From Goals to Growth? Chatbot Feedback on Learner Goals and Action Plans

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Learning Management Systems are commonly used by numerous educational institutions. Research shows the significance of students experiencing ownership of their goals. This is currently omitted as the educational system concentrates on goals set by a teacher. Letting students set their own goals and creating a plan of action can assist the learners with attaining ownership. It can be challenging for learners to formulate effective goals and develop a plan of action to achieve them. This research assesses the possibility of a chatbot that provides feedback on learners' processes of setting goals and developing action plans. Utilizing a literature review and a survey, this research aims to identify the types of feedback that learners perceive as effective for goal setting and developing a plan of action. The survey gathered participants' perceptions based on insights derived from the literature review. Findings indicated that participants desire a chatbot with diverse capabilities, including the decomposition of goals into manageable tasks, providing feedback to ensure goal attainability, and offering assistance in modifying action plans. The results of the survey highlight the importance of designing a customizable chatbot that can cater to the individual needs of the learner. Furthermore, the study evaluates the potential of such a chatbot within an LMS, as creating a standalone system could diminish effectiveness and accessibility. Integrating the chatbot into an LMS is seen as a way to improve its utility and better support the educational process.

1 INTRODUCTION

Learning Management Systems (LMSs), such as Canvas[1], often lack resources to facilitate learners in establishing personal goals and devising a plan of action. The goals set by teachers often lack personalization, thereby presenting challenges in effectively engaging and motivating learners throughout the course [6]. Research indicates that goal setting enhances productivity and intrinsic motivation among learners[18], thereby fostering a supportive environment for self-regulated learning (SRL). Feedback on these goals can further aid learners in achieving their objectives. Nevertheless, not all learners engage in setting goals and creating plans of action, and among those who do, some struggle to formulate effective goals, or tend to forget them [6]. While feedback can significantly support learners, teachers often lack the resources, such as time and detailed knowledge of individual learners, to provide such support. Consequently, there is a need for additional assistance, potentially through the use of chatbots, which this study aims to explore.

LLMs are increasingly being utilized in various educational settings by both learners and educators. An example of this application is an LLM system that provides feedback [20, 23]. The use of generative AI and LLMs appears promising in giving feedback. However,

no existing research explores their application for providing feedback on self-set goals and action plans within an LMS, revealing a significant research gap [8]. Within the scope of this research, the following research questions and sub-questions will be addressed:

In what ways can Large Language Model chatbots facilitate learners in developing effective learning goals and action plans?

RSQ1. What are the capabilities of current LLM-based chatbots such as ChatGPT in giving feedback on building effective personalized goals and action plans?

RSQ2. What are learners' perceptions and expectations about the enhancement of LMS with such AI-based assistive features for personal goal setting and action plans?

To answer these research questions, a literature review and a survey were conducted. The methodology and approach of the research are explained in Section 3. Section 4 presents the results of the literature review, addressing RSQ1. Section 5 outlines the survey methodology, including participant demographics, followed by an analysis of the survey results that reflect learners' perceptions and expectations, addressing RSQ2. The final section offers the conclusion and discussion of the paper, including limitations and suggestions for future research.

2 RELATED WORK

Teachers have the ability to give feedback on goals formulated by learners. Nonetheless, they lack the resources to give individual feedback to all learners. This can be the case, for example, in courses with a substantial number of students. In absence of such feedback, learners who struggle to generate effective feedback and establish a plan of action, have a higher chance of not achieving their goals [6].

Large Language Models (LLMs) like ChatGPT are being utilized in a variety of educational contexts, including information retrieval and giving feedback [13]. This study will explore the potential of utilizing LLMs for defining learning goals. Establishing a connection between LMSs and LLMs could potentially support learners with learning on a familiar platform, which assists in improving their well-being and motivation [16], which is beyond the scope of the present study. Integrating LMS resources, such as course materials, assignments, or page views, with a chatbot, could enhance the accessibility and effectiveness of e-learning [10].

Through the use of LLM chatbots, learners have the opportunity to receive individualized feedback. The goals set by teachers tend to be more generalized and personal goals are lacking. Additionally, teachers are constrained by time limitations, unlike chatbots, which offer greater flexibility in time scheduling [20].

