AI Am Motivated: Leveraging Self-Determination Theory in Chatbots

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***Abstract*—Artificial intelligence (AI)-powered chatbots promise to streamline administrative tasks and offer just-in-time support within higher education institutions. However, many current chatbots prioritise simple information delivery over the cultivation of deeper student engagement and intrinsic motivation. This paper argues that Self-Determination Theory (SDT), a prominent framework for understanding motivation, offers a robust model for designing chatbots that go beyond passive answering to become active facilitators of student agency. SDT emphasises three core psychological needs: autonomy, competence, and relatedness. This paper explores how the intentional integration of those needs into chatbot design could transform administrative support interactions into opportunities to empower students as self-directed learners.**

Keywords—Artificial intelligence (AI), chatbots, Self-Determination Theory (SDT), student engagement

I. Introduction

Artificial intelligence (AI) holds transformative potential for streamlining student support services within higher education. AI-powered chatbots can automate routine inquiries, provide on-demand information, enhance service accessibility outside of traditional working hours, and potentially alleviate pressure on staff [4], [7]. These chatbots offer a compelling way to address administrative tasks and free up human staff for interactions that require deeper expertise and empathy.

However, many existing chatbots focus primarily on delivering information in a question-and-answer format [13],[17]. This approach, while useful, misses a crucial opportunity to cultivate student agency, intrinsic motivation, and deeper engagement with the learning process. When designed with these goals in mind, AI chatbots could do more than simply answer questions – they could become active partners in fostering student self-direction by providing personalised learning paths, encouraging critical thinking, and offering real-time feedback [11],[5]. By acting as virtual mentors, chatbots can empower students to take ownership of their learning and cultivate the skills necessary for independent study and lifelong learning.

Self-Determination Theory (SDT), a prominent theoretical framework within educational psychology, has long provided a powerful lens for understanding motivation [2], [14]. SDT proposes that intrinsic motivation and well-being flourish in environments that support three core psychological needs: autonomy, competence, and relatedness [14]. This suggests that beyond mere efficiency gains, we should consider how administrative interactions can be redesigned to empower students within their broader learning journey, particularly as these needs remain central to modern educational practices [3].

Educational research offers extensive support for SDT's core principles. Studies have consistently linked autonomy-supportive environments with increased motivation, achievement, and overall well-being in learners [14], [15. Similarly, fostering competence through targeted feedback and scaffolding has been shown to enhance student engagement, persistence, and positive self-perceptions [4], [16], [19].

Furthermore, SDT's emphasis on relatedness – the need to feel connected, understood, and part of a community – has implications for enhancing the student experience [14]. Building a sense of connection and belonging has been empirically linked to greater motivation and overall well-being across diverse learning contexts [1], [12], [3]. Within the context of seemingly mundane administrative tasks, there's the potential for chatbots to make students feel seen and cared for. This could include recognising and responding to expressions of stress or frustration or proactively connecting students with resources and opportunities that align with their needs and interests.

This paper proposes that by intentionally embedding the principles of SDT into the design and functionality of AI chatbots, we can unlock their potential as facilitators of student empowerment, positively impacting not only the efficiency of administrative tasks but also a student's broader engagement and motivation within their learning environment.

II. Methodologies: Theoretical Exploration of SDT in Chatbot Design

This paper presents a conceptual exploration of how the principles of SDT can be translated into concrete chatbot design features and interaction patterns aimed at administrative support. A literature review was initiated by

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identifying and analysing meta-analyses and systematic reviews to establish a foundational understanding of the research on educational chatbots ([7] This approach allowed the study to build on existing research by focusing on relevant studies concerning AI in education, Self-Determination Theory (SDT), and metacognition. The primary keywords—'AI in education,' 'educational chatbots,' and 'motivation and metacognition in chatbots'—guided the search across databases including IEEE Xplore and Scopus. Thematic analysis was then employed to distil key patterns and themes from the selected literature [7]. Our study thus builds upon this established theoretical grounding to propose a model for embedding the motivational principles of SDT into the core functionality of educational chatbots. Each key element of SDT is examined with illustrative examples.

