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Laidlaw Scholars Undergraduate Leadership and Research Programme
Research Proposal

The Importance of Cultural Adaptation in the Use of AI within Education

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April 19, 2025

STUDENT LIFE | Centre for International Experience

UNIVERSITY OF TORONTO

Abstract

As artificial intelligence (AI) continues to evolve, its integration into education has become increasingly prevalent. AI-powered chatbots are now commonly used by students in schools, supplementing learning and providing personalised educational assistance. However, current AI models often fail to account for cultural differences, which can influence how students perceive, interact with, and benefit from these tools. This research explores the significance of cultural adaptation in the use of AI within education. By investigating how cultural elements shape educational experiences and human-computer interaction, this study aims to develop cultural approaches for AI chatbot design. The research will be split into three stages: a literature review, chatbot prototyping, and survey-based evaluation. The literature review will examine existing research on the role of culture in traditional education and human-AI interaction. Based on these findings, a prototype chatbot will be developed using the DeepSeek AI model. Finally, a survey will be conducted with University of Toronto students to evaluate the effectiveness and perceived cultural responsiveness of the chatbot. The goal is to assess how culture can be integrated with educational AI chatbots. Ultimately, this research seeks to contribute to the conversation surrounding ethical and inclusive AI in education, creating practical design strategies and a framework for future development.

Introduction

AI has become a powerful tool used in many sectors of society, including education. During my first year at the University of Toronto, I watched my peers utilise AI to supplement their learning. It led me to wonder about the efficacy of AI chatbots and the factors that can improve AI chatbots within education. My preliminary research found that culture shapes how people interact with AI; depending on the culture, individuals will view their relationship with AI differently, impacting the effectiveness of AI itself (Ge et al., 11). There have been plenty of studies addressing the importance of culture within traditional education, leading to the rise of *culturally responsive teaching*, defined as "using the heritages, experiences, and perspectives of different ethnic and racial groups to teach students who are members of them more effectively," (Gay, 124). However, I found a lack of literature on how educational AI can incorporate culture and the impact this would have on learning outcomes and perception of AI. Thus, this research study will explore the relationship between culture and educational AI and how educational chatbots can integrate culture within their answers. The goals of my research are as follows:

1. Assess the relationship between culture and traditional education and how traditional education can integrate culture.
2. Analyze the connection between culture and AI, specifically how culture can impact human-computer interaction and perception of AI.
3. Identify methods in which culture can integrate with educational chatbots and the ethical considerations behind each method.
4. Develop a prototype educational chatbot using the methods from (3) and evaluate the strengths and limitations of it.

Research Objectives & Questions

How can cultural elements be integrated within educational AI chatbots to enhance the effectiveness of students' learning? This question is at the center of my research. My primary objectives are identifying different approaches to incorporating culture within educational AI and assessing the strengths, weaknesses, and ethical considerations. In addition, I would like to create a prototype chatbot to evaluate the effectiveness and limitations of utilising each approach. My secondary objectives are to research the relationship between culture and traditional education and the relationship between culture and the perception of AI.

Background

There have been many studies outlining both the impact of culture on traditional education, and the impact of culture on how people perceive AI (examples of these studies were cited above in the *Introduction* section). However, there is a gap as to how culture can impact educational outcomes when using AI. Exploring this topic can be beneficial for implementing AI strategies into education and providing better learning tools for students.

At the University of Toronto, I plan to take a Computer Science and Ethics, Society, and Law double major. In my first year, I learned a lot about both AI and AI ethics, which has sparked my interest in exploring the ways in which people interact with and perceive it. Through the University of Toronto's Machine Intelligence Student Team (UTMIST), I have learned the basics of how AI models are made and trained. My experience in Trinity One Policy, Philosophy, and Economics stream has allowed me to explore how AI interacts with the economy and people's psychology. My work in these areas has influenced me to pursue this research topic.

