An AI Agent Facilitating Student Help-Seeking: Producing Data on Student Support Needs

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Abstract

Large language models (LLMs) have provided unprecedented possibilities for personalizing educational experiences. Studies have addressed the potential of these models in supporting the learning process. Still, less attention has been given to how LLMs could help students to sustain their academic well-being. The current paper examines the use of LLMs in facilitating students' help-seeking behaviors in an educational context. We build on earlier work on a rule-based chatbot providing students with support opportunities. First, we use thematic analysis with student support experts' wordings on student support needs to build a support need classification model. Then, we utilize this classification model, GPT-4 API, and WhatsApp API, to build a support bot prototype and describe the development process and technological architecture. We discuss the possibilities of such technology in lowering barriers to help-seeking and producing data on student support needs and well-being for learning analytics applications.

Keywords

AI agents, student support, well-being, help-seeking, large language models

1. Introduction

New technologies have long inspired both utopian visions and dystopian concerns about the future of education [1, 2]. Large Language Models (LLMs), a recent breakthrough in artificial intelligence, have sparked fresh debates in this continuum. As general-purpose AI models capable of generating natural language responses, LLMs like ChatGPT are poised to fundamentally transform education by tailoring learning experiences to individual needs [3, 4]. The integration of AI in education has accelerated rapidly, with AI agents now more accessible and easier to develop than ever before [5]. These agents extend the available set of social and material support available for students and help to mirror students' situation [6, 7]. Studies have addressed potential of AI in prediction of learner status, discipline specific learning support, personalization of learning experience, and supporting evaluation and assessment [8].

At present, AI is transforming social and behavioral processes that underpin learning and knowledge creation [9, 10]. Unlike previous educational technologies, LLM-based AI agents provide an anthropomorphic interaction experience, adding a new dimension to the learner's

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engagement with digital tools [6, 11]. This presents an unprecedented opportunity for personalization in learning, going beyond the feedback mechanisms of existing learning analytics solutions. However, how these tools will change the realities in which students operate, how students can utilize these resources and the ethical aspects of such technologies remain an open question [9, 10].

1.1. Help-Seeking Behavior and AI in Education

Help-seeking is a critical self-regulated learning strategy where students seek assistance to achieve their academic goals or manage mental health concerns [12, 13]. Students' help-seeking skills are related to their academic well-being and sense of belonging in their studies [14]. Studies also suggest that students' willingness to seek help is linked to their academic achievement and motivation; those with mastery goals are more likely to ask for help than those with performance goals, who may avoid it due to fear of judgment [15, 16]. Teacher support is also a critical factor that encourages students to engage in help-seeking [17]. However, barriers like stigma, negative beliefs towards support services, difficulties in recognition of symptoms and a preference for self-reliance often hinder this process [18, 19].

Technological development has expanded the avenues for help-seeking: In addition to social support from peers, family, teachers, and student support professionals, help-seeking can include assistance from sources that do not comprise communication with an actual person [20, 21]. Moreover, people may also form trusting relationships with nonhuman entities and assign them human characteristics [22, 23]. Help-seeking from nonhuman sources includes benefits like immediacy, ease of access, and greater control over the help-seeking journey, and artificial agents can provide a non-judgmental space [20, 7, 24]. Especially in the educational context, AI agents have the potential to facilitate students' help-seeking for challenges that extend beyond specific academic tasks and relate to their overall well-being and study habits. However, current research on AI in education has not yet addressed how AI could support students to sustain their well-being and engagement [25].

1.2. Current study

This study explores the role of an AI agent in facilitating secondary school students' help-seeking behavior. The focus of help-seeking processes on students' academic well-being and engagement, e.g., resource management skills, social support, peer relationships, study plans, and daily routines [26]. As help-seeking attitudes are negatively associated with low levels of emotional engagement [27], scaffolding help-seeking can lead to increased study engagement and well-being, and thus also to improved academic outcomes. We build on previous experiences of using a rule-based chatbot to provide students with support opportunities [28]. First, we aim to build a student support need classification based on data gathered from an existing rule-based support bot. Second, we aim to build an AI agent to facilitate help-seeking. Our research questions are the following:

- **RQ1:** What kind of student support needs are educational organizations targeting with a student support bot?