A. Autonomy in Chatbot Design

Autonomy, within the SDT framework, refers to a sense of volition and ownership over one's actions [14]. Educational research has consistently demonstrated a positive link between autonomy support and student motivation, achievement, and well-being [4], [15]. AI chatbots designed for administrative support can promote student autonomy in several ways:

- Offering Choices: Instead of prescribing a singular pathway, the chatbot can provide options for how students receive information or complete administrative tasks [4]. This demonstrates respect for the student's preferences and allows for tailoring to individual learning styles.
- Personalisation: With ethical use of student data, the chatbot could adapt its interactions and recommendations based on a student's previous inquiries, course enrolments, or other profile information [9]. Responsiveness to individual contexts reinforces a sense of agency for the student.
- Student-Directed Exploration: Rather than merely providing answers, the chatbot might encourage students to formulate their own questions about administrative processes. This guides the information search process and nurtures student initiative.

Illustrative Scenarios: Autonomy in Action

To visualise how autonomy can be supported through administrative interactions, let's consider the following scenarios:

- Scenario 1: Extension Request
  - Student: "I need an extension on my assignment."
  - Chatbot: "I can help with that. Would you like to see the extension policy for your course, draft an extension request email, or should I connect you directly with the student support office?" (Choice and personalisation).
- Scenario 2: Finding Campus Resources
  - Student: "Where can I get my student ID printed?"
  - Chatbot: "There are a few options. Would you like directions to the student services office, their hours of operation, or a link to their online ID replacement request form?" (Choice in how to receive information).

B. Competence in Chatbot Design

The second core need identified by Self-Determination Theory is competence – the feeling of effectiveness and mastery over one's actions [14]. Within educational contexts, supporting student competence has been linked to increased engagement, effort, and positive self-perceptions [16]. AI chatbots can play a valuable role in fostering a sense of competence with administrative tasks by providing targeted support and guidance:

- Submission Assistance: Instead of merely guiding students to the submission link, a chatbot can be designed to empower students by reinforcing their ability to successfully navigate the process. For instance, if a student is unsure about submitting their assignment, the chatbot could not only provide clear instructions but also encourage the student by affirming their understanding of each step. The chatbot might ask, "Would you like a quick review of how to check if your file meets the submission requirements?" This approach supports the student's confidence in managing their academic tasks effectively and builds their competence in using the system independently [4], [17].
- Scaffolding Based on Need: When a student indicates difficulty with a process, the chatbot can offer tiered levels of support. This could include providing definitions, walkthroughs with step-by-step examples, or opportunities to practice with hints and explanations [14], [16]. Customisation based on student input empowers learners, making them active participants in their education, leading to greater competence and mastery over their learning.
- Just-in-Time Knowledge Boosts: The chatbot's ability to access and process information quickly can be used to provide context-specific support. For instance, while a student is reading a document with unfamiliar terminology, the chatbot could proactively offer definitions or explanations of key concepts without the student needing to break their workflow [17].

Illustrative Scenarios: Competence in Action

Let's envision how these competence-focused design principles might translate into chatbot interactions:

- Scenario 1: Submission Guidance
  - Student: "I'm not sure how to submit my assignment on Blackboard. Can you help?"
  - Chatbot: "Absolutely! Let’s go through it together. First, have you logged into Blackboard and found the right unit? If you need, I can walk you through each step to make sure everything’s set up correctly. Ready to start?"
- Scenario 2: Practice & Scaffolding
  - Student: "I'm struggling with financial analysis concepts."
  - Chatbot: "Let's break it down. Would you like to start with a definition review, a step-by-step

example problem, or try a practice quiz with hints and explanations?"

- Scenario 3: Just-In-Time Definition
  - Student: "What does pro bono mean in this legal article?"
  - Chatbot: "Here's a definition of 'pro bono': [definition]. Would you like a more detailed explanation of its relevance within legal practice?"

