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Exploring the Integration of Artificial Intelligence in Formal Physician Assistant Curricula: A Review of Current and Future Applications

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Online Program Quality: What Learners Say

Will Hatheway is a quality assurance specialist for Northern Virginia Community College's NOVA Online. His work focuses on training, mentoring, and assessing asynchronous online faculty in the area of course delivery. He also advocates for online learning through his work with the College Senate. He has taught asynchronous courses since 2010 and has degrees from Hampshire College, Boston College, and VCU. He is completing his PhD in Education at George Mason University (expected graduation: May 2026) with a focus on online learning program quality.

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Editor's Note

The Journal of ITC employs a rigorous peer-review process to uphold high academic standards and ensure the quality of published work. Each submission is carefully evaluated for originality, relevance, and scholarly contribution. Reviews are conducted by a panel of experienced faculty and researchers from New Jersey City University along with valued members of our board, whose expertise supports the journal's commitment to excellence in education.

Artificial intelligence has rapidly become a defining force in higher education, and its relevance is especially pronounced in community colleges. These institutions—serving diverse learners and adapting quickly to workforce and community needs—are uniquely positioned to benefit from AI's potential while also confronting its challenges. Understanding and thoughtfully exploring AI is now essential to supporting student success, operational efficiency, and equitable access.

AI tools can personalize learning, expand academic support, and reduce routine tasks so faculty can focus on meaningful, high-impact teaching. Yet the technology also raises critical questions about equity, data privacy, academic integrity, and digital literacy. Community college students arrive with varied technological experiences, making it vital for educators to guide them in using AI ethically, responsibly, and effectively.

This issue highlights the need for community colleges not just to adopt AI, but to study it critically. The articles gathered here explore practical applications, emerging tensions, and the human-centered values that must guide AI integration. Together, they encourage us to approach AI as a catalyst for re-imagining how we teach, support students, and advance the mission of open-access education.

Dr. Brooke Litten, Ed. D

Editor-in-Chief

Journal of ITC

A Critical Examination of Online Chemistry Laboratory Education

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Abstract

Chemistry laboratories are usually thought to be incompatible with online education. This opinion is exclusionary to students who require online education. This critical review discusses the current need for online chemistry laboratory courses, the needs of online chemistry students, and instructor perspectives regarding online chemistry laboratory courses. The literature demonstrates that virtual laboratories have been criticized as not rigorous or sufficient in lieu of in person laboratories. However, advantages to online chemistry labs include the ability to start over, lower environmental risks, and the ability to place a stronger focus on data analysis skills. Students enjoy the flexibility, gamified instruction, and auto-graded assessments in online chemistry laboratories. However, students also express issues with time zones for group work and internet connectivity, lack of instructor technological skills, and issues with self-motivation. Finally, instructors of online chemistry laboratories face challenges such as needing to be able quickly adapt to the online modality, ensuring digital content accessibility, and tackling the concern of academic dishonesty and plagiarism.

Keywords: online chemistry laboratories, higher education, chemistry education

Introduction

During the Spring 2020 semester, the coronavirus pandemic required a rapid transition to emergency remote teaching in higher education and K-12. This sudden transition was meant to help mitigate risk of exposing students and educators to the newly discovered COVID-19 disease. Almost all higher education courses were moved online, with the exception of very few workforce and technical courses that required in person interaction (Khlaif et al., 2021; Kimble-Hill et al., 2020; Trust & Whalen, 2021). Academic Science, Technology, Engineering, and Mathematics (STEM) courses were included in those moved to be fully online. However, this transition was met with controversy for courses with laboratory courses accompanying the lecture course like chemistry, physics, and biology.

STEM laboratories, and especially chemistry laboratories, are usually thought to be incompatible with online education. During the emergency remote education transition, chemistry laboratory courses were quickly regarded as not compatible with the online format. The American Chemical Society's (ACS) Committee on Professional Training swiftly released a response to COVID-19 regarding "Laboratory Experiences that Require Hands Experience" (*Teaching Labs in the Time of COVID-19*, n.d.). In this public statement, the ACS declared that the physical manipulation of laboratory equipment is required for laboratory experiences according to their standards. The ACS also more recently declared that online chemistry laboratory courses are not permissible to earn an ACS certified chemistry degree due to lack of lab safety skill development (*2023 ACS Guidelines for Undergraduate Chemistry Programs*, 2023). Additionally, further precedent has been set by professional schools. Certain medical schools are not accepting online chemistry laboratory courses as an acceptable prerequisite course credit for entrance to their programs (*Medical School Admission Requirements™*

(MSAR®) Report for Applicants and Advisors Premed Course Requirements, 2024)**.** With the leading organization on chemistry education and medical schools excluding online chemistry laboratories as acceptable, there is a clear disposition in the education and professional community. While the ACS and medical schools do have reasoning why physical laboratory experiences are necessary (to build laboratory safety awareness), this argument is exclusionary to students who require online education.

