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Developing AI chatbots to enhance student learning experiences in online courses

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Abstract

Online learning has grown rapidly. However, reduced face-to-face interaction can lead to psychological and communication gaps between learners and instructors, known as transactional distance (Moore, 1997). The recent development of AI-powered chatbots presents an opportunity to study how they may bridge these gaps. This article describes Phase 1 of a multi-phase study on the implementation and assessment of AI chatbots in online graduate courses. It offers instructional designers and faculty who design and teach online courses, a detailed, step-by-step guide for selecting, training, and implementing AI chatbots in their courses. Phase 2 will analyze students' perceptions of AI chatbots' effectiveness and their role in satisfaction and reducing transactional distance.

Keywords: AI chatbots, transactional distance, online learning, instructional design, student engagement

Introduction

Online learning has experienced rapid growth in recent years, yet the reduced face-to-face interactions can result in a perceived psychological and communication distance between learners and instructors. This sense of *transactional distance*, as conceptualized by Moore (1997) in his *Theory of Transactional Distance* can lead to feelings of isolation, disengagement, and a lack of motivation and support for online learners. Although the use of chatbots as conversational agents in education is not new, the recent development of AI-powered chatbots presents a novel opportunity for bridging the transactional distance gap in online courses. As a result, the faculty of an online graduate program are conducting a study to examine the potential of AI chatbots in reducing transactional distance and improving the learning experiences of students. The multi-phased study is focused on selecting, developing, testing, deploying, and analyzing the impact of AI chatbots in online graduate courses. Phase 1, which was recently completed, included the selection, training, and implementation of an AI chatbot in several of the graduate program's online courses. In Phase 2, which begins in fall 2024, data will be collected and analyzed regarding students' perceptions of AI chatbot utility, clarity, influence on outcomes, efficiency, responsiveness, interaction ease, and role in student satisfaction and reducing isolation. This article details Phase 1, beginning with an overview of Transactional Distance Theory, a brief history of chatbots, and examples of educational applications. It also provides a detailed, step-by-step guide for selecting, training, and implementing AI chatbots.

Review of Literature

Transactional Distance Theory (TDT) is a pedagogical framework that examines the dynamics of education environments, focusing on learner interactions with the instructor, content, and peers, as well as how these

interactions are influenced by the mode of instructional delivery. Transactional distance, on which Moore (1997) based the theory, "is a concept describing the universe of teacher-learner relationships that exist when learners and instructors are separated by space and/ or by time" (p. 22), such as in online, remote, and distance learning environments. According to Moore, this separation affects interaction and learning dynamics, representing not just physical distance, but an ongoing psychological and communication gap. He adds that effective communication (dialogue) between learners and instructors, clear course structure (structure), and balanced self-directed learning (learner autonomy) can contribute to bridging gaps that the distance, real or perceived, may produce. According to Bergman and Wickersham-Fish (2023), for example, if a course is designed with a focus primarily on structure, learners may feel more distant from the instructor. "Conversely, a course that prioritizes dialogue over structure reduces the transactional distance" (p. 24). Regarding learner autonomy, Bergman and Wickersham-Fish add that in an online environment where the course organization (structure) and interaction levels (dialogue) often fluctuate, learners may need to implement more self-directed learning strategies (learner autonomy).

Moore's *Theory of Transactional Distance* has undergone many developments since it was first developed. For example, Zhang (2003) expanded on the theory by incorporating online learning environments and defining transactional distance as the barriers that exist between students and their full engagement with the learning environment. She also identified four dimensions of transactional distance, between student and student, student and teacher, student and content, and student and the instructional technology used for teaching/learning, and proposed that these dimensions influence students' learning, satisfaction, and achievement of learning goals. In 2021, Swart and MacLoud introduced a figure illustrating Zhang's (2003) *Scale of Relative Proximity of Transactional Distance (SRPTD)*. Adapted from Swart and MacLoud, Figure 1 below introduces the learning management system (a component of course structure), which facilitates interactions (dialogue) among students, instructors, and content. In addition, AI chatbots have been incorporated into the model for this study.