Research has extensively explored the creation of goals, building action plans, and providing feedback, alongside the utilization of LLMs in education. However, a gap exists regarding the use of LLMs for goal-setting within an LMS. For effective feedback, key questions include "Where am I going?", "How am I going?", and "Where to

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[1]Instructure Canvas is an LMS for educational facilities.

next?" [12]. These questions help in defining clear and manageable goals, aligning efforts with goals, and reflecting on progress.

Several studies have examined different aspects of feedback and LLMs. For instance Sedrakyan et al. (2020) explored the different learning regulations and feedback types, related to learner-specified learning goals and tracking trajectories for reaching goals using visual analytics dashboards [22]. Additionally, Zaib et al. (2022) looked into Conversational Question Answering (CQA) for possibly improving chatbots' answers [24]. Moreover, Du et al. (2021) introduced a goal-recommender chatbot [8]. Bodily and Verbert (2017) conducted research on learners' awareness [2], while Chang et al. (2023) looked into the potential utilization of data tracked by the LMS [4].

Next to CQA and a similar chatbot, there exists a framework that helps learners with Self-Regulated Learning (SRL), CHAT-ACTS. This framework uses chatbots to help learners with SRL, to enhance learner engagement, motivation, and learning outcomes [14]. This framework is based on three components: SRL, active learning, and a personalized chatbot, which are all connected to each other and the learner. The learner works on SRL by setting their own goals and figuring out how to study. The personalized chatbot helps with evaluation, feedback, and planning. The active learning component focuses on activity-based learning and teaching strategies, so the learner is actively working on the course material. To answer the research question defined in this research proposal, the focus will lay on the combination of personalized chatbot and SRL.

In recent years, limited research has been conducted on the integration of chatbots within LMS Canvas [15, 19]. An example is the study by Puertas et al. who explored the integration of a chatbot in Canvas and provided a concise overview of the implementation. Their project included various components: (1) a programming language to create the system, (2) an LLM, (3) a Knowledge Base, (4) an API that integrates with Canvas, and (5) a web application for the interface. The first component uses the programming language Python due to its amount of libraries supporting the implementation of LLM systems. They tried two different LLMs. The first model is ChatGPT and has a cost per executed query. For their purpose, the cost is low enough. However, with many queries, which is necessary for the creation of goals and action plans, is it cheap enough? There exists a free model they tried, which is called vicuna-13B. However, it has limitations, mainly being that the models' responses are somewhat worse [19].

This study aims to address the research gap by evaluating the feasibility of using LLMs for providing feedback on self-set goals and action plans within LMS Canvas. By integrating personalized chatbots with SRL practices, the study seeks to enhance learner engagement and motivation, ultimately contributing to the field of educational technology.

3 METHODOLOGY AND APPROACH

This research employed a dual approach, consisting of a literature review and a survey, to investigate the capabilities of Large Language Model (LLM) chatbots in aiding learners to develop effective learning goals and action plans.

For selecting literature, the inclusion criteria included studies focused on chatbots and feedback on goal-setting and action plans. The quality is ensured through peer-reviewed sources. The search process involved academic databases for relevant articles in English and Dutch. Different frameworks have been used for summarizing the results. RSQ1 is a systematic review and for RSQ2 the meta-analysis framework has been used.

3.1 RSQ1

Research Question 1 aims to research the capabilities of current LLM-based chatbots, such as ChatGPT, in providing feedback on the development of effective personalized goals and action plans. A systemic review methodology was employed to summarize findings from existing literature. This involved an extensive search for relevant studies on chatbot capabilities and their effectiveness in delivering feedback for goal creation and action planning. Keywords used in the search included 'LLM', 'chatbot', 'education', 'feedback', and 'plan of action'. The keyword 'goal' was also utilized. However, primarily retrieved literature resulted in research about the goal as a property of another keyword instead of as a research subject in itself, leading to less relevant results. For each article, the references were examined to deepen the understanding of the topic.

3.2 RSQ2

To address Research Question 2, a survey has been designed and distributed to gather analytical data. The survey questions are based on insights from the literature review conducted for RSQ1. A process for the chatbot was developed using these insights, and the steps in this process were translated into Likert scale statements to measure participants' perceptions of the chatbot.