Higher education is not accessible to all if certain course modalities are considered inferior or second tier. Rural students, full-time caregiver students, or students with visible or invisible disabilities (among many more examples) who require alternatives to face-to-face courses, such as online synchronous and asynchronous modalities, are being excluded from online chemistry education. The purpose of the critical review is to understand the current need for online chemistry laboratory courses in higher education, the needs of students in these courses, and instructor perspectives regarding online chemistry laboratory courses, based on extant literature. This research topic is important due to the rising supply and demand for remote education in general. Online STEM curriculum, including chemistry laboratory courses, need to be offered and accessible for all students.

Emerging Themes

Advocacy for Online Chemistry Laboratory Courses in Higher Education

Chemistry laboratory courses in particular have been a subject of controversial discussion in terms of remote online education. Since traditional chemistry laboratory courses require a physical presence and learning dexterity of handling equipment, virtual laboratories assigned in remote online courses have been criticized as not rigorous and not sufficient in lieu of in person laboratories (*Teaching Labs in the Time of COVID-19*, n.d.). However, working students,

students with families, students with disabilities, caregiving students are among the population of students who benefit from the availability of online science courses. Without the availability of online chemistry laboratory and lecture courses, some students may not be able to pursue or aspire to a certain degree or professional track. Why is it okay to exclude these students? According to the Universal Declaration of Human Rights compiled by the United Nations, “everyone has the right to education…higher education shall be equally accessible to all on the basis of merit” (*Universal Declaration of Human Rights*, 1948). Additionally, Article 27 of the Universal Declaration of Human Rights states that everyone has the right “to share in scientific advancement and its benefits” (*Universal Declaration of Human Rights*, 1948).

Advocates for online science courses being offered emphasize the benefits of everyone having access to this education (Faulconer & Gruss, 2018). In addition to this necessity, online laboratory courses also allow several advantages over face-to-face laboratories. For example, the rapid development of robust online laboratory simulations has revolutionized online laboratory courses (Chan et al., 2021). Before this, online laboratories were thought of as impractical due to needing expensive at-home laboratory kits or simply impossible. Now, online chemistry laboratory education is more accessible to students with disabilities who are not able to physically attend a college or a STEM laboratory in person. The ability to "fail" and have no repercussions enforces that it is okay to start over and helps personalize learning for students at different levels. This is in comparison to in person laboratories which require costly material and laboratory hardware/glassware. Additionally, virtual laboratory simulations decrease chemical hazards and costs. With a push for more environmentally friendly chemistry laboratory course experiments (Armstrong et al., 2019), laboratory simulation technologies provide a cost effective and environmentally friendly alternative. Virtual laboratories have the potential to create engaging, effective, and accessible learning experiences for all students.

Online laboratory simulations offer real-time data access/collection, whereas face to face laboratories are at times so cumbersome and anxiety inducing to students (Gungor et al., 2022; Kurbanoğlu & Yücel, 2015). These face-to-face activities may be so overwhelming that data collection does not feel like the purpose of a laboratory activity and instead may seem unimportant. While learning laboratory safety is essential to any laboratory setting, this is usually the easiest of the tasks in a laboratory course. After conducting a literature review, Faulconer and Gruss (2018) question if face to face science laboratory courses properly prepare students for subsequent courses (Faulconer & Gruss, 2018). Data collection, analysis, and interpretation can be sidelined cognitively. However, learning these scientific reporting skills is important to building critical thinking as a scientist. General and simple laboratory safety skills can still be practiced in virtual laboratory simulations. Specialized laboratory safety skills can be learned onsite as part of any employer onboarding training. However, the critical thinking skills that are learned from collecting, analyzing, and interpreting data are far more valuable and require more practice.

In fact, recent studies have demonstrated that students who participated in virtual laboratory simulations received better grades (Montoya et al., 2023) and performed better at scientific reporting in comparison to a control group (Al-nakhle, 2022). In a study on the efficacy of online science laboratories, students themselves describe feeling that their online laboratory experience was just as good or better than traditional in person laboratories (Rowe et al., 2018). Students participating in an innovative, collaborative, escape room based online laboratory activity found the activities engaging and an effective learning tool (Abdul Rahim & Chuah, 2024). Online chemistry laboratories can also decrease absenteeism of students (Montoya et al., 2023).