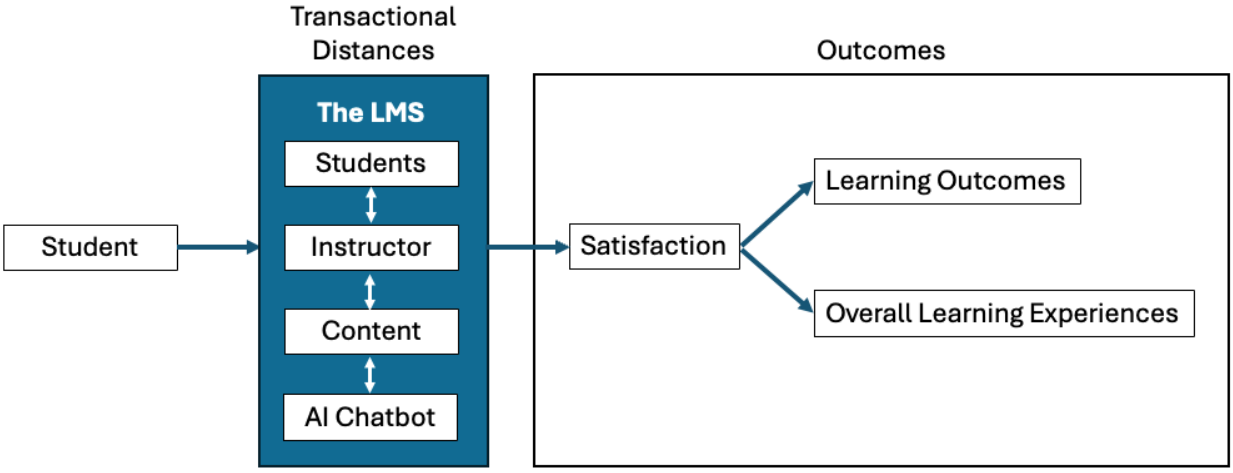

Figure 1: Factors Influencing Transactional Distance in an Online Course (Modified from Swart & MacLoud, 2021)

As technologies have also advanced since the first publication of TDT, so have the applications and research on it. For example, studies (e.g. Falloon, 2011; Groshell, 2020; Belt & Lowenthal, 2022) have shown that the use of synchronous tools like virtual classrooms can enhance dialogue and reduce transactional distance,

although they may also impose external structures that affect learner autonomy. According to Moore (1997), *Transactional Distance Theory* provides guidance for balancing dialogue, structure, and learner autonomy to minimize transactional distance and create more engaging and effective learning experiences. Bergman and Wickersham-Fish (2023) agree, observing that "identifying and implementing assistive technologies in the online learning environment becomes crucial to eliminating potential barriers to learning. By leveraging suitable assistive tools, educators can empower all students to excel and thrive in their educational journey" (p. 25). This is where AI chatbots may help. As conversational agents, they can be integrated into the structure of a course so students can interact with it (dialogue) to get their questions answered just in time, and thereby reduce perceived feelings of transactional distance, and increase learner autonomy.

Chatbots for Reducing Transactional Distance

Chatbots as conversational agents in education have roots dating back several decades (Kuhail, et al., 2023), showcasing that the concept is not entirely novel. Early implementations of chatbots in education primarily focused on interacting with students to help support administrative services and in online courses through text-based interfaces. These chatbots served various purposes, including providing responses to frequently asked questions for registration, financial aid, etc., and in courses, delivering content, facilitating discussions, and even assessing students' understanding (Ramandanis & Xinogalos, 2023).

One of the earliest examples of chatbots in education is ELIZA, developed by Joseph Weizenbaumin in the 1960s (Berry, 2023). Although ELIZA was not specifically designed for educational purposes, its natural language processing capabilities allowed it to engage users in conversations. This demonstrated the potential for using conversational agents to simulate human interaction, which could be applied to educational contexts. Then, in the late 1990s and early 2000s, as online education platforms began to emerge, and as advances such as ALICE (Artificial Linguistic Internet Computer Entity), and later, personal assistants such as Alexa and Siri were developed, the use of chatbots increased to support learning experiences (Adamopoulou & Moussiades, 2020).

These early chatbots were often integrated into learning management systems (LMS) or course websites. They could answer frequently asked questions, provide explanations, offer feedback on assignments, and even guide students through course materials using a conversational interface. For instance, some chatbots acted as virtual tutors, providing personalized assistance to students based on their learning needs and progress (Gupta, et al., 2022). These chatbots could adapt their responses and interventions according to the student's performance, providing targeted support in areas where the student struggled. Moreover, chatbots were utilized in online discussion forums to stimulate interactions among students and instructors. These chatbots could pose questions, moderate discussions, summarize key points, and provide additional resources based on the topics being discussed. Early implementations of chatbots as conversational agents in education set the stage for more advanced applications in today's online learning environments. The release of ChatGPT by OpenAI in November 2022 significantly accelerated the experimentation and adoption of AI-powered chatbots in both education and talent development spheres.

Phase 1: Developing, Testing, and Implementing AI chatbots

The faculty of a graduate online program are conducting a study to examine the potential of AI chatbots in reducing transactional distance and improving the learning experiences of students. The initial phase, which has been completed, focused on developing, testing, and implementing AI chatbots within their online courses. This phase was broken down into 5 steps:

Step 1: Research and Selection of an AI Chatbot Tool. Phase 1 involved a thorough exploration of available AI chatbot platforms to identify the most suitable option for deployment across an online graduate program. Several factors were considered, including intuitive design, ease of use, compatibility, adaptability to course and program requirements, and cost-effectiveness. The following criteria, developed by the researchers, were used to select the most appropriate AI-powered chatbot platform for this project:

- **Intuitive design.** Intuitive design involves crafting user interfaces that are straightforward and easy to use, making interaction with the chatbot feel natural and effortless. Key characteristics we considered included familiarity, simplicity, consistency, efficiency, and feedback.