3.2.1 Survey Method. The survey aimed to collect data on students' perceptions and expectations regarding the integration of a chatbot within a Learning Management System (LMS), specifically Canvas, with feedback capabilities for goal setting and action planning. The survey included sections on demographic information, Likert scale questions, and open-ended questions. Likert scale questions are used to measure participants' attitudes towards specific topics [21]. Open-ended questions provided additional insights, despite the tendency for lower response rates compared to closed questions [9]. Therefore, the survey included both open-ended and closed questions (e.g. Likert scale) to maximize response rates and gather comprehensive data. Open-ended questions are optional, allowing participants to elaborate on their responses to the Likert scale statements. The survey was distributed among students of the University of Twente who use Canvas, through group chats and direct solicitation.

3.2.2 Data analysis. The collected survey data were analysed using a meta-analysis approach. Likert scale responses were statistically analysed to quantify various capabilities identified in RSQ1. Open-ended questions were qualitatively analysed through descriptive summarization, highlighting key points and significant input from participants. This combination of quantitative and qualitative analysis provided a comprehensive understanding of student perceptions and expectations regarding the chatbot's integration and functionality within the LMS.

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4 CHATBOT CAPABILITIES

This section reviews the literature on capabilities that can enhance a chatbot for providing effective feedback. It combines insights into the important capabilities of the proposed chatbot, categorizing them into feedback-related and chatbot-related capabilities. Feedback-related capabilities focus on the delivery of effective feedback and the frameworks used to assist learners in creating goals and action plans. Chatbot-related capabilities focus on the interaction between the chatbot and learners. This section concludes with a proposed process for the chatbot based on the findings of the literature review.

4.1 Capabilities for Effective Feedback

A key capability of the chatbot is the ability to provide effective feedback. Effective feedback in the context of chatbots encompasses the following five criteria, as adapted from Allagui et al. [1]:

(1) **Feedback Focus**: The feedback addresses the topic of the goal and action plan, as well as the frameworks used for goal and action plan development;
(2) **Feedback Balance**: The feedback includes both positive and negative aspects;
(3) **Feedback Specificity**: The feedback provides specific and clear examples to support the provided feedback;
(4) **Feedback Appropriateness**: The feedback is clear and suitable for the students;
(5) **Feedback Engagement**: The feedback encourages learners to actively reflect and improve their goals and action plans.

Different types of feedback support learning regulation [22]. Cognitive feedback helps learners understand their successes and failures by providing prompts, cues, and questions. This encourages self-regulated learning (SRL) and improves learners' goal-setting processes. The chatbot must have the knowledge to deliver cognitive feedback to support SRL.

Effective feedback can be placed in three phases, consisting of a question each. (1) "Where am I going?", (2) "How am I going?" and (3) "Where to next?" [12]. For goal setting, the feedback first ensures that learners understand the process and purpose of creating a goal. The second question addresses the goal-setting process itself, ensuring it aligns with a goal-setting framework. The final question focuses on achieving the goal through a plan of action, which may also involve addressing the three questions related to action planning.

When it is unclear where the student wants to go, the SWOT framework can be used [5]. SWOT analysis involves evaluating Strengths, Weaknesses, Opportunities, and Threats to identify new possibilities. Before, the importance of understanding your strengths and weaknesses is mentioned. While creating goals, the SWOT analysis can aid learners in understanding where they are and the external factors. Aiding learners in goals that work for them.

To ensure goal effectiveness, it is important to use a framework to check the quality of the goal. The SMART framework [7] is often used in education. According to the SMART framework, goals should be Specific, Measurable, Achievable, Relevant, and Time-bound.

The next step is to create an effective plan of action. To get there, the PRINCE2 framework can be adapted [3]. This framework is build to manage products with a team, as this research focuses on individual learners creating goals, products will adapted to fit goals. This framework can be combined with the SMART framework. This framework concists of two elements, namely (1) goal-based planning and (2) internal and external constraints. The goal-based planning aids in creating a plan of action. This is a process of three steps: (1) Producing a goal breakdown structure, (2) Writing goal descriptions, and (3) Producing a product flow diagram, which is about deciding the order. The process starts with creating subgoals until they are small enough that they are simple to execute and making sure that they are explained if necessary. Following this, a flow diagram is created to decide the order of the created tasks. There can also be constraints connected to the tasks. These can be internal, then they are dependent on another activity. For example, before you can send out a form, the form needs to be made. Another type of constraint is the external constraint, where the task is dependent on someone else. For example, before analysis can be done with the results from the form, participants need to fill in the form.

