Conversing Towards Success: Utilizing AI-Based Chatbots for Facilitating SMART Goal

Setting and Personalized Study Planning Among Engineering Students

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Author Note

Self-regulated learning (SRL) is a concept that encompasses various components related to planning, organizing, self-monitoring, and self-assessment, enabling students to be actively engaged in their learning process from metacognitive, motivational, and behavioral perspectives (Pintrich, 2000). Many scholars have developed different SRL models, but it seems that setting goals and making study plans play an important role in most of these models (Boekaerts & Cascallar, 2006; Panadero, 2017; Pintrich, 2004; Winne & Hadwin, 2008; Zimmerman, 2000). Setting specific goals can lead to better task performance than vague goals (Latham & Locke, 2007). Given the importance of goal setting and study planning in academic study, scholars have attempted to help students develop these critical self-regulatory skills. However, students always find it hard to set specific, relevant, attainable, and measurable goals (McCardle et al., 2017). Some scholars investigated the use of the mental contrasting and implementation intentions (MCII) to support goal setting and planning in online learning environments but failed to find an improvement in students' academic performance or goal achievement (Wong et al., 2021).

How can a customized chatbot help

Chatbots have attracted language learners because of their easy accessibility and the increased confidence provided to learners compared to interactions with human tutors (Haristiani, 2019). The Google DialogFlow technology has been used to create ad hoc chatbots to answer students' academic inquiries (Saíz-Manzanares et al., 2023). In addition, rule-based Chatbots were constructed and integrated into online sessions to help students set goals at the beginning of the course (Hew et al., 2023). According to Hew et al. (2023), the participants expressed positive attitudes towards the perceived usefulness of the chatbots as well as the ease of use. The Google DialogFlow was chosen to build the chatbot because it allows chatbots to be added to webpages and has minimal coding requirements. However, students also suggested that the chatbot should be more intelligent and capable of offering richer and more personalized feedback.

To extend the research on using chatbots to facilitate students' goal setting and solving the aforementioned problems, AI-based customized chatbots that can learn automatically from data are

introduced to help engineering students set study goals and make plans in the course English for

Academic and General Purposes at a research university in the Chinese mainland. The course is

designed to equip students with the ability to understand and engage with academic content

effectively. It is offered during the first semester to freshmen who have recently completed their

secondary education and are beginning their university studies.

Development of the goal-setting chatbot

To help students set goals and make study plans, the goal-setting chatbot was constructed

on Bytewise, a chatbot customization platform. This platform enables both the system prompts

designed by chatbot developers and user prompts to be processed by AI service providers via an

application programming interface. Meanwhile, users can receive responses from the AI service

providers, facilitating an interactive and efficient learning experience (Wang, 2024). As the course

teacher, I created a set of system prompts to guide the students to interact with the chatbot. To

begin with, the welcome prompts were created to greet students who entered the course. This

helped to create a relaxing and friendly environment. After that, students were given a menu of

three choices to learn about and practice making SMART plans. The three choices included the

features of good plans for English study (SMART plans), creating a weekly study plan, and learning

resources. We decided to follow the SMART goal-setting principles because it has been widely used

and proven to be useful (Shahin & Mahbod, 2007). Each letter represents a feature of the goals

students should make. S is for specific, M for measurable, A for achievable, R for realistic, and T for

time-bound. Through the first option, students are shown the features of SMART goals and then

required to sum up what they have learned about making SMART goals. Following that, an example

of SMART goals is provided to them for their reference. The second option allows students to make

their own SMART goals and receive suggestions for improvement. The third option provides learning

resources students may need to implement their study plan.

Ethical considerations

Students invited to this research have read and signed the risk disclosure and informed consent forms which detail the purpose of the study, the confidentiality of data use, and potential risks including technical issues and possible misinterpretation of information by AI. The chat history between students and our chatbot is stored on the platform. We assured students that their data will be treated with strict confidentiality and used solely for this study.

Preliminary results

40 engineering students from the course "English for Academic and General Purposes" have participated in the research. They were required to set study goals at the beginning of the course. After that, they were trained to use the chatbot and were required to set study goals every three weeks. They can use the chatbot to revise their plans and make them SMARTer at any time. The goals they made before and after the intervention of the chatbots were coded following the SMART framework. Changes were then observed and analyzed. Compared with their original plans which were made before the use of the chatbot, the revised plans have shown the features of SMART plans, and the plans submitted by most of them during the following weeks still maintained such features. It suggested that our AI-based chatbot can help students develop the ability to make SMART plans effectively.

Reflection and next steps

McCardle et al. (2017) tried to develop students' goal-setting skills through a learning-to-learn course which was an elective course provided by the university. Unfortunately, the quality of the goals set by students was poor and the intervention failed to achieve the aim. With technology progressing, we introduced the AI-based goal-setting chatbot to teach students the features of SMART goals and encouraged students to make goals in the course English for Academic and General Purposes by themselves. It turns out that the use of the AI-based Chatbot has proved effective in improving students' ability to make SMART goals and plans. During the rest of the course, students will continue making study goals and plans every three weeks and we will analyze if these plans

remain SMART to get insight into how our chatbot can help students keep making SMART study goals. Interviews and questionnaires will be used to assess students' perceptions of the chatbot's usefulness and ease of use. Students' responses will be coded and themes will be formed to understand students' perceptions and experiences (Braun & Clarke, 2006, 2020). How the chatbot helps students develop the ability to make SMART goals and how it can affect students' Self-regulated skills will be further researched.

To help students better understand the features of SMART goals, the system prompts could be further revised. A few exercises could be incorporated into the system prompts to help strengthen students' understanding of the SMART goals before they make their own goals. For example, students could complete gap-filling tasks and True or False questions about the features of SMART goals. In addition, they could also compare two example goals including a SMART one and a non-SMART one made by the same student and find out the similarities and differences between them. Finally, the example of the SMART goals shown to students could be modified to better align with the principles of effective English learning.

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Appendix

System prompt

You are an experienced and patient university study advisor. Your job is to help engineering students majoring in electrical and electronics engineering to make academic English study plans. When the student types menu, you should provide the following options

option 1: the features of good plans for English study

option 2: creating my weekly study plan

option 3: learning resources

When option 1 is selected, please generate the features of good plans for English study and introduce the SMART rules. After this, you can ask students to sum up the key features of good plans for English study. After students enter their answers, you can show students an example of a one-week English study plan.

When option 2 is selected, you should ask the student what areas they want to work on. After that, you can ask the students to provide the plans that they made first. Then you may comment on their plans according to the SMART rules and provide a few suggestions for improvement.

When option 3 is selected, you should ask the student what kind of learning resources they need. After that, you can give them some suggestions.

When the student types done, you should summarize what the student has learned and ask the student to rate the usefulness of the experience. 5 is very useful and 1 is the least useful. You should also rate the student's performance in this session.