- **Ease of use.** Ease of use refers to how simple and straightforward the chatbot is to operate, ensuring users can interact with it with minimal effort, confusion, or reliance on external help. Key characteristics we considered included having a simple interface, straightforward navigation, and intuitive controls that make the user's experience with the chatbot effortless.

- **Compatibility.** Compatibility refers to the chatbot's ability to integrate seamlessly within existing software, systems, and infrastructure to achieve project goals without causing conflicts or performance issues. One key compatibility characteristic we valued was the chatbot's ability to integrate into web pages or LMS via customizable widgets or embed codes.

- **Adaptability.** Adaptability refers to the chatbot's ability to adjust to the specific needs and evolving requirements of the course or program. An adaptable chatbot is one that can be customized to suit unique user preferences, learning goals, and content types. High adaptability allows for a more tailored and flexible solution that can grow and evolve with the program's needs.

- **Cost-effectiveness.** Cost-effectiveness refers to the extent to which the chatbot delivers value for its cost. A cost-effective solution achieves the desired results while utilizing resources efficiently and minimizing expenses, ensuring the sustainability of the solution over time.

After the criteria were identified and operationally defined, the researchers created a rubric to evaluate each platform. The rubric provided a structured approach to evaluate potential chatbot solutions across the 5 valued criteria.

Table 1: AI Chatbot Selection Rubric

Criteria	1	2	3	Pts
Intuitive Design	The chatbot interface is confusing and challenging to use, lacking in intuitive design aspects.	The chatbot offers a reasonable level of user-friendliness but lacks one or more of the key intuitive design features.	The chatbot interface is user-friendly, offering high levels of familiarity, simplicity, consistency, efficiency, and immediate feedback. Interaction feels natural and effortless.	
Ease of Use	The chatbot is complex and consistently challenging to operate, requiring significant external guidance.	The chatbot requires some learning to use effectively, with occasional user assistance needed.	Users can operate the chatbot effortlessly, with minimal effort and no confusion, thanks to a clear interface, straightforward navigation, and intuitive controls.	
Compatibility	Performance issues arise when integrating the chatbot with existing	The chatbot works with most systems, but there are some notable compatibility	The chatbot integrates flawlessly with existing software, systems, and	

	systems. Chatbots cannot be embedded into web or LMS pages.	problems. The chatbot is accessed from a web page or LMS via a URL.	infrastructure via customizable widgets or embed codes.	
Adaptability	The chatbot shows limited adaptability. It can't accommodate basic requirements or unique user preferences.	The chatbot is adaptable to most requirements and user preferences, with some limitations.	The chatbot is highly customizable and flexible, easily adapting to specific user needs and program requirements, making it scalable across the program.	
Cost-Effectiveness	The chatbot is expensive relative to the value it delivers, with high costs and limited benefits.	The chatbot offers average value, meeting basic expectations with moderate resource use.	The chatbot provides exceptional value for its cost, achieving desired outcomes efficiently and sustainably.	
			Total Points:	

Next, the researchers used a search engine to identify potential AI-powered chatbot platforms. During the initial screening, 24 platforms were selected based on affordability and adaptability. Of these, 12 were eliminated for lacking flexibility, scalability, or user-friendly design. The remaining platforms were assessed according to the five valued criteria identified by the researchers: (1) intuitive design, (2) ease of use, (3) compatibility, (4) adaptability to course and program requirements, and (5) cost-effectiveness. Table 2 below presents a list and description of the top 10 AI-powered chatbot platforms presented in alphabetical order.

Table 2 : Summary of 10 AI-Powered Chatbot Designer Applications

Chatbot Platform	Rating
AI Coaches https://aicoaches.io The AICoaches chatbot designer enables users to create customizable AI-powered chatbots that can simulate the expertise of actual people. Users can customize the avatars, including personality, coaching style, appearance, and type of response generated. The chatbot can be trained using course content in the form of text, video links, URLs, and custom Q&As. The chatbot includes simple analytics and maintains a conversation history that can be analyzed to improve response accuracy. Customizable widgets can be created and embedded into web pages. A premium license of AICoaches is currently available for a one-time launch fee of $41.00.	• **Intuitive Design.** The ability to customize avatars, personalities, and coaching styles suggests an intuitive and user-friendly interface for creating and interacting with the chatbot. • **Ease of Use**. The platform is straightforward to use, with features like content integration and customizable widgets contributing to an effortless user experience. • **Compatibility.** The capability to embed customizable widgets into web pages indicates good compatibility with existing systems and infrastructure. • **Adaptability.** High customizability in terms of avatars, personalities, coaching styles, and content integration suggests the chatbot can adapt well to specific user needs and program requirements. • **Cost effectiveness.** The one-time launch fee of $41.00 for a premium license provides good value and sustainable costs, especially in the long run.
Botsonic https://writesonic.com/botsonic The Botsonic AI chatbot platform provides a user-friendly interface intended for individuals seeking to implement chatbots swiftly without programming skills. The platform provides a free plan which includes 1 chatbot, 100 messages per month, and 1 million uploaded characters, along	• **Intuitive Design.** The user-friendly interface designed for non-programmers suggests an intuitive and straightforward design. • **Ease of Use.** The accessibility for users without programming skills indicates a high degree of ease of use. • **Compatibility.** The ability to embed chatbots on websites shows good compatibility with existing