When the learner of the plan of action, the Threats element inside the SWOT framework can be used to give knowledge of what risks there are within the plan of action and evaluating certain risks. External constraints can be a threat worth noticing.

Next to creating a goal and a plan of action, it is also important to reflect on the attainment of these goals after different scenarios in time [17]. As mentioned before, for a plan of action, it is important to create specific manageable tasks. It needs to be clear how to do that task. Nevertheless, it can happen that after reflection, the plan of action needs to be adjusted accordingly.

For the chatbot to be able to give effective feedback, it is important to critically think about the prompt given to the chatbot. Creating a prompt for a chatbot is called prompt engineering. Giray shows the importance of prompt engineering by saying: "By employing prompt engineering techniques, academic writers and researchers can unlock the full potential of language models, harnessing their capabilities across various domains. This discipline opens up new avenues for improving AI systems and enhancing their performance in a range of applications, from text generation to image synthesis and beyond." [11]. Without correctly incorporating prompt engineering, the chatbot could not function as expected. This can come in the form of giving answers instead of feedback, or giving feedback differently.

4.2 Chatbot Related Capabilities

Generally, users initiate a conversation with a question, prompting the Large Lange Model (LLM) system to find an appropriate solution. Employing a Conversational Question Answering (CQA) approach, where the chatbot considers previous interactions with the user, can enhance response accuracy [24]. With CQA the computer looks at other conversations with the user, as well as having human-like responses. The chatbot can also ask questions to the user. This is beneficial for developing effective feedback for the learner, and for example knowing what goals have already been created, to make sure that the user will not create the same goal each time without

making the necessary changes to improve. For the feedback-giving chatbot, the capabilities of the *human-like responses* and the *history of other conversations* are included in the design of the chatbot.

In 2021, Jiahui Du et al. [8] developed a chatbot integrated into Moodle, an LMS platform, which recommended goals based on learner responses to questions. This study presents potential capabilities that the chatbot could employ for goal creation and learner interaction. However, a gap remains in providing feedback on these goals. Goals generated by the chatbot adhere to the SMART framework, with the research outlining specific questions the chatbot asks, along with examples and recommended goals. The study identified learner preferences for enhancing the chatbot, including (1) providing more frequent reminders and assistance throughout the learning process, (2) offering more specific goals such as subgoals, and (3) summarizing goals and action plans at the conversation's conclusion. From this research, key capabilities identified include the chatbot's ability to ask questions to aid learners, *summarize* goals and action plans, provide *reminders and assistance*, and facilitate the *creation of effective goals* using a *goal-setting framework*, including the establishment of *subgoals*.

The CHAT-ACTS framework underlines the importance of supporting learners to set their own learning goals, thereby fostering independent learning. Additionally, it emphasizes that assisting learners in understanding their *strengths* and *weaknesses* contributes significantly to the development of effective learning strategies [14].

Integrating LMS resources could be beneficial for LLM chatbots [10]. However, current literature provides limited insights into how LMS resources can be effectively utilized by LLMs to support learners, particularly in the context of goal-setting and action plans [22].

4.3 Chatbot Process

The chatbot process, following the capabilities identified in the literature, is illustrated in a flowchart diagram, as can be seen in Figure 1. The process starts with the learner opening the chatbot. Upon, the chatbot asks questions to the learner to help the learner aimed at clarifying their learning objectives, ares for improvement, or goals to achieve.

Subsequently, the chatbot provides feedback on the established goal, ensuring alignment with the SMART framework. Once the goal is defined, the chatbot proceeds to assist in devising a plan of action by prompting the learner to break down the goal into manageable sub-goals and tasks. Additionally, the chatbot aids the learner in identifying external constraints and potential risks, facilitating preparedness and risk management. Following this, the chatbot guides the learner in prioritizing tasks based on internal constraints. Ultimately, the chatbot summarizes the formulated goal and action plan, ensuring clarity on the next steps for the learner.

