

# AI Literacy for Hispanic-Serving Institution (HSI) Students

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## Abstract

Degree completion rates for Hispanic students lag far behind their white non-Hispanic peers. To close this gap and accelerate degree completion for Hispanic students at Hispanic-Serving Institutions (HSIs), we offer a pedagogical framework to incorporate AI Literacy into existing programs and encourage faculty-mentored undergraduate research initiatives to solve real-world problems using AI. Using a holistic perspective that includes experience, perception, cognition, and behavior, we describe the ideal process of learning based on a four-step cycle of experience, reflecting, thinking, and acting. Additionally, we emphasize the role of social interaction and community in developing mental abilities and understand how cognitive development is influenced by cultural and social factors. Tailoring the content to be culturally relevant, accessible, and engaging to our Hispanic students, and employing projects-based learning, we offer hands-on activities based on social justice, inclusion, and equity to incorporate AI Literacy. Furthermore, combining the pedagogical framework along with faculty-mentored undergraduate research (the significance of which has been shown to have numerous benefits) will enable our Hispanic students develop competencies to critically evaluate AI technologies, communicate and collaborate effectively with AI, and use AI as a tool anywhere; preparing them for the future and encouraging them to use AI ethically.

## Introduction

In 2021, 28% of Hispanic adults (25 and older) in the United States had earned an associate degree or higher, compared to 48% of White non-Hispanic adults (Excelencia in Education 2023). At two-year institutions, Hispanics' graduation rate was 5%-points lower than that of their White non-Hispanic peers and at four-year institutions, Hispanics' graduation rate was 13%-points lower. Nationally the gap in degree completion between Latinos and their White peers has increased and to close this gap, we need to accelerate Latino completion and scale up programs and initiatives that work for them.

Fairleigh Dickinson University (FDU), a Hispanic-Serving Institution (HSI), is one of the four higher education programs that have been recognized for their evidence-based efforts to advance Latino college students' success in the

classroom and in the workforce (Flores 2022). Latino Promise and HACER (Hispanics Achieving College Education Recognition), sister programs at FDU, were recognized for helping primarily first-generation college students complete associate degree programs in a timely manner and help them transfer into bachelor programs. Our programs are designed to help Latino students achieve their college goals and we offer four different programs – Latino Promise, HACER, Puerta al Futuro (Gateway to the Future), and Avanza for bilingual Latino high school students. These provide a pre-college summer program, small classes, academic support, financial grants, personalized advising, and cultural enrichment all designed to mold high school graduates from the local communities into successful college students.

FDU's Latino Promise Program provides a personalized approach to higher education for high school students in pursuit of an associate or bachelor's degree. These programs recruit students in immigrant-heavy school districts to redress educational, economic, and social barriers. They offer students the same curriculum, but Latino Promise offers English instruction, while HACER helps students preserve and improve their Spanish and English through ESL (English as a second language) bilingual coursework, eventually helping them move into English-only instruction. Puerta al Futuro's main purpose is promoting higher education in the Hispanic community.

In response to the increasing number of employers interested in providing educational opportunities to their Latino employees, FDU designed undergraduate degrees for Spanish speaking adults with the possibility of progressing into graduate degrees, allowing students to achieve their dreams and realize their potential. This program enables Spanish-speaking adults to learn English and to earn a college degree through progressive all-Spanish to all-English coursework. With the goal of helping students in grades 9-12 graduate high school, Avanza, assists Latino students in fulfilling high school requirements, earning college credits, and learning academic English while opening pathways to higher education and preparing them for college life.