The increasing availability of virtual simulation experiments offers a valuable tool for teaching complex and hazardous chemistry experiments (Hou et al., 2023). These simulations provide a safe and controlled environment for students to explore concepts, practice experimental techniques, and analyze data. By leveraging virtual simulations, educators can enhance student learning, reduce risks associated with hazardous chemicals, and provide flexibility in course delivery (Hou et al., 2023). However, it is essential to carefully select and implement virtual simulations to maximize their effectiveness. Key considerations include the alignment of simulations with learning objectives, the quality of the simulations, and the integration of hands-on experiences where appropriate. By thoughtfully incorporating virtual simulations into chemistry curricula, educators can create engaging and effective learning experiences that prepare students for future challenges.

Student Experiences in Online Chemistry Courses

Students' satisfaction and engagement with online chemistry courses are multifaceted, influenced by factors such as course design, instructor engagement, and technological support. Accettone (2021) surveyed students who participated in a remote chemistry course during the Fall 2020 semester. According to the results, Accettone demonstrated that students preferred fully asynchronous courses because they could speed lectures up, there was greater flexibility, and the lectures were on demand. However, when asked about future courses, students preferred a mixture of both synchronous and asynchronous for their chemistry courses (Accettone, 2021). Similarly, Blackford et al. (2022) designed a remote gamified laboratory experience for chemistry students. The premise of the gamification aspect was a choose-your-own-adventure-style video-based online experiments which benefit students by real-time feedback on decisions made during experiments. Students indicated that while this instruction modality was not as effective as face-to-face laboratory courses, they did find the laboratory activities clear and engaging and appreciated the flexibility (Blackford et al., 2022).

The transition to online laboratories presents opportunities such as gamified instruction, but challenges are also present. Buchberger et al. (2020) explored the challenges and benefits of transitioning traditional, in-person laboratories to online formats. The authors discuss the transition from an inquiry-based face to face lab which was data-collection focused, into a remote online statistical analysis-driven one. Students' successes included being able to gain teamwork skills, learn excel, statistical analysis, and PDF generation. However, challenges were associated with accepting the drastic change in the premise of the laboratory and the time zones where students were located (Buchberger et al., 2020). To further understand the student experience, Chans et al. (2022) documented the experiences of students in an environmental chemistry course that was redesigned to be online. The authors found that students did feel they learned in the course and would recommend the course (Chans et al., 2022). Huang (2020) surveyed students about the successes and and challenges in the transition of chemistry courses online. Students describe being cognizant of their instructors' technology skills and presence of strong student interaction online (Huang, 2020). Petillion and McNeil (2020) conducted a phenomenological study to understand the experiences of students in second year chemistry during the Spring 2020 emergency online transition. Students expressed having issues with self-motivation and engagement. The participants also described issues with faculty communication and facing anxiety and stress (Petillion & McNeil, 2020). Sadarangani et al. (2024) explored pre and post semester experiences of organic chemistry online students. According to their results, students reported positive experiences indicating that the online laboratory courses can provide a valuable learning experience (Sadarangani et al., 2024). Henbest et al. (2020) conducted an observational study to evaluate the effectiveness of an asynchronous online preparatory chemistry course. The researchers found that students in the online course had higher final exam scores and higher grades in subsequent general chemistry courses. Notably, students with lower incoming academic preparation benefited significantly from the online format. Serafin and Chabra (2020) explored the adaptation of a cooperative, hands-on general chemistry laboratory framework to a virtual setting. While acknowledging the limitations of virtual experiments compared to traditional hands-on experiences, the study demonstrated the feasibility of maintaining a cooperative learning approach in an online environment. Finally, Anzovino et al. (2020) investigated the experiences of students during the Spring 2020 online transition to remote learning. The authors found that students in introductory organic chemistry courses, in particular, struggled with the transition, likely due to increased workload and limited access to resources (Anzovino et al., 2020).

These findings highlight the importance of innovative assessment strategies in online chemistry courses. Coyte and Lowry (2024) described the use of formative-summative paired chemistry laboratory assessments for foundation year chemistry students. The use of these types of assessments, which contain smart worksheets and auto grading, were positively associated with student engagement and summative attainment (Coyte & Lowry, 2024). Garner and Osthoff (2024) produced high quality laboratory videos filmed in first-person to use in their online quantitative chemistry laboratory courses during the Fall 2020 semester. Students found these instructional videos enriching to their experience by helping them feel prepared and less anxious about missing a laboratory session (Garner & Osthoff, 2024). Yeerum et al. (2022) developed a

Lab-at-Home (LAH) model to address the challenges of hands-on experimentation in analytical chemistry. The authors found that the LAH was effective in achieving learning outcomes, including analytical chemistry skills. Students were generally satisfied with the LAH experience, although some challenges related to internet connectivity and individual performance were noted (Yeerum et al., 2022).