Throughout the interaction, the chatbot employs a CQA approach, using its ability to recall previous conversations and provide responses that emulate human-like interaction. As the learner progresses towards their goal, for example, the duration of a course, the chatbot provides periodic reminders and assistance, serving to reinforce goal awareness and facilitate reflection on progress. Should adjustments to the action plan become necessary, the chatbot assists the learner in making these modifications.
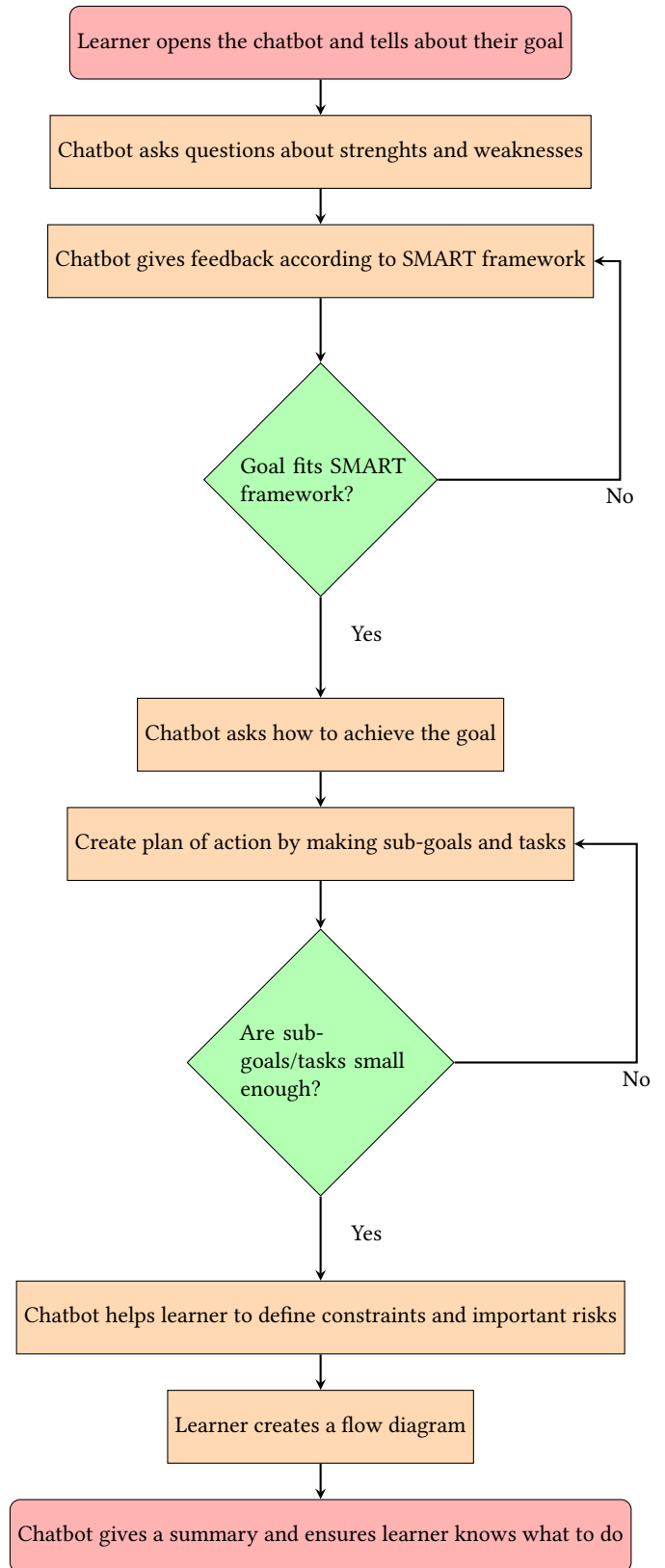

Fig. 1. Flowchart about the basis of learner chatbot conversation

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5 LEARNERS' PERCEPTIONS AND EXPECTATIONS

This chapter goes into the potential of Large Language Model (LLM) chatbots to assist learners in setting and achieving their educational objectives. Building on a literature review that identifies essential functionalities of LLM chatbots, such as the employing the SMART framework for goal-setting, and the providing structured feedback and reminders. The review highlights the significance of these chatbots in strategic planning and organizational skills, while addressing concerns related to privacy and user autonomy. Informed by these insights, a survey was designed to explore the perceptions and expectations of students at the University of Twente who utilize the Canvas Learning Management System. The survey aims to assess how students perceive the integration of chatbots into their learning processes and what features they perceive most beneficial. This chapter details the methodology, demographic characteristics of participants, and results of the survey, offering an in-depth analysis of students' attitudes towards utilizing feedback-oriented chatbots for goal setting and action planning.