AI literacy is a set of competencies that enable individuals to evaluate the accuracy and biases of AI technologies and communicate effectively with AI. Especially designed for our Hispanic students, AI literacy will help them develop a set of competencies that will enable them to critically evaluate AI technologies, communicate and collaborate effectively with AI, and use AI as a tool anywhere (school, home, and in the workplace). Helping our Hispanic students attain AI literacy will not only prepare them for the future, but it will encourage them to use AI ethically. AI literacy can result in heightened productivity, the acquisition of future-ready skills, and a novel way of learning for our Hispanic students. The authors look forward to implementing these ideas into all the four programs already established at our university – the Latino Promise, the HACER, the Puerta al Futuro (Gateway to the Future), and the Avanza, with support of our College Dean and the Executive Director of our Hispanic Center. Such administrative support is crucial to implementing projects of this nature.

In this paper we describe a pedagogical framework to incorporate AI literacy into these existing programs for our Hispanic students. We rely on holistic perspectives and describe a 4-step cycle of learning, considering the role of social interaction and community. We further describe how we use hands-on active learning approach with culturally relevant projects. In addition to the pedagogical framework, engaging our Hispanic students in faculty-mentored undergraduate research, to solve real-world problems using AI, will help accelerate their degree completion rates. By involving them in such problem-solving experiences early on and introducing them to the thrill of creating and uncovering new ideas, we not only deepen their knowledge base and improve their critical thinking and problem-solving skills, but also help them develop their “soft” or “people” skills such as communication and collaboration – which are very essential in all sectors. Our goal is to equip these students with the competencies and skills to use AI to prepare them for the future and enable them to critically evaluate AI technologies and use them responsibly and ethically.

### **Pedagogy Framework**

To accelerate Latino degree completion and offer new initiatives that will work for them, we propose a pedagogy framework to incorporate AI Literacy into these existing programs for our Hispanic students, into existing courses and/or new courses, based on the following:

- Experiential learning theory (Kolb 1984).
- Sociocultural cognitive development theory (Vygotsky 1987).
- Competencies and design considerations (Long and Magerko 2020).

In his paper on experiential learning theory, David Kolb (1984) offers a holistic perspective which includes experience, perception, cognition, and behavior, and describes the ideal process of learning in a four-step Experiential Learning Cycle: Experiencing – Reflecting – Thinking – Acting. In his collected works, Lev Vygotsky (1987), emphasizes the role of social interaction in the development of mental abilities and believes cognitive development is influenced by cultural and social factors and that community plays a central role in the process of “making meaning.” AI pervades our daily lives, as we embrace a future increasingly shaped by its implementation, with little thought to the human perspective, ethical issues, and cultural-societal implications. In their paper, Duri Long and Brian Magerko (2020) explore the competencies users need to effectively interact with and critically evaluate AI and how to design learner-centered AI technologies that foster increased user understanding of AI.

### **Existing and New Courses**

For the Hispanic students in our Latino Promise, HACER, Puerta al Futuro, and Avanza programs, we offer several courses including Computer Science Fundamentals, Mobile Applications Development, and Introduction to Programming among many others. We are proposing infusing AI Literacy into the existing courses or as an additional course to be offered to every student in these programs, without any language barriers or pre-requisites such as mathematics or computer programming. This will involve tailoring the content to be culturally relevant, accessible, and engaging for our Hispanic students. We aim to provide these students with a foundational understanding of AI, its ethical considerations, and its applications while incorporating a cultural perspective that resonates with our Hispanic community. We want to empower our students to engage with AI and other technology responsibly. Additionally, the hands-on activities based on social justice, inclusion, and equity perspectives, and invited guest speakers will enhance engagement and practical skills. Employing projects-based learning will help integrate knowledge (concepts, facts, and information), activity (hands-on application of knowledge to a real-world setting), and reflection (analysis and synthesis of knowledge and activity to create new knowledge). Pursuing an AI for Good approach by identifying practical applications of AI (social justice, inclusion, and equity), scaling these solutions for global impact, and accelerating progress towards United Nations Sustainable Development Goals (UN SDGs) will provide appropriate learning experiences and materials to stimulate students to advance their thinking and will encourage student-centered learning, formative assessment, active learning, discovery learning, and peer interaction.