with unlimited file and link uploads, website embedding, and basic analytics. The "Plus" plan, priced at $20 per month, allows users to develop an unlimited number of chatbots, receive up to 2,000 messages per month, upload up to 20 million characters, and integrate with social media platforms. Botsonic offers a 30% discount to educational institutions and non-profit organizations.	• **Adaptability.** As needs grow, users can switch to the Plus plan to develop an unlimited number of chatbots and receive up to 2,000 messages per month. • **Cost-Effectiveness.** The free plan allows users to try the service at no cost, and the paid Plus plan at $20/month is reasonably priced. A 30% discount for educational institutions and nonprofits makes this tool more accessible to organizations with limited budgets.
Chatbase https://www.chatbase.co The Chatbase AI chatbot builder was designed with an intuitive and user-friendly interface, making it accessible to non-programmers. The company offers a free plan and paid plans starting at $19 per month. Users can create and customize a GPT-powered chatbot and integrate it into websites through a simple embed code. The chatbot can be trained through connections to multiple data sources, including text, file uploads, and website URLs. The free plan includes 1 chatbot with 20 message credits per month, while the Hobby plan increases this to 2,000 message credits and two chatbots, with extensive training capabilities.	• **Intuitive Design.** The intuitive and user-friendly interface designed for non-programmers provides an intuitive design focused on ease of use. • **Ease of Use.** The accessibility for non-programmers and the intuitive interface indicates a high degree of ease of use. • **Compatibility.** The ability to integrate chatbots into websites via simple embed codes demonstrates good compatibility with existing web infrastructure. • **Adaptability.** The support for training chatbots from multiple data sources like text, files, and URLs allows for adaptability to different content types and use cases. • **Cost-Effectiveness.** While the free plan allows users to try the service, the 20-message credit limit is quite restrictive. The $19/month Hobby plan seems reasonably priced but only supports 2 chatbots, limiting its scalability across multiple courses.
Chatbit https://chatbit.co Chatbit is a cloud-based chatbot builder that enhances website engagement by enabling features such as lead capture, appearance customization, and automated responses. It supports multilingual communication and allows for the integration of custom data sources. Users can train the chatbot using uploaded documents or direct input, optimizing it to meet specific customer needs. The app provides basic analytics and insights from customer interactions to better understand user behavior. The company offers a free starter license for one chatbot and 500 messages per month, and a Core license at $19 per month for two chatbots and 5,000 messages.	• **Intuitive Design.** The ability to customize chatbot appearance and style suggests an intuitive design focused on user experience. • **Ease of Use.** No coding requirements and the ability to train chatbots via document uploads or direct input indicate a straightforward and easy-to-use platform. • **Compatibility.** The ability to embed customizable widgets into websites demonstrates good compatibility with existing web infrastructure. • **Adaptability.** Flexible training options using documents or direct input, along with multilingual support, allow the chatbots to adapt to diverse content types and audiences. • **Cost-Effectiveness.** While the free starter plan allows users to try the service, the 500-message limit is too restrictive. The $19/month Core plan seems reasonably priced but only supports 2 chatbots.
Coachvox AI https://coachvox.ai/course-ai-chat/ The Coachvox AI chatbot is designed to transform educational material into an interactive, AI-powered chatbots. The chatbot can be integrated into any platform that supports HTML, offering flexibility in its deployment. Users can customize the chatbot's coaching style, choosing between short or long responses and selecting a formal or informal tone. Training the chatbot involves uploading or dragging and dropping course files, pages, or video transcripts, which the system then	• **Intuitive Design.** The ability to customize the chatbot's coaching style, tone, and length of responses suggests an intuitive design focused on creating a natural conversational experience. • **Ease of Use.** The simple process of uploading or dragging and dropping course materials to train the chatbot, along with the iterative customization process, indicates a straightforward and easy-to-use platform. • **Compatibility.** The ability to integrate the chatbot into any platform supporting HTML demonstrates compatibility across various systems and environments. • **Adaptability.** Customization options for coaching style, tone, and response length, along with the iterative