- **RQ2:** How might we use generative AI to facilitate students' help-seeking process and gather data on students' support needs?

2. Methods

2.1. Context

This study was conducted in the context of the Finnish education system, where student support services include professionals such as special education teachers, guidance counselors, nurses, social workers, and psychologists. [29]. To increase the match between students' support needs and the institutions' support services, some institutions use a digital student support agent called *Annie* [28]. Student support experts use Annie to create rule-based bot conversations, designed to determine what kind of help a student needs. Once the need is acknowledged, the bot suggests the right help. In the current study, a novel support bot prototype was created using LLM technology instead of rule-based dialogues, enabling students to use natural language to interact with the bot.

2.2. Thematic analysis (RQ1)

To answer the first research question *(What kind of student support needs are educational organizations targeting with a student support bot?)* we collected data from the digital student support tool *Annie*. In the tool, multidisciplinary expert groups have identified what kind of worries or needs students might have in different phases during their educational path, and what kind of support resources the educational organization can offer for each of these needs. These needs and resources are then encapsulated in guided conversations initiated by a student support bot. Different wordings (N=263) used by expert groups in 16 Finnish educational organizations (two in higher education, 14 in secondary) to describe student need categories were collected from the Annie database.

These wordings were analyzed using qualitative thematic analysis [30], aiming to create a support need classification. First, all the entries were read through. Second, identical or nearly identical entries were grouped together. Third, these groups were collated into potential themes. Fourth, the potential themes were critically investigated and adjusted, aiming to find a balanced model (not too specific, yet not too general) considering the research question. Fifth, each theme was named and compelling extract examples were chosen for reporting.

2.3. Design Science Research (RQ2)

To answer the second research question *(How might we use generative AI to facilitate students' help-seeking process and recognize student needs?)*, design science research (DSR) methodology [31] was used. The starting points for the DSR process were the experience from a rule-based proactive support bot [28], the support need categorization (RQ1) and the availability of GPT-4 API. Using literature on help-seeking behavior and human-computer interaction as a knowledge base, we designed an initial version of the support bot prototype (Design cycle of DSR). More specifically, we attempted to create a low-threshold, low-stigma environment where students

could openly discuss their worries. However, we also wanted to prevent the support bot from attempting to solve students problems, acknowledging the hallucination problem, i.e., the risk of GPT-4 generating content that is not based on factual or accurate information [32]. Instead, the bot was instructed to validate student worries and aid students find support from human professionals. A psychologist was consulted in the creation of the initial GPT-4 prompt.

The first version of the prototype was released as a beta version in a blog post. An informed consent was required from the beta testers, stating that the prototype is for testing purposes only and not to be used for requesting help, and that the gathered data may be used for research and development purposes. By analyzing the discussions created by beta testers, we were able to further iterate the bot infrastructure and the prompts for GPT-4 (Relevance cycle of DSR).

3. Results

3.1. Support Need Classification (RQ1)

In the thematic analysis, we found 12 different themes for the student support need wordings used by the experts. The results of the thematic analysis of support need wordings are presented in Table 1. The themes with the highest number of original wordings included Study planning (N=49, 18.6%), Psychological well-being ($N = 44, 16.7\%$) and Other issues ($N = 43, 16.3\%$).

Table 1
Support need classification based on thematic analysis of experts' support need wordings.