### **Computer Science Fundamentals**

Our Computer Science Fundamentals course is a first introduction to computer technology and application for all disciplines. The topics covered in this course include discussion of computer hardware and software, the societal impact of computers and computer applications in everyday life and business. The goal of this computer course is to foster skills development so that students have sufficient computer skills for use in college, home, and in the workplace for a technology-filled twenty-first century. With the momentum and popularity of AI and the stir it has caused in the recent years, it is easy to get students excited about AI with a brief history and the concepts behind AI in this course. Teaching with AI and teaching about AI are distinct but both are important to bring into our classrooms. Teaching with AI involves using AI tools to help students learn any relevant topics. Teaching about AI involves teaching students what AI is all about and how it works. Students gain knowledge, develop skills, and understand the capabilities and risks of AI. We want to cultivate critical thinking skills in our students and help them make informed judgement in their daily lives. Knowledge content and theory is just one part, what we really want is our students to transform from being consumers to becoming creators and evaluators, thus we offer practical engagement via AI creation. Using the four-step cycle (Kolb 1984) we start with first two steps of experience and reflection for a simple problem of recognizing if something goes in trash or the recycle bin. Then in next two steps, we let our students think how they can make this happen and act on it by creating a model that can do this task of recognizing trash or recyclable. Using available online resources, students train simple models to do this binary classification. Knowing that community plays a big role and how cultural and social factors influence mental and cognitive development (Vygotsky 1987), we use in-class discussions to elicit individual perspectives to shape the collective ideas of the group. Students discuss about recycling efforts in their home, campus, work, communities, and globally. Duri Long and Brian Magerko (2020) explore seventeen different AI literacy competencies that users would need to effectively interact with AI, and course activities are based on these. For example, one activity is about recognizing AI and it involves being able to distinguish AI or not from everyday life of our Hispanic students. Another activity is to identify different perspectives on the various ethical issues around AI related to these students. These activities include hands-on active learning approach with culturally relevant projects for our Hispanic students.

### **Mobile Applications Development**

Our Mobile Applications Development course is designed for students without any prior programming experience and helps them to become active creators rather than passive

consumers of technology. In this course, students create mobile applications (apps), using MIT's App Inventor (Massachusetts Institute of Technology 2012), an intuitive, visual programming environment that enables anyone to build fully functional apps for Android phones, iPhones, and Android/iOS tablets. The front end of the app is the design, which the app users will see and use to interact with the app. The back end is the code the students write to make their app function in the intended way. Some of the first few apps our students develop in this course are language translators and text-to-speech apps. We then expand into apps which can use AI. AI systems accomplish various tasks including image classification and understanding spoken language and now significant AI computations can even be performed on smartphones/tablets available to our students. Students create mobile applications to use an AI model they create and then interact with the model to make predictions or classifications. The concepts of good design (for the app front end) and bias is easily incorporated into the lessons. Students also learn how to balance AI with Human Interaction (HI). Starting with individual action, then expanding to community action and government action, students aim for international action with the mobile applications they create. Recently, MIT launched the AI with MIT App Inventor tutorials that include supplementary teaching materials (lesson plans, slides, projects, assessments, etc.). We use many of these tutorial projects to give our Hispanic students an introduction to AI and mobile apps creation with emphasis on constructionist learning where students create apps for their ideas related to AI projects. Our students learn all about image classification, deep fakes, and the ethics behind AI algorithms in their own projects. While the students do not have to go deep into the various algorithms being used by the AI model, they do need to learn how to build their AI model using online available free resources. Students will train a model using data they collect and once they train and test the model, they can easily export it to their app creating program and use the model for real-world prediction and classification. Again, as in the earlier course, we rely on the four-step cycle (Kolb 1984) and lead our students through the four stages of awareness, competency, knowledge, and integration. We build upon AI literacy competencies (Long and Magerko 2020) and promote teamwork and encourage working with members of their community (Vygotsky 1987).