C. Relatedness in Chatbot Design

Relatedness, within SDT, underscores the fundamental human need to feel connected, understood, and cared for by others [14]. In educational settings, a sense of belonging and connection to a learning community has been linked to positive outcomes such as motivation, persistence, and overall well-being [1], [12]. AI chatbots, while not a replacement for human interaction, can cultivate feelings of relatedness by demonstrating empathy, fostering community connections, and taking on the role of a 'teachable agent.'

- Empathetic Responses: Chatbots can be programmed to recognise and respond to expressions of frustration, stress, or uncertainty. Rather than simply sticking to task-oriented responses, the chatbot could acknowledge the student's emotions and offer resources or options tailored to their needs [10].

- Fostering Community Connections: Building on its knowledge of campus resources, programs, and events, the chatbot could proactively connect students with relevant opportunities. These suggestions could be based on the student's expressed interests, program of study, or even hints of disengagement that the chatbot detects.

- Teachable Agent Role: In a unique approach, the chatbot can temporarily switch roles with the student, taking on the position of the learner [4]. By allowing the student to explain concepts or walk the chatbot through a process, a sense of mastery and contribution to a learning community is fostered.

Illustrative Scenarios: Relatedness in Action

Here's how a chatbot designed with relatedness in mind might interact with students:

- Scenario 1: Proactive Reminder
  - Student: "I'm feeling overwhelmed with all the upcoming exams. I don't know where to start."
  - Chatbot: "I'm here for you! It sounds like you've got a lot on your plate. Would it help if we broke down your study schedule together? I can also connect you with study groups or share some relaxation techniques to help manage the stress. What would you like to do first?" (Acknowledges the student's feelings, offers support, and fosters a sense of connection).
- Scenario 2: Beyond Basic Answers
  - Student: "Is there parking near the library?"
  - Chatbot: "Yes, here's a map of nearby parking: [map]. The library can get crowded during peak study times. Would you like me to check current library occupancy levels?" (Goes beyond the immediate question, shows responsiveness to potential broader need).
- Scenario 3: Teachable Agent
  - Student: "I'm confused about how to enrol in my units for next semester. Can you help?"
  - Chatbot: "Of course! How about you walk me through what you understand so far about the unit enrolment process? I'll ask questions along the way to make sure I'm following. This way, we can figure it out together, and you'll feel confident about the steps." (Role reversal fosters relatedness and a sense of mastery).

III. Discussion

The integration of Self-Determination Theory (SDT) into the design of administrative support chatbots holds significant potential to transform these interactions into opportunities that empower students. This approach moves beyond the traditional role of chatbots as mere information providers, instead fostering deeper engagement and supporting the development of student autonomy, competence, and relatedness [14]. Such a shift in design philosophy reflects a more holistic view of student support, aligning technological advancements with the fundamental psychological needs outlined in SDT [14].

A. Autonomy: Choices and Personalisation

Administrative processes within educational institutions are frequently rigid, failing to accommodate the diverse needs and individual circumstances of students. An SDT-informed chatbot addresses this rigidity by offering choices, thus empowering students to take control of their own administrative journeys. For instance, when faced with the task of requesting an assignment extension, the chatbot does more than simply present the relevant policy; it provides multiple pathways for the student to follow. These might include the option to draft an extension request email using a guided template, access a detailed breakdown of the extension process, or even connect directly with a student support officer [4], [9]. By offering these choices, the chatbot respects and supports the student's autonomy, encouraging a more active role in their own educational experience [14].