Chapter 4 explored the role of Large Language Model (LLM) chatbots in assisting learners to develop effective learning goals and action plans. A comprehensive literature review was conducted, revealing key capabilities of LLMs, such as their utilization of goal-setting frameworks like SMART to facilitate the creation of well-defined effective goals. These findings informed the design of a survey aimed at assessing learners' perceptions and expectations regarding chatbots that provide personalized feedback in educational contexts. To ensure the survey's reliability and validity, various question types were employed, and participant anonymity was guaranteed.

The survey is divided into three main sections: (1) General questions, which included demographic and research-related inquiries, (2) Learners' perceptions, comprising Likert scale statements on factors deemed significant by participants, and (3) Learners' expectations, focusing on students' anticipated functionalities and benefits of chatbot integration in educational settings.

In the second section, participants are instructed to assess Likert scale statements envisioning the existence of the chatbot. Each statement ranges from 1 (Not important) to 5 (Very important) and can be referenced in Table 1. In section 4.3, the process of the chatbot is explained and visualized. Each feature from that process is visualized in a Likert scale statement, excluding features that make the chatbot give feedback on goals and action plans. For instance, statements such as "The chatbot helps you create an effective goal" are absent, maintaining the sequence as illustrated in Figure 1. Concluding this section of the survey, an open-ended question (OEQ) could be filled in, allowing participants to elaborate on their responses.

The third section concerns students' expectations regarding the chatbot. It starts with the Likert scale question: "Would you want to use a chatbot to help you create goals and a plan of action?". Responses to this question ranged from 1 (Never) to 5 (Always), reflecting participants' expected utility of the chatbot.

5.1 Demographics

The survey is distributed to students from the University of Twente who use the LMS system Canvas. These participant criteria are validated in the first section of the survey. The results of participants who did not study at the University of Twente are excluded from the demographic and overall analysis, leaving 50 valid participants. On average, participants were 21 years old, with ages ranging from 17 to 29. There is a minuscule imbalance among male respondents. However, the difference is insignificant. Most participants follow a study that is connected to the Electrical Engineering, Mathematics and Computer Science (EEMCS) faculty (44 participants), 6 participants are from Behavioural, Management and Social Sciences (BMS), 4 from 'Technische Natuurwetenschappen' (TNW) and only 1 from Engineering Technology (ET). Another survey question focused on participants' origin, categorizing countries into regions to enhance data security while still providing meaningful insights. For instance, students from outside the EU have to pay institutional money, which is what higher than for people within the EU. The most people were from The Netherlands (68.8%), the second-largest group was people from the European Union (17.6%), excluding The Netherlands and the smallest group was people from outside the EU (13.7%).

5.2 Results

Participants responded to 10 Likert scale statements, with statements 1-9 sourced from the second section of the survey. Statement 10 reflects the current expectations of students regarding the use of such a chatbot. The statements and their corresponding statistical results are detailed in Table 1.

Among these statements, four received an average score above 4.0. These statements, ranked in order, are 5, 4, 9, and 2. The most favored capability identified was the chatbot's assistance in breaking down goals into smaller tasks. Other highly rated statements included receiving feedback to ensure goals are attainable, obtaining assistance in creating a plan of action, and allowing the chatbot to understand the learner's weaknesses.

Statement 10 is "Would you want to use a chatbot to help you create goals and a plan of action?", reflecting participants' expectations regarding the chatbot's utility. The average response is 3.08, indicating relatively modest expectations among students. Insights from open-ended questions (OEQ) reveal various factors contributing to these expectations. Four students reported negative past experiences with chatbots, while others expressed competence in setting goals and planning independently. Privacy concerns and the potential for forgetting about the chatbot were also raised. Within the responses, several students emphasized the importance of autonomy and flexibility in goal-setting and planning, as found in the literature review. The chatbot will aid the learner in creating a plan of action, therefore the learner can take control over their plan of action, including the option to exclude deadlines if preferred. Therefore, it is crucial for the chatbot to include diverse user preferences, allowing students to create personalized action plans that align with their individual needs.