uses as training data. Further customization is possible through an iterative process where users can ask sample questions and refine the chatbot's responses based on feedback. Coachvox AI charges $99 per month for its services.	refinement process, allow the chatbot to adapt to specific user preferences and educational needs effectively. • **Cost-Effectiveness.** While the platform offers robust features and customization, the $99 per month cost may be prohibitive for smaller educational institutions or individual educators with limited budgets.
DocsBot.ai https://writesonic.com/botsonic DocsBot.ai is an easy-to-use chatbot builder that features a free personal plan and native integrations with platforms like Notion, allowing users to connect and streamline their data sources efficiently. It supports the creation of ChatGPT-powered bots trained with specific content and documentation to accurately answer detailed questions. The builder offers customizable embeddable widgets for website integration and continuously updates with new features. Pricing starts with a "Hobby" plan at $16.00 per month, that includes 1 chatbot and up to 1,000 questions per month, with a free personal plan available to test the service.	• **Intuitive Design.** The emphasis on ease of use and a user-friendly interface suggests an intuitive design focused on simplifying the chatbot building process for users with non-technical backgrounds. • **Ease of Use.** The user-friendly interface and straightforward approach to creating chatbots demonstrate a high degree of ease of use for this platform. • **Compatibility.** The ability to create customizable, embeddable widgets for website integration indicates good compatibility with existing web infrastructure and systems. • **Adaptability.** Native integrations with platforms like Notion allow users to connect and manage their data sources, enabling the chatbots to adapt to diverse content types and use cases. Additionally, the continuous addition of new features contributes to the platform's adaptability over time. • **Cost-Effectiveness.** While the free personal plan allows users to test the service, its limitation of 1 chatbot with only 20 message credits significantly restricts its practical utility. The $16/month "Hobby" plan also only supports just 1 chatbot with a maximum of 1,000 questions per month, limiting its scalability across multiple courses.
Poe https://poe.com Poe AI is a versatile chatbot platform that serves as an aggregator for AI models from leading companies like OpenAI, Anthropic, Google, Meta, and others, as well as community-created bots. Users can create their own chatbots or interact with those developed by the Poe community, allowing them to explore various AI capabilities and knowledge bases. Poe AI offers a free basic version with limited features and daily messages, and a paid subscription plan at $19.99 per month. The platform allows users to choose their base AI model, customize system prompts, add knowledge bases, and configure greeting messages. The chatbots created on Poe cannot be embedded into web pages or courses and must be accessed via a URL.	• **Intuitive Design.** The ability to customize various aspects like system prompts, knowledge bases, and greeting messages suggests an intuitive and user-friendly design. • **Ease of Use.** The straightforward process of creating chatbots by selecting base models, adding knowledge bases, and configuring prompts indicates a high degree of ease of use. • **Compatibility.** The inability to embed chatbots into web pages or courses limits the platform's compatibility with existing systems and infrastructure. Chatbots can only be accessed via a URL. • **Adaptability.** The aggregation of multiple AI models from leading companies, along with the ability to customize system prompts, knowledge bases, and greeting messages, provides excellent adaptability to cater to diverse needs and use cases. Unfortunately, the chatbots are not private, accessible by anyone in the Poe community. • **Cost-Effectiveness.** The free basic version allows users to try the service, albeit with limited features and daily messages. At $19.99 per month, the paid plan is reasonably priced for the level of customization and access to various AI models.
ProProfs Live Chat https://www.proprofschat.com	• **Intuitive Design.** The drag-and-drop interface and ability to preview conversation flows before launching suggest