B. Competence: Scaffolding and 'Just-in-Time' Support

Administrative tasks can often overwhelm students, particularly when they involve complex processes or unfamiliar terminology. This can erode their sense of competence, leading to frustration and disengagement [16], [17]. A chatbot designed with SDT principles at its core can mitigate these challenges by offering targeted support that scaffolds the student's understanding and ability to navigate these tasks. For example, when a student is struggling with submitting an assignment, the chatbot could provide step-by-step guidance, ensuring that each stage is clearly understood before moving on to the next [17]. Additionally, the chatbot might offer 'just-in-time' assistance, proactively supplying definitions or explanations as the student encounters challenging concepts, thereby reinforcing their sense of competence and mastery over the task at hand [17], [18], [19]. The effectiveness of these interactions is greatly enhanced by advanced Natural Language Processing (NLP) technologies, which enable chatbots to understand and respond to student queries in a nuanced and contextually appropriate manner [6].

C. Relatedness: Beyond Functional Assistance

Although chatbots cannot replace the nuanced and deeply personal connections that human interactions offer, they can nevertheless play a crucial role in cultivating a sense of relatedness and empathy. This is particularly important in the context of administrative interactions, which are often perceived as impersonal or transactional [14]. By recognising and responding to the emotional cues of students—such as expressions of frustration or confusion—a well-designed chatbot can offer more than just functional assistance. It can acknowledge the student's feelings, provide words of encouragement, and even suggest resources or support services tailored to their emotional and academic needs [14], [10]. [8]. In doing so, the chatbot helps to foster a sense of connection and belonging, key components of the relatedness that SDT emphasises as essential for motivation and well-being [14].

D. Benefits, Challenges, and the Road Ahead

An SDT approach to administrative chatbot design offers numerous benefits for students, including increased engagement, motivation, and a more personalised educational experience [14], [16]. By fostering autonomy, competence, and relatedness, chatbots can transform routine administrative tasks into opportunities for meaningful student interactions. For instance, when students are offered choices in how they manage their administrative tasks, or when they receive timely support that enhances their understanding and competence, they are more likely to feel empowered and motivated within their educational journey [9], [17].

However, the implementation of such chatbots is not without challenges. The complexity of developing chatbots that can accurately and sensitively respond to a wide range of student needs requires advanced natural language processing capabilities, which are still evolving [4], [6]. Additionally, ensuring data privacy and ethical use of student information is paramount. As chatbots become more integrated into the student experience, careful consideration must be given to how data is collected, stored, and utilised, with transparency and consent being key priorities [1],[16].

Further research is needed to empirically validate the effectiveness of SDT-based chatbots in enhancing student motivation and well-being. While the theoretical foundation is strong, real-world applications and longitudinal studies will be essential to determine the long-term impact of these technologies on student outcomes [14].

IV. Conclusion

Transforming student-facing chatbots from rudimentary information providers into active facilitators of their agency is within reach. While existing educational chatbots often prioritise knowledge delivery over intrinsic motivation [6], [13], this paper makes a strong case for the integration of Self-Determination Theory (SDT) as a guiding framework for administrative support chatbots. By supporting autonomy, competence, and relatedness, we can reimagine these tools, empowering students not just to complete tasks but to become active participants in their learning journey.

In response to the need for stronger evidence supporting the effectiveness of AI chatbots in fostering Self-Determination Theory (SDT) needs, we have initiated the development of a prototype AI chatbot. This chatbot is currently undergoing testing and utilises secure data sources while grounding its design in both SDT and Self-Regulated Learning (SRL) theories. Preliminary results from this ongoing research indicate promising potential for enhancing student engagement and autonomy through tailored interactions.

Further research and development are needed to address this shift's technical and ethical considerations, but the potential for enhancing the student experience is considerable. This approach aligns with the evolving nature of university support services in the AI age, not only prioritising efficiency but fostering a holistic student experience.

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References

[1] Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. Psychological Bulletin, 117(3), 497-529. https://doi.org/10.1037/0033-2909.117.3.497

[2] Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. New York: Plenum.