Participants' feedback highlights the significance of providing choices. This is the same for getting reminders throughout the module, which is the least liked statement by the participants. Another

	Average	Standard deviation	Median	Mode
1. The chatbot asks questions to get to know your strengths	3.94	0.93	4	4
2. The chatbot asks questions to get to know your weaknesses	4.08	0.93	4	4
3. The chatbot explains SMART if you do not understand how to use SMART (Specific, Measurable, Attainable, Relevant, Time-bound)	3.65	1.05	4	3
4. The chatbot gives feedback on your goal to make it attainable	4.33	0.84	5	5
5. The chatbot helps you to make the goal smaller and smaller until it is divided into tasks	4.35	0.69	4	5
6. The chatbot will help you to define risks and how to work around them	3.80	1.04	4	4
7. When the goal and plan of action are finished, the chatbot will give a summary of the goal and tasks to do	3.98	1.03	4	5
8. Throughout the module, the chatbot will ask how it is going with your goals and tasks	3.57	1.17	4	4
9. The chatbot will help you to change the plan of action if needed	4.16	0.9	4	5
10. Would you want to use a chatbot to help you to create goals and plan of actions?	3.08	1.28	3	2

Table 1. Survey results

capability multiple participants would appreciate is having the chatbot create an automated schedule for the learners, as this would reduce a lot of their time. However, it is essential to ensure that learners are educated on how to effectively utilize such tools if they choose to adopt them. Moreover, many participants recognized the potential benefits of using a chatbot in courses involving goal-setting and action planning, indicating strong support for integrating these capabilities into educational contexts.

The other questions provided insights into the reasoning behind participants' responses to the Likert scale statements. Participants expressed a preference for a chatbot that guides them through each phase of task completion, underscoring the importance of reminders for goal achievement and the ability to swiftly adapt plans throughout the module. They perceive the chatbot primarily as a tool for strategic planning and organizational support, rather than as a source of motivation. Privacy emerged as a significant concern among participants, and some were hesitant to disclose their strengths and weaknesses to a chatbot. They emphasized the importance of having the flexibility to select which features of the chatbot to utilize, and they value the tool's ability to address aspects they might neglect. Aditionally, participants indicated a preference for voluntary and specific progress checks by the chatbot, rather than general inquiries about overall progress. These insights highlight the importance of user autonomy, privacy considerations, and the functionality of the chatbot in supporting structured and adaptable task management processes.

Moreover, participants expressed various expectations regarding the chatbot's functionalities. Some participants emphasized the need for the chatbot to establish deadlines and provide corresponding reminders, whereas others preferred a system without any imposed deadlines. Concerns were raised about the chatbot's current capability in providing effective feedback, with suggestions for soliciting specific input to enhance accuracy. Additionally, there was a desire for the chatbot to maintain a visible presence, potentially through pop-up notifications on the Canvas main screen, and to conduct daily check-ins for plan adjustments, although some participants opposed these check-ins due to concerns about autonomy. Participants also expected the chatbot to offer simplified explanations and to estimate necessary information to avoid overwhelming users. Furthermore, some students expressed a desire for the chatbot to act as a motivator, offering compliments and feedback based on their strengths and weaknesses. Overall, the data indicates that while students recognize potential benefits in using chatbots, they value customization, voluntary use, and robust privacy safeguards to fully embrace this technology.

In conclusion, the survey data provides valuable insights into student expectations and concerns regarding the application of LLM chatbots in educational contexts. While students acknowledge the potential of chatbots in facilitating goal setting, task execution, and organizational strategies, they express significant concerns regarding privacy and the chatbot's ability to provide effective feedback. The findings highlight a preference for a customizable tool that respects user autonomy and seamlessly integrates with existing LMS systems such as Canvas. Participants value the flexibility to select specific chatbot functionalities and prefer progress assessments that are voluntary and specific rather than generic. Additionally, there is an inclination for the chatbot to manage deadlines and issue reminders, although opinions vary on the necessity of these features. Overall, while there is moderate enthusiasm for integrating chatbots into educational environments, their implementation must address these diverse needs and preferences to ensure widespread acceptance and effectiveness.