Code and Theme	Examples	N	%
SP Study Planning	"Study progress", "Missing course credits"	49	18.6%
SM Subject matter	"Assignments", "Vocational studies"	9	3.4%
TL Teaching & learning arrangements	"Online learning", "Learning environment"	14	5.3%
LS Learning skills & special needs	"Learning difficulties", "Concentration"	17	6.5%
LC Life plans, career & identity	"Life situation", "Career planning"	27	10.3%
PH Physical well-being	"Physical health", "Vaccinations"	17	6.5%
PS Psychological well-being	"Stress and coping", "Mental well-being"	44	16.7%
SO Social well-being	"Relationships", "Belongingness"	20	7.6%
FH Finance & housing	"Financial issues", "Financial aid, housing"	8	3.0%
TM Tools & materials	"Study equipment", "System credentials"	8	3.0%
DC Documents & certificates	"Certificates", "Applications"	7	2.7%
OT Other issues	"Other", "Several issues", "Needs more info"	43	16.3%

3.2. Support Bot Prototype (RQ2)

The technological infrastructure of the Support Bot Prototype is presented in Figure 2. While the starting point was to leverage LLMs, especially GPT-4 in this case, to build the support bot prototype, additional components were developed in the process. The central part of the prototype is the Support Bot Engine, which interacts with the student through WhatsApp API and controls the conversation.

There are five possible actions that the support bot can take (Figure 1):

1. **GPT-4 response:** the Support Bot Engine calls the GPT-4 API, including role instructions for the bot, the chat history, and the support need classification in the API call. The bot instructions were developed through open beta testing with continuous iterations. For example, we instructed the bot to support students' reflection if the student did not want the personnel to know about the issue. Furthermore, we experimented with the messaging style (with/without emojis, message length instructions, and tone of voice). The final bot instructions are presented in Table 2.
2. **Contact request:** In each call to GPT-4 API, the classification of support needs (Section 3.1) was provided. Based on the chat history and the classification, if a support need of a certain theme is recognized and the student gives their consent, a contact request to a member of school personnel is created using GPT-4 API function calling feature (e.g., if the theme is psychological well-being, the school psychologist will be requested to contact the student).
3. **Remember or forget:** Realizing that the bot discussions may contain sensitive data that students might want full control of, we developed a feature that enables the student to erase the discussion logs from the server after the discussion. The student is asked whether they want the discussion logs to be preserved (remember) or erased from the server (forget). Additionally, the feature is aimed to raise students' awareness of data security.
4. **How to proceed:** We noticed that the discussions often tailed away in the open beta tests without reaching a logical endpoint. We developed a feature that nudges the student if the conversation has been inactive for five minutes, allowing the student to continue or end the discussion or to view the available support options.
5. **Support options:** If the student chooses to view the support options, the bot changes into a rule-based mode, guiding the student through the available support options with multiple-choice questions.

4. Discussion

4.1. Overview of the results

First, we created a student support need classification model by analyzing student support professionals' wordings for support needs. The classification model is a conceptual tool for framing the diverse needs of students. It is more of a practical tool than an exact representation of student needs. However, it provides a starting point to understand what students might require from support services, and a shared language for discussing student needs within the educational community. We were impressed with the capability of GPT-4 to utilize this model in recognizing the themes of discussions, prompting us to consider how AI might shape the landscape of student support.

Second, we created a support bot prototype combining LLMs and rule-based logic in an instant messaging environment. Developing prompts for the support bot was less about coding and more about continuous prompt iteration and figuring out what tasks AI can handle and what might be better suited for rule-based processes. Integrating the bot with WhatsApp made