[3] Deci, E. L., & Ryan, R. M. (2022). Self-determination theory in the digital age. Journal of Motivation Science, 8(1), 1-15. https://doi.org/10.1037/mot0000190

[4] Dominguez, C., Garcia-Izquierdo, F. J., Jaime, A., Perez, B., Rubio, A. L., & Zapata, M. A. (2021). Using process mining to analyse time distribution of self-assessment and formative assessment exercises on an online learning tool. IEEE Transactions on Learning Technologies, 14(5), 709-722. https://doi.org/10.1109/TLT.2021.3119224

[5] Gaggioli, A., & Riva, G. (2023). The impact of AI-driven interventions on student motivation and well-being: A systematic review. Computers in Human Behavior, 140, 107601. https://doi.org/10.1016/j.chb.2023.107601

[6] Hwang, G. J., & Chang, C. Y. (2021). A review of opportunities and challenges of chatbots in education. Interactive Learning Environments. https://doi.org/10.1080/10494820.2021.1952615

[7] Kuhail, M. A., Alturki, N., Alramlawi, S., & Alhejori, K. (2023a). Interacting with educational chatbots: A systematic review. Education and Information Technologies, 28(1), 973–1018. https://doi.org/10.1007/s10639-022-11177-3

[8] Kuhail, M. A., Al Katheeri, H., Negreiros, J., Seffah, A., & Alfandi, O. (2023b). Engaging Students with a Chatbot-Based Academic Advising System. International journal of human-computer interaction, 39(10), 2115-2141. https://doi.org/10.1080/10447318.2022.2074645

[9] Mendoza, S., Hernández-León, M., Sánchez-Adame, L. M., Rodríguez, J., Decouchant, D., & Meneses-Viveros, A. (2020). Supporting student-teacher interaction through a chatbot. In P. Zaphiris & A. Ioannou (Eds.), Learning and Collaboration Technologies. Human and Technology Ecosystems (pp. 93–107). Springer International Publishing. https://doi.org/10.1007/978-3-030-50506-6_8

[10] Okonkwo, C. W., & Ade-Ibijola, A. (2021). Chatbots applications in education: A systematic review. Computers and Education: Artificial Intelligence, 2, 100033. https://doi.org/10.1016/j.caeai.2021.100033

[11] Pérez, J. Q., Daradoumis, T., & Puig, J. M. M. (2020). Rediscovering the use of chatbots in education: A systematic literature review. Computer applications in engineering education, 28(6), 1549-1565. https://doi.org/10.1002/cae.22326

[12] Reeve, J. (2006). Teachers as facilitators: What autonomy-supportive teachers do and why their students benefit. The Elementary School Journal, 106(3), 225-236. https://doi.org/10.1086/501484

[13] Riel, J. (2021). Understanding AI-enabled adaptive learning systems as sociocultural assemblages [Doctoral thesis, University of British Columbia]. UBC Theses and Dissertations.

[14] Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being.

American Psychologist, 55(1), 68-78. https://doi.org/10.1037/0003-066X.55.1.68

[15] Su, Y. L., & Reeve, J. (2011). A meta-analysis of the effectiveness of intervention programs designed to support autonomy. Educational Psychology Review, 23(1), 159-188. https://doi.org/10.1007/s10648-010-9142-7

[16] Vansteenkiste, M., Lens, W., & Deci, E. L. (2006). Intrinsic versus extrinsic goal contents in self-determination theory: Another look at the quality of academic motivation. Educational Psychologist, 41(1), 19-31. https://doi.org/10.1207/s15326985ep4101_4

[17] Wang, Y., Gong, S., Cao, Y., & Fan, W. (2023). The power of affective pedagogical agent and self-explanation in computer-based learning. Computers and Education, 195, 104713. https://doi.org/10.1016/j.compedu.2023.104713

[18] Winne, P. H. (2011). A cognitive and metacognitive analysis of self-regulated learning. In B. J. Zimmerman & D. H. Schunk (Eds.), Handbook of Self-Regulation of Learning and Performance (pp. 15–32). New York: Routledge.

[19] Winne, P.H. (2022). Modeling self-regulated learning as learners doing learning science: How trace data and learning analytics help develop skills for self-regulated learning. Metacognition and Learning, 17(3), 773-791. https://doi.org/10.1007/s11409-022-09305-y