Several participants highlighted in their open-ended questions (OEQs) the potential advantages of integrating the chatbot directly within the Canvas LMS. As noted in the related work, research on integrating chatbots with LMS Canvas remains limited. Addressing the technical complexities of LMS integration necessitates leveraging

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online resources and exploring potential developmental pathways [19]. Such integration holds promise for enhancing the functionality of LMS Canvas through advanced chatbot capabilities.

6 CONCLUSION AND DISCUSSION

This paper explores the potential of Large Language Model (LLM) chatbots to assist learners in formulating effective learning goals and action plans within Learning Management Systems (LMSs). By addressing the necessary capabilities for LLM-based chatbots to provide feedback, based on current capabilities and feedback mechanisms, and by evaluating learners' perceptions and expectations, this study provides insights into the integration of AI-driven assistive capabilities in educational contexts.

The research also identifies a critical gap in existing resources: the limited availability of personalized feedback and support for goal-setting. Integrating LLM chatbots with LMSs has the potential to fill this void by offering continuous and scalable assistance that is not limited by human capacity constraints. This potential enhancement could significantly enhance learner engagement and motivation through timely and individualized feedback and support throughout the learning journey.

The findings from Research Sub-Question 1 (RSQ1) illustrate that LLM chatbots have significant capabilities in delivering personalized feedback. These capabilities include utilizing frameworks such as SMART for goal-setting, providing cognitive feedback, and aiding in the creation of detailed action plans. The literature review emphasizes the important role of these frameworks in enhancing learners' self-regulated learning (SRL), promoting intrinsic motivation, and ensuring the effectiveness of the goals. Such capabilities highlighted in existing research highlight the advantages of personalized feedback within educational contexts.

Consequently, in what ways can Large Language Model chatbots facilitate learners in developing effective learning goals and action plans? Research Sub-Question 2 (RSQ2) involved surveying learners to get their perceptions and expectations regarding the usage of LLM chatbots in Learning Management Systems (LMSs) equipped with AI-based assistive features. The findings reveal varied attitudes toward chatbot adoption. While learners value functionalities that aid in breaking down goals into manageable tasks and providing structured feedback, concerns surrounding privacy and the autonomy of goal-setting practices were prominent. This suggests the necessity for customizable chatbot interactions that uphold learner preferences and ensure data privacy while delivering effective guidance.

RSQ1 reviews existing literature to establish the ideal attributes of chatbots, particularly focusing on methodologies for providing feedback and using chatbots. In contrast, RSQ2 highlights the varying preferences among individual students, necessitating chatbots to encompass a broad range of functionalities. These individual preferences may not consistently align with established feedback and the usability of chatbots found in current literature. However, the survey does reveal some commonalities with specific literature findings, as evidenced by the consistently high averages in multiple Likert scale statements.

6.1 Limitations and Future Work

Large Language Models (LLMs) are continuously advancing in today's rapidly evolving world. There remains a need for further investigation into the current capabilities of chatbots in providing feedback, as well as exploring avenues to enhance these capabilities where current limitations exist.

This study has focused on exploring the possibility of employing an LLM chatbot within educational settings, utilizing a modest participant group of 50 students. Future research could expand upon these findings with a larger and more diverse participant pool to enhance the generalizability and robustness of results. Moreover, additional research is needed for the technical aspects of implementing such systems, including prototyping and iterative testing involving students. A crucial area for exploration would be prompt engineering, ensuring optimal utilization of LLM chatbot capabilities to effectively support educational goals and action planning.

The inclusion of participants exclusively from the University of Twente reflects a specific educational context. Conducting research across diverse educational institutions would enhance the generalizability of findings regarding chatbot integration.

In summary, this study demonstrates the viability and advantages of integrating LLM chatbots into LMS to assist learners in establishing and attaining educational objectives. By examining both the technical capabilities of chatbots and learners' expectations, this research contributes to the field of educational technology and provides a framework for future studies and implementations.

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A AI STATEMENT