ProProfs Live Chat chatbot builder enables users to create a chatbot from scratch using a simple drag-and-drop interface, with no coding skills required. It offers the ability to customize conversation flows and test them through a preview option before launching. The platform allows for extensive customization of the chatbot window, including themes, colors, and text, ensuring it aligns with brand aesthetics. Users can leverage ready-to-use templates for quick setup, respond to FAQs with canned responses, and gain insights from detailed reports and analytics. ProProfs offers a free plan that includes all premium features for one user and an optional White Label Package for additional branding control at $300/year. Installation is straightforward, requiring just a copy and paste of the provided code, with no HTML or CSS knowledge necessary.	an intuitive and user-friendly design focused on simplifying the chatbot creation process. ● **Ease of Use.** The drag-and-drop interface, combined with the lack of coding requirements and the availability of ready-to-use templates, indicates a high degree of ease of use for users with varying technical backgrounds. ● **Compatibility.** The ability to integrate the chatbot into any platform that supports HTML demonstrates good compatibility with existing web infrastructure and systems. ● **Adaptability.** The extensive customization options for the chatbot window, including themes, colors, and text, allow users to tailor the chatbot to align with their brand aesthetics and specific preferences. The ability to leverage canned responses for FAQs contributes to adaptability in handling common queries efficiently. ● **Cost-Effectiveness.** The free plan, which includes all premium features for one user, provides a cost-effective entry point for individuals or small organizations to explore the platform's capabilities. The optional White Label Package at $300/year may be too expensive for those seeking additional capabilities.
Zapier https://zapier.com/apps/chatbot The Zapier chatbot platform allows users to build custom, AI-powered chatbots using GPT-3.5, which can be trained on personal text data sources. The free version supports up to two chatbots, shareable via public links but not embeddable on web pages. The Basic Plan caters to individuals exploring AI chatbots, while the Premium Plan, at $20.00 per month, permits up to five chatbots, includes embedding options, and allows uploading 1 MB of text data for training. This makes the platform adaptable for both beginners and advanced users.	● **Intuitive Design.** The platform's user-friendly interface designed for non-programmers suggests an intuitive and accessible design approach. ● **Ease of Use.** The accessibility for users without programming skills and the ability to train chatbots using personal text data indicate a high degree of ease of use. ● **Compatibility.** While chatbots can be shared via public links, the lack of web embedding capabilities limits the platform's compatibility with existing web infrastructure. ● **Adaptability.** The ability to train chatbots using custom text data sources allows for adaptability to specific domains and information needs. The platform's versatility in catering to both beginners and advanced users through different pricing tiers contributes to its adaptability. ● **Cost-Effectiveness.** The free plan allowing up to two chatbots provides a cost-effective entry point for experimentation. The $20/month Premium plan is reasonably priced, only permits the creation of five chatbots, limiting its scalability across multiple courses.
Zobot https://www.zoho.com/' The Zobot chatbot automates customer support by instantly addressing frequent inquiries with its AI-driven Answer bot, which utilizes your existing knowledge base to provide responses in natural language. The platform includes a free version that allows up to 100 chat sessions per month. For additional capacity, the Basic plan costs $7.00 per month and supports up to 1000 chat sessions. The Basic plan features an intuitive interface for creating chatbots and offers customization options to improve user experience and flexibility.	● **Intuitive Design.** The platform features a user-friendly interface, which suggests an intuitive design aimed at simplifying the process of building and deploying chatbots for users without advanced technical skills. ● **Ease of Use.** The intuitive interface and lack of coding requirements indicate a high degree of ease of use, making the platform accessible to users with varying levels of technical expertise. ● **Compatibility.** While no specific details are provided, the ability to deploy chatbots implies some level of compatibility with existing systems and infrastructure. ● **Adaptability.** The platform offers customization options to improve user experience and flexibility, which contributes to adaptability. However, its primary focus on business customer support may limit its adaptability to

	other contexts, such as instructional or coaching applications. ● **Cost-Effectiveness.** The free version allowing up to 100 chat sessions per month provides a cost-effective entry point for testing the platform's capabilities. The $7/month Basic plan, supporting up to 1000 chat sessions, is reasonably priced for small-scale usage.

After a thorough evaluation, *AICoaches* emerged as the strongest candidate. It was chosen for its user-friendliness, compatibility with the program's requirements, and cost-effectiveness. The platform featured an intuitive, user-friendly interface that simplified the customization of avatars, personalities, and coaching styles. Its streamlined capabilities, including straightforward content integration and customizable widgets, made developing and testing the chatbots seem effortless. The platform also excelled in compatibility, supporting the seamless embedding of widgets into web pages and easy integration into the learning management system. The platform was also highly adaptable with high customizability options for creating avatars, personalities, coaching styles, and content. The one-time premium license fee of $41.00 offered great value, ensuring cost-effectiveness and long-term affordability.

Step 2: Setting Up and Training of AI Chatbots. Following the selection of the AI chatbot platform, the researchers set up and trained AI chatbots using a range of course materials, including video content, syllabi, lesson modules, rubrics, and project tutorials and instruction pages. One chatbot was created for each course to equip them with the necessary information to provide accurate, reliable, and contextually relevant responses to course-specific queries posed by students. The chatbots were configured using the Widget Editor, which allowed the researchers to customize their appearance, personality, coaching style, and response type based on its function as a conversational agent. The appearance of chat widgets was adjusted to align with the color schemes of the online courses and LMS platform. Figure 2 below displays a screenshot of the Widget Editor, illustrating the appearance of the chatbot widget based on the designer input.