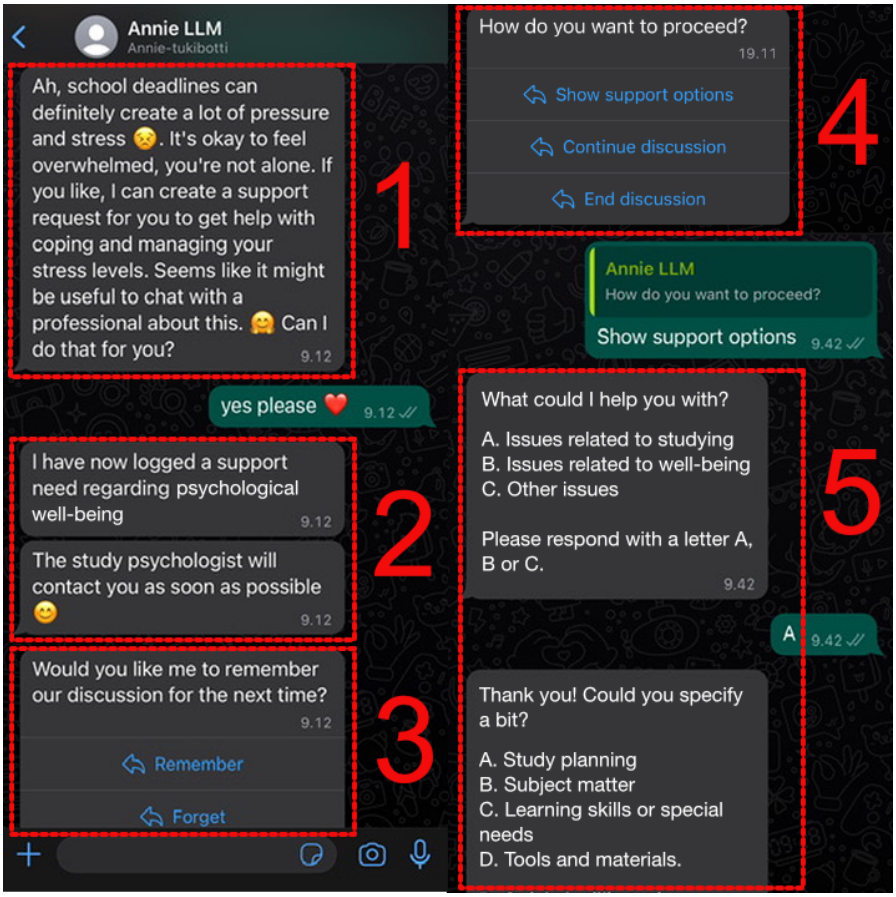

Figure 1: Features of the support bot prototype from a student perspective. 1. GPT-4 response, 2. Contact request, 3. Remember or forget, 4. How to proceed, 5. Support options.

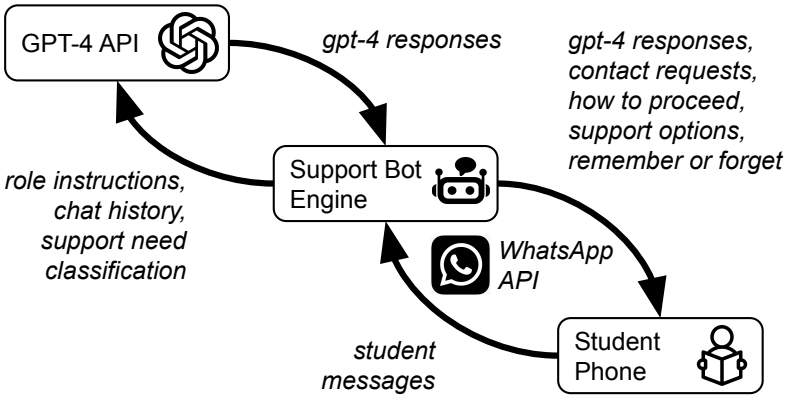

Figure 2: The technological infrastructure of the support bot prototype.

Table 2
The final bot instructions after several iterations.

Prompt section	Prompt text
General role	You are a student support bot called Annie. Your role is to help students find right kind of support and services for their worries or needs regarding their studies or well-being.
Detailed instructions	You need to act as a first listener of their worries and find out what is their issue or worry. You do not need to solve their problem but show empathy and let them know that support is available, and that it is a good thing that they talked about their worries. You can chat about their issue for a good while, and when a good moment appears, you can carefully try to suggest them relevant support options. Make sure to ask the student whether you can create a contact request. They might also like to just chat with you about their worries, and that is perfectly alright. You can encourage students that reaching out for help is a good thing, but you do not need to push them.
Messaging style	Use emojis, ask one question at a time, message length appropriate for mobile instant messaging, use warm and positive [language here] Gen Z language.

the interaction feel rather personal. We are optimistic about its potential, yet cautious on ethical considerations. Overall, our results are promising in the sense that the possibilities of AI agents in scaffolding help-seeking should be investigated further.