### **Introduction to Programming**

Our Introduction to Programming course aims to teach popular programming languages such as Python, C#, C++ and more. In this course, our Hispanic students learn the syntax and semantics of a computer programming language and then develop applications for real-world projects. They also learn about the UN SDGs and use AI to come up with solutions that affect all globally. A great example of a real-world

project is climate change education, and we use this to promote student engagement and creativity. Computer science education is often stereotyped as coldly detached from real life, focusses on “hard” skills: critical thinking, problem solving, analytical thinking, quantitative reasoning, programming, technology design, and data analysis, and fails to foster human-centric skills of cooperation, empathy, social awareness, and global citizenship which enable our Hispanic students to shape future societies that are inclusive and equitable. We need these students to be knowledgeable about real-world issues that affect them, to be able to effectively address them. For example, climate change education is vital to show these students how they are directly connected to the environment and to create an atmosphere where students see that they have control over how they interact with the physical world. Knowing their field of study has potential to make the world a better place in the face of a rapidly changing planet, is both inspiring and empowering to these next generation graduates, who will be valuable allies to combat climate change. Climate change is one of the greatest threats to sustainable development and the significance of education in providing an informed response to such environmental problems is not novel. Since 1992, United Nations Framework Convention on Climate Change (UNFCCC) (United Nations 1992) and international agreements (UNESCO 2015, Læssøe and Mochizuki 2015) recognized education as an essential element for mounting an adequate global response to climate change. Most solutions to climate change involve a two-pronged approach: mitigation and adaptation, and successful implementation of either requires an informed community. Climate change mitigation avoids/reduces emissions of heat-trapping greenhouse gases into the atmosphere to prevent warming to more extreme temperatures, while climate change adaptation alters behavior/systems/ways of life to protect families/economies/ environment from impacts of climate change (WWF 2022, NASA 2022). Creating climate change awareness is crucial to both. Mitigation approaches often center on clean technologies while the potential of a quality educational experience is rarely discussed. In recent years, interest in climate change education has increased (UNESCO 2015, Læssøe and Mochizuki 2015, Will and Prothero 2022) due to leadership efforts from organizations like United Nations Education, Scientific, and Cultural Organization (UNESCO) that continue to advocate for educational efforts to respond to climate change. San Jose State University researchers evaluated the impact of climate change course on individual long-term carbon emissions and showed potential reductions in carbon emissions compared to other large-scale mitigation strategies (Cordero, Centeno, and Todd 2020). While teens want to learn more about how climate change will affect the future, and what they can personally do to lessen the effects, most states do not require comprehensive instruction on this, and a nationwide survey (of

teenagers) (Will and Prothero 2022) reveals an education system that is incompatible with student interest. In June 2020, New Jersey became the first state to require climate change education in all K-12 schools, across grade levels and subjects (New Jersey School boards Association 2022, SubjectToClimate 2022). There is an urgent need to develop a framework for climate change education and conceptualize the skills needed to catalyze both technical and social transformation in higher education too. This can bring about a fundamental shift in how our Hispanic students think, act, and discharge responsibilities toward one another and our planet.

### **New Course on AI Literacy**

Including AI literacy in existing courses is just one way to promote AI literacy in higher education for all students. By offering an entirely new course on AI literacy, especially geared for Hispanic students, we can empower these students to not only to understand AI and engage with technology responsibly, but also learn AI skills to further continue their exploration and training. AI literacy is a multifaceted concept (which is so essential in this 21<sup>st</sup> century) which goes way beyond a simple understanding of AI technologies. In this course, we introduce some basics of what AI is, how it works, and some historical context around AI. Then we explore the ethical implications of AI in the context of bias, fairness, and transparency. Next, we focus on real-world AI applications in healthcare, finance, education, entertainment, and discuss the impacts of AI on jobs, privacy, and social dynamics. We want our Hispanic students to gain the skills and competencies required to view AI technologies critically and to question their design and implementation. Our goal is to make students capable of discerning the benefits and challenges of AI while making informed decisions about its use. We want to help them to think critically about AI’s role in their lives. Using hands-on projects to apply AI concepts and build simple models, we introduce concepts of supervised and unsupervised learning and help students understand data collection, preprocessing, and algorithm selection. AI literacy isn’t just about being professionally competent, so we invite guest lecturers (including professionals from the AI industry with a Hispanic background) to share their experiences and to help students gain critical thinking skills to help them understand the AI-driven world around them. We hope to collaborate and partner with companies to have our students gain experience with real-world projects and participate in industry workshops.