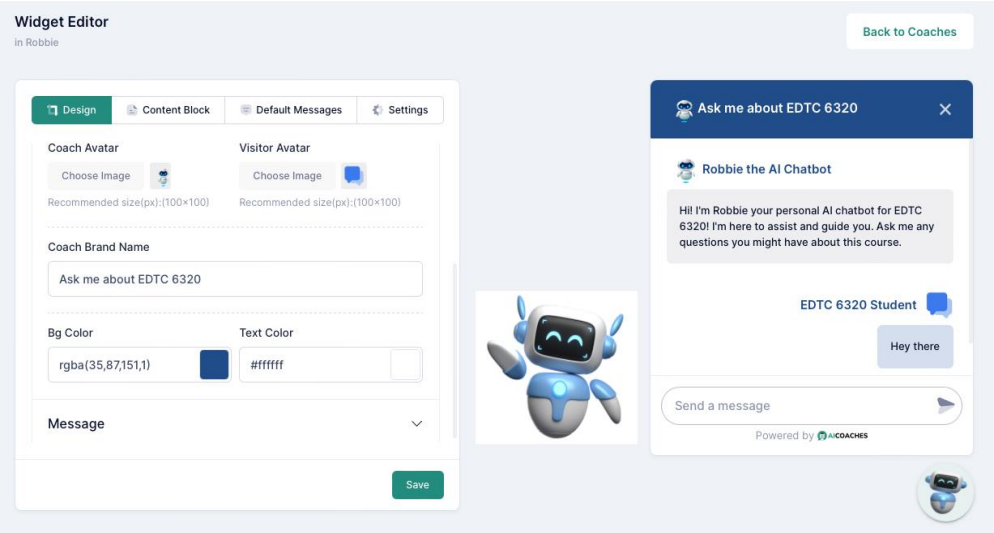

Figure 2: Screenshot of the Widget Editor and Resulting Chatbot Widget

Figure 3 below shows the content editor used to train the chatbots. Each chatbot was trained using course content in the form of video links, text, file uploads, and custom Q&As.

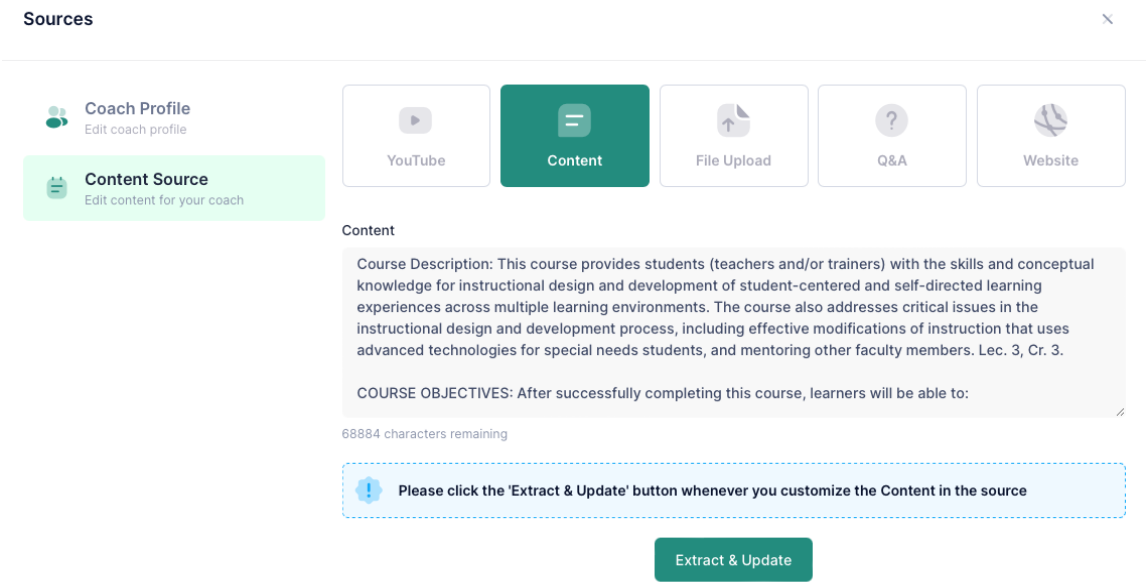

Figure 3: Screenshot of the Content Editor Used to Train the Chatbots

Step 3: Testing the Chatbots. To gauge each chatbot's readiness for launch, the researchers posed a series of frequently asked course-specific questions to assess the accuracy and relevance of the responses. When a chatbot provided an unsatisfactory, confusing, or inaccurate answer, the training content was refined, and specific questions and answers were added to the system. This iterative process of testing, refining, and retraining continued until the researchers were satisfied with the quality of each chatbot's responses. Figure 4 below presents a screenshot of the Q&A tool within the content editor.