Methodology

My proposed research is split into three distinct parts, literature review, prototyping, and survey-based evaluation. The literature review will first focus on identifying the importance of culture within traditional education to justify using culturally adapted methods within non-traditional forms of education, like the use of AI. Afterward, the focus will be on analysing the relationship between culture and AI, specifically how cultural factors can impact the efficacy and perception of AI (these factors include but are not limited to language, tone, and beliefs). This will be done by completing an in-depth analysis of how datasets, bias, cultural language, and other factors intersect with people's perceptions on AI. With this information, I will develop potential methods and approaches that incorporate cultural aspects into educational AI.

The second research method will be prototyping. Using the approaches in the first stage, I plan to create a basic AI chatbot that is specifically trained to teach on one topic (for example, the history of the CN Tower). The chatbot will be created using the current DeepSeek AI model, which is highly accessible and affordable, Google Colab, FastAPI, Railway, and Vercel. These tools will each be used respectively to build and set-up a simple chatbot website. More specifically, DeepSeek and Google Colab will be used to create the AI model, FastAPI and

Railway will be used to setup the backend (or the coding framework), and Vercel will be used to set up the frontend (the actual website).

Lastly, a simple survey-based evaluation will be conducted by asking a sample of students (25-40 people) at the University of Toronto to interact with the chatbot and give their perceptions and thoughts on its effectiveness in teaching. This will be done by setting up a Google Form survey, and the student sample will be garnered through financial incentive and the Computer Science Student Union. In addition, my research advisor, Sadia Sharmin, can aid in providing me with the tools and resources to get a student sample.

Training/ Certifications Needed

No certifications are required for my research. However, prior to my six-week research period, I plan to teach myself more advanced AI topics and techniques so that during the six-week research period, I can focus on prototyping and surveying.

Research Location

The research will be conducted in Canada, specifically in Guelph, Ontario where I currently live. However, I plan to go to the University of Toronto for some of the six weeks in order to access resources and conduct surveys.

Research Ethics Board

My research does require approval from the REB, however I have begun the process and my advisor has assigned me as a student investigator on the REB portal.

Timeline

Prior to Research Period	
April 22nd – 30th	Complete REB approval form. Create meeting arrangements with Sadia Sharmin.
May	Complete literature review portion of research study. Develop approaches for cultural integration in educational AI. Begin learning how to create chatbot. - The focus will be on working with DeepSeek AI model and specialized training Talk with previous UTMIST presidents to learn more about prototyping.
June 1st –15th	Continue learning about how to build chatbot. - The focus will be on creating a backend and frontend for the chatbot, and a deployable website Begin setting up survey and gathering sample of students.
Research Period	
Week 1	Create datasets for AI chatbot.

	Begin training AI model.
Week 2	Build a website to host AI chatbot model. Complete prototype.
Week 3	Extra week, use to catch-up in any area, or to work ahead.
Week 4	Complete survey set up, and ensure sample is attained.
Week 5	Begin surveys.
Week 6	Complete surveys.
After Research Period	
Rest of Summer	Write research report.

Resources & Support Needed

I am an executive of UTMIST and have connections with both the academic leads (students who teach how to create machine learning models throughout the year) and the 2024-2025 presidents of UTMIST. I plan to request support during the early stages of my preparations so they can teach me the basics of how to build an AI model (setting up environments, finetuning parameters, etc.)

My research advisor, Sadia Sharmin, has published research in computer science education and has a lot of experience in terms of working with student samples. During the survey portion of my research study, I plan to work closely with my advisor to ensure I am doing everything ethically and efficiently.

Potential Impact

Technological advancements continue to grow rapidly worldwide, yet methods of education seem to be stagnant. Many regions still lack accessible education, which starkly contrasts with the accessibility of information in first-world countries. Thus, I hope that this research can broadly explore the power AI can have within education, and how AI can be adapted to better suit specific needs, including cultural needs. This research can provide a cultural framework for educational AI, which can be implemented to improve the efficacy of educational chatbots and general chatbots. Educational AI is a very novel topic within the academic literature surrounding AI, thus, I hope my research can contribute new ideas towards AI literature. On a broader scale, the research can potentially help make education more accessible, providing an alternative education method for students in countries that lack infrastructure for traditional education.

References

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