### **Faculty-Mentored Undergraduate Research**

In addition to the pedagogical framework, another way to encourage students in degree completion is to involve them in research with a faculty mentor. The importance of under-

graduate involvement in active research is widely acknowledged in the literature and is seen as essential not only for the personal development of students but also for the overall advancement of the field (Kuh et.al. 2006, Gates et. al. 2008 and Villa et. al. 2019). With National Science Foundation Broadening Participation in Computing funding, the Computing Alliance of Hispanic-Serving Institutions (CAHSI) was established in 2006, to address the low representation of Hispanics in computing in both higher education and the workforce (Computing Alliance of Hispanic-Serving Institutions 2006). The CAHSI Local Research Experiences for Undergraduates (LREU) program engages students and faculty at their home institutions in impactful and meaningful research projects that develop solutions to real-world problems. The program seeks to excite African-American/Black, Hispanic/Latinx, Native American (AHN) and female students about computing graduate studies and provide them with the research experiences critical for graduate studies. CAHSI institutions are working together to raise the low number and share of AHN and female students who enter and complete graduate programs in computing fields, which are among the least diverse science disciplines. We encourage our Hispanic students to avail these research experience opportunities with a faculty mentor based on their interest and motivate them to investigate AI-based projects. Once a student is paired up with a faculty mentor, they begin to work on projects they have selected related to AI. Students in the computing major can work on developing algorithms for AL and Machine Learning (ML) as they have the necessary mathematics background. Students in non-computing majors can select AI application projects rather than developing their own solutions. In both cases, students will work on real-world problems and gain the experience of working on research under the mentorship of a faculty member. This will enable students to gain problem-solving, critical thinking, communication, and collaboration skills; all of which are essential in today's world.

### Hands-on Projects

Many hands-on projects are freely available from several online, curated curriculum sites. Science Buddies offers several AI projects for teaching various topics and one such project uses reinforcement learning to build an AI system to solve any maze (Ngo 2023). In this project, students train a computer agent to explore a maze using a special ML technique called reinforcement learning. Students first create the maze environment and then navigate the maze without any training. Then they implement the agent, define a reward system, and train the agent. Finally, they evaluate the agent and experiment to improve the system.

Another project guides students to use AI to teach a web-based tool to classify happy and sad faces, or other objects,

or sounds (De Brabandere 2022). In this project, students start by getting familiar with free online ML tools to train their model. Then they create the learning and testing data and train the model. Finally, they test new data and analyze and communicate the results.

Students can create an unbeatable tic-tac-toe AI player and learn about how algorithms are used to make decisions in two-player games (Ngo 2024). Students start by setting up the tic-tac-toe board and preparing the game environment. Then they build the AI player using the algorithm and test it by playing the game against the AI player.

In this digital age, computers possess the remarkable ability to produce coherent paragraphs and even entire pages of text that closely resemble human writing. A project helps students learn about chatbots and AI-generated text (Finio 2023) and try to analyze if humans can recognize AI-generated text. Another similar project answers questions about AI-generated images (Finio 2023).

### Conclusions and Future Directions

To increase diversity in AI education and research, we have presented a pedagogical framework with initiatives and strategies that leverage faculty-mentored undergraduate research to accelerate Latino degree completion. By leaning on resources that are already available, this task can be accomplished in due time, and AI Literacy can be achieved for our Hispanic students. The data we gather from this experience will be presented in a forthcoming paper. We hope to form collaborations with industry and government agencies to encourage wider adoption that spotlight student success in AI literacy.

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