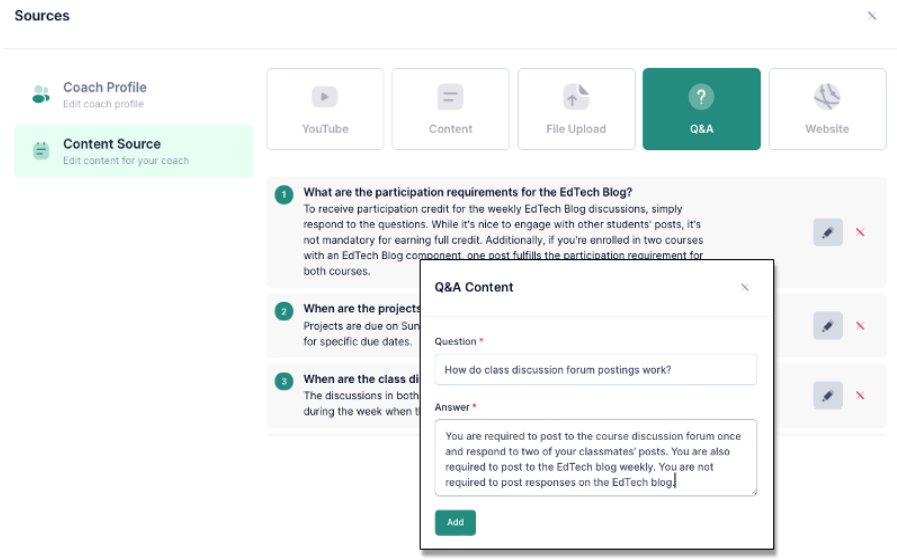

Figure 4: Screenshot of the Q&A Tool within the Content Editor

Step 4: Integrating the Chatbots into Courses. Following the testing phase, the chatbots were integrated into their respective courses using widget embed codes provided by the chatbot platform. The researchers experimented with various placements and widget configurations to determine the most convenient and accessible location for the chatbots within the online learning environment. To make the chatbots less intrusive, the avatars were placed in the lower right corner of the browser window. They would only be activated when users clicked on the hovering chatbot icon. The researchers verified the functionality of the chatbots across multiple browsers, operating systems, and screen sizes. Figure 5 shows a sample iFrame embed code used to embed the chatbot widgets into an LMS course page.

Figure 5: Sample iFrame Embed Code Generated by the Widget Editor

Step 5: Live Testing with Real Students. During the live testing phase, which began in Summer 2024, the researchers introduced the chatbots to students, explained their purpose, and encouraged them to experiment with them to get answers to commonly asked course-related questions and to help refine their writing. Throughout this phase, the researchers monitored the chatbots' performance across all courses, its impact, and user feedback, including suggestions for improvement and issues or concerns raised by students. Student feedback was used to make revisions and guide the continuous improvement to the chatbots' capabilities. Figure 6 below presents a screenshot of an AI chatbot embedded into an LMS course page. The chatbot is activated when a student clicks on the hovering icon located in the lower right-hand corner of the browser window.

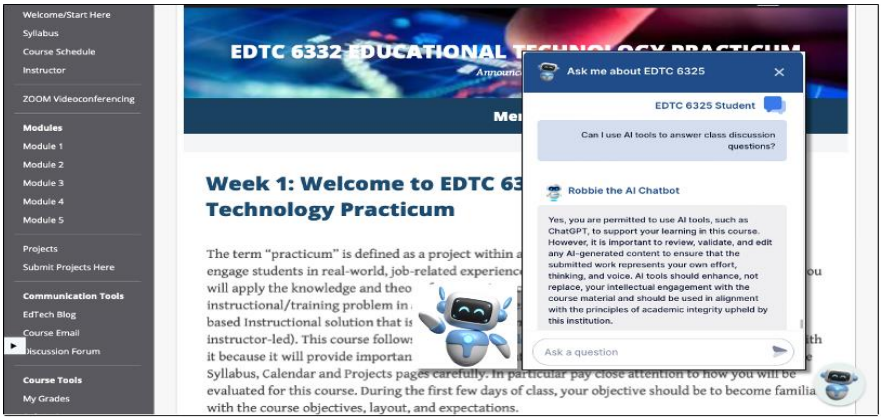

Figure 6: A Screenshot of the AI Chatbot Embedded in an LMS Web Page

This research has been reviewed and approved by the university's Institutional Review Board for Human Subjects Protection (IRB). In Phase 1, the researchers selected and trained AI chatbots using course materials, tested and refined them, then integrated them into courses via embeddable widgets for live student testing. Students are currently experimenting with them for the first time.

Summary & Next Steps

Phase 1 of the project involved the selection, development, testing, and implementation of AI chatbots within online graduate courses. Researchers started by evaluating various AI chatbot platforms using criteria such as intuitive design, ease of use, compatibility, adaptability, and cost-effectiveness. The *AICoaches* platform was selected due to its user-friendly interface, seamless integration capabilities, and affordability. The chatbots were trained using a variety of course materials, including videos, syllabi, and lesson modules. Testing involved an iterative process of posing frequently asked questions, refining responses, and ensuring the chatbots provided accurate and relevant answers. Finally, the chatbots were integrated into the course pages using embed codes, with their placement optimized for accessibility and minimal intrusiveness. Live testing with students, currently underway, will provide valuable feedback for further refinement before full implementation.

In Phase 2, the focus will shift to evaluating the impact and effectiveness of the AI chatbots from the students' perspective. Researchers will collect and analyze data on students' perceptions regarding the utility, clarity, and influence of the chatbots on their learning outcomes. The survey will assess various aspects such as ease of use, response quality, and the chatbots' role in improving student satisfaction and reducing feelings of isolation in online learning environments. This phase aims to gather insights on how well chatbots bridge the transactional distance gap and enhance the overall online learning experience. The findings will inform potential improvements and the broader applicability of AI chatbots in educational settings.

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