Challenges and Instructor Perspectives of Online Chemistry Courses

There are numerous challenges associated with online science laboratories. Some challenges are technical while some are pedagogical and curriculum based. Before the pandemic caused the transition to remote education, there were very limited sources of literature on these issues. One of the few sources, *Accessible elements: teaching science online and at a distance*, was published more than a decade ago in 2010 but remains relevant to this day. In this book, Kennepohl and Shaw (2010) gather insights on online science education, best practices, challenges, and case studies (Kennepohl & Shaw, 2010). Kennepohl and Shaw (2010) emphasize that the skills required in online science course instruction are numerous and therefore crafting a learning environment online is difficult. A rising question in the online chemistry education literature is whether all online chemistry professors are properly equipped for online teaching? Technical issues arising from this issue can impact students negatively.

The literature on this topic is growing. Huang (2020) emphasizes that instructors of online chemistry must be able to quickly adapt their teaching methods to the online modality and be willing to improve their communication with students (Huang, 2020). Similarly, Njoki (2020) describes the numerous hardware, software, and internet connectivity issues they had when transitioning his course online in Spring 2020 (Njoki, 2020), which were not isolated experiences. Reyes et al. (2023) explored the experiences of instructors transitioning to online chemistry courses, where minimal bandwidth and low internet data usage is required for the weak online infrastructure in the Philippines. The authors found that instructors fostered community in their courses while also dealing with the difficult online transition (Reyes et al., 2023).

Another issue arising from the increase in online chemistry lecture and laboratory courses is the need to remain compliant with content meeting the Americans with Disabilities Act (ADA) and the Individuals with Disabilities Education Act (IDEA) (H.R.5 - 105th Congress (1997-1998), 1997). The ADA and IDEA acts are two significant pieces of legislation designed to protect the rights of individuals with disabilities. The ADA prohibits discrimination against individuals with disabilities in various aspects of life, including employment, public accommodations, and transportation. It ensures equal opportunities and access to services for people with disabilities. IDEA is specifically focused on providing a free public education to eligible students with disabilities. It mandates that schools provide specially designed instruction and related services to meet the unique needs of these students, ensuring they have access to the same educational opportunities as their non-disabled peers. There is difficulty with ensuring online science material is ADA and IDEA compliant. For example, Veal et al. (2005) document the early difficulties of an online science course, finding that using internet sources are accompanied by accessibility issues (Veal et al., 2005). However, efforts to ensure content is meeting the needs of all learners have grown since the early millennium and have been further catalyzed by the pandemic causing the remote online education transition.

As online laboratories continue to improve, challenges simultaneously emerge. There is a strong concern of academic dishonesty and plagiarism, and a decreased opportunity for teamwork skills. Schultz et al. (2017) identified several characteristics associated with students who searched the internet during online chemistry examinations. These students often exhibited lower levels of initial knowledge and investment in the course content. Additionally, they tended to perform more poorly overall on assessments. While the study did not find a significant gender difference in internet search behavior, it highlights the potential impact of such behavior on academic integrity and the need for educators to develop strategies to mitigate it (Schultz et al., 2022). Research by Veale et al. (2022) has highlighted the potential misuse of image-based search engines during online chemistry examinations. Students may use these tools to quickly access and copy solutions to specific problems, thereby compromising the validity of assessments (Veale, 2022).

Gaps in the Literature

Many studies have been done on online laboratory courses, focusing on student success, faculty perspectives, and overall effectiveness. However, there is a considerable gap in the research in terms of specific groups of students, especially those who face challenges due to systemic inequalities. Students from marginalized backgrounds often have a harder time with online science classes, due to the digital divide (Katz et al., 2021; Spector, 2016, p. 140; *Understanding the Digital Divide in Education | AU*, 2020). This could be because they don't have access to good technology, reliable internet, or a quiet place to study. If they come from different educational backgrounds, they might not be as prepared for college-level chemistry, especially in an online setting. One under-researched topic is how race and ethnicity affect student experiences in online chemistry. While there's a growing body of research on online laboratories, there is a need to focus more on the specific needs and challenges of students from diverse racial and ethnic groups.