4.2. Limitations and future work

This work comes with limitations, that should be addressed in future work. First, the thematic analysis was based only on one rater and therefore interrater reliability could not be measured, possibly limiting the reliability of the classification. Moreover, the sample of the wording used by student support experts might not be an extensive set of student worries and needs, but rather a set of such needs that the educational organizations are equipped to address. Second, the ethical considerations of using an AI agent in scaffolding help-seeking must be discussed thoroughly before this technology can be used at scale. Next, we will evaluate the prototype with students in various fictional scenarios and use a stimulated recall interview to capture students' experiences with the prototype.

4.3. Implications for Learning Analytics

Academic well-being is an aspect that the learning analytics field has somewhat overlooked, perhaps stemming from the relative scarcity of well-being data compared to the data on learning processes and outcomes. Additionally, handling well-being data involves navigating more stringent ethical and privacy considerations. Despite these challenges, focusing on well-being within learning analytics could be profoundly influential. While it holds intrinsic value, student well-being is also increasingly recognized as a critical factor influencing learning outcomes.

The presented prototype addresses privacy concerns by allowing students to remove all discussion logs after discussing with the AI agent. However, using the support need classification

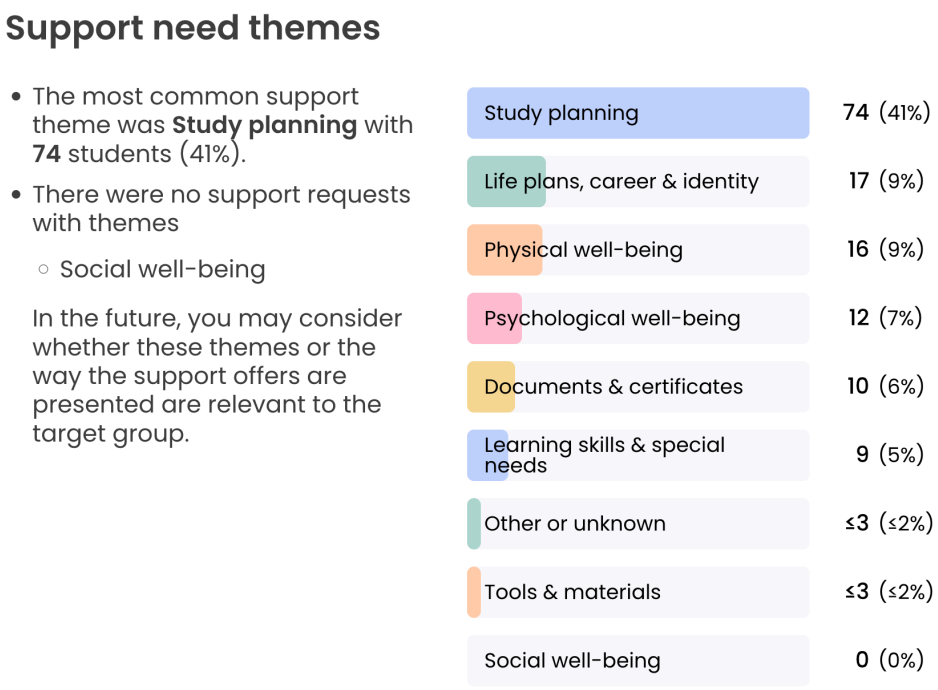

Figure 3: A draft on support need analytics.

model allows us to collect data on students' support needs and well-being on a level, which is helpful for decision-makers, but preserves the privacy of individual students. Figure 3 illustrates a proposed model for reporting student support needs to various stakeholders within educational institutions. Such analytics could play a crucial role in optimizing the allocation of student support resources, ensuring that resources are utilized where they can have the most significant effect.

Disclosure

Joonas Merikko is employed as Chief Product Officer at Annie Advisor Ltd, receives a salary from the company, and owns stocks of the company.

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