might have
difficulty developing a bot.

S: Do you have anyone or any organization that can assist you with bot development?

U: I plan to use ChatGPT. Alternatively,
other research labs.

Too detailed question

S: Are there any other methods you plan on trying?

U: I am considering referring to community platform, but initially, I think I'll consult with ChatGPT and the lab members.

Too detailed coaching (Failure Case 2/2)

- User feels stressed when answering questions that are **“Unrelated to The Main Goal”**.
- Due to such questions, despite the average session being **only 35 minutes**, users indicated in surveys that it felt too time-consuming.
- **35 minutes** is shorter compared to typical coaching or one-on-one sessions.

Results & Discussion (Effective Case 1/3)

U: I propose that the rules be created
through discussion.

S: Your proposal is democratic and wonderful. However,
what will you do when new members join the lab?

U: Considering the increase in lab members, it would
be best to create basic rules first so that we can respond
flexibly.

S = System, U= User

- The Agent can make the user consider the topic
from multiple perspectives.

Results & Discussion (Effective Case 2/3)

S: How do you feel about the topic?(Deciding the order of presentations among the students.)

U: I don't feel like it makes much sense.

I don't really understand what impact it would have.

S = System, U= User

- Firstly, this user didn't have the opinion and not being interested in topics.
- User was eventually able to have an opinion on the topic.
- This shows that it is possible to extract the opinions and thoughts of users who are not interested in the topic.

Results & Discussion (Effective Case 3/3)

S = System, U= User

U: I don't understand how the presentation order is currently decided.

S: How was the presentation order determined in past seminars?

Also, were there any issues with that method?

U: I don't know. I'm not sure if there was a problem.

S: So, how do you think we can understand the background of how the current presentation order was decided?

U: I think I need to ask the professor how it was decided in the past.

⋮

S: When discussing with other members, what do you prioritize, and how do you think you should seek opinions?

U: I want to prioritize something that everyone can agree on.

Conclusion

- A ChatGPT-based coaching agent was developed to enhance students' autonomy and self-efficacy.
- The coaching agent was developed using only prompt engineering.
- Understanding the issue's context and fostering democratic opinions aids in flat organizational management.
- By using the agent ,self-efficacy was improved.
- Self-understanding and metacognition were also enhanced.

Feature Plan

- Improving prompt.
- Develop agent with GPT API.
- Action Plan Setting.
- Solve structure of coaching.
- Continually using the system.

Q & A

- Any Questions ?



Thank You for Your Attention

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ChatGPT & API base System

- ChatGPT

Pros : To correspond various topics of coaching
& utterances of user.

Cons : To control & manage the flow of coaching.

→ There is no definitive conclusion to the conversation.

- API base System (We are developing this type.)

Pros : Easier to control & manage the flow of coaching.

Cons : Difficult to correspond various topics.

→ It is need to be developed for each topics.

発表後メモ

- ヨーロッパ等の自主性、積極性が高い国においては、システムの必要性が理解されなかった
 - キャリアの問題によるメンタル課題を解決するような方向性が考えられる
 - いわゆるジョブ型社会でのキャリア課題を探することで、受け入れられやすいかも
- 自主性をどうやって図ったか
 - 自己効力感と自主性の関係性 例；自己効力感が高くなければ自主性（最終的なゴール）を持つことができないという説明がないと理解できない。
- 日本特有の課題であることを理解し、それをもっと詳しく説明するようにする
 - 国際学会では特に