To fill this gap and improve online chemistry courses for all students, several key areas need to be explored. Researchers should investigate how race and ethnicity impact student engagement, motivation, and academic performance. Additionally, it is important to consider the role of socioeconomic status in shaping student experiences. It is crucial to investigate the barriers to access faced by marginalized students, such as limited technology resources and lack of technical support. There is also a need to explore different teaching methods and technologies to find what works best for diverse learners. Ultimately, by addressing these research gaps and implementing effective strategies, more inclusive and equitable online learning experiences can exist for all students.

Conclusions

The advent of technology has significantly impacted the landscape of education, particularly in the realm of science education. Online learning has emerged as a viable alternative to traditional classroom instruction, offering flexibility, accessibility, and a unique learning experience. Chemistry faculty, who teach a subject often perceived as challenging and abstract, have also embraced online education. This critical review delves into the existing literature on online chemistry education, exploring key aspects such as student outcomes, student and faculty perceptions, benefits, and challenges.

Despite the challenges, online chemistry education offers several potential benefits. It can provide students with greater flexibility in terms of scheduling and learning pace. Additionally, online learning can enhance student engagement through interactive tools and multimedia resources. Furthermore, online chemistry courses can promote equity by making education more accessible to students with disabilities or those who live in remote areas.

However, the implementation of online chemistry education also presents a number of challenges. Technical issues, such as unreliable internet connectivity and software glitches, can hinder the learning process. Moreover, the lack of face-to-face interaction can make it difficult to build rapport between students and instructors, which is essential for effective learning. Additionally, online chemistry laboratories pose unique challenges, as they require careful planning and the development of virtual laboratory simulations.

Given the increasing prevalence of online chemistry education, further research is needed to fully understand its impact. Future studies should investigate the efficacy of online chemistry lectures and laboratory courses, particularly in comparison to traditional face-to-face instruction. Additionally, more research is needed to explore the factors that contribute to student success in online chemistry courses, such as motivation, self-regulation, and technology literacy. The findings of this critical review suggest that the benefits of online chemistry education could potentially outweigh the negative implications.

As an online chemistry professor, I firmly believe that providing online chemistry education to all students is crucial to equity efforts in STEM. By offering flexible and accessible learning opportunities, we can empower students from diverse backgrounds to pursue their academic and career goals in chemistry. However, it is essential to continuously evaluate and refine online chemistry courses to ensure that they meet the needs of all learners.

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Empowering Geriatric Wellness: The Role of an AI-Based Resource Connector in Supporting Healthy Aging Practices

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Abstract

Older adults often face challenges related to falls, inactivity, and access to nutritious food, which can compromise their ability to age safely and independently. This study evaluated the impact of combining a brief in-person wellness education session with LumaLink, a phone-based AI resource connector, on confidence and health related to these factors. Adults (65+) or caregivers, completed a baseline survey, attended a 30-minute session, and were introduced to LumaLink. A follow-up survey conducted 3–4 weeks later assessed changes in behaviors and confidence. Results showed no direct engagement with LumaLink. Nearly one-third of participants reported their intent to use it. Major improvements in confidence related to resource navigation, fall prevention, and overcoming health challenges were noted from the pre- to post-survey in non-AI users. Positive trends were observed in exercise frequency, food access, and nutrition confidence. Additionally, over half of the participants reported no barriers to accessing healthy foods. Despite the limitations of sample size, low response rates, lack of LumaLink utilization, and a short intervention timeline, the findings demonstrate the role of education in being a confidence-building tool for healthier habits and potential of accessible AI tools, such as LumaLink, to enhance self-efficacy and support healthy aging. It is our goal to offer a transferable model through this study for designing confidence-building online instruction, evaluating short-term intervention impact using pre–post assessment, understanding barriers to digital tool adoption a supporting equitable access to technology in distance learning environments through both pedagogical and implementation insights that align closely with the mission and challenges of community college distance education professionals.

Introduction

Interactive wellness programs have gained traction to address the multifaceted health challenges facing the geriatric population. This demographic is uniquely vulnerable to a range of chronic conditions, such as cardiovascular disease, diabetes, and arthritis, which significantly impact their quality of life and increase healthcare utilization. The integration of wellness initiatives that target physical, mental, and social health aligns with the shift toward preventive care in modern medicine. The question at the heart of this review is: Does implementing an interactive wellness program in the geriatric population improve their health outcomes compared to traditional approaches administered by healthcare professionals?

Understanding the effectiveness of such programs is vital for clinicians, caregivers, and policymakers. Interactive wellness programs often emphasize personalized and engaging activities, such as group exercises, cognitive stimulation, and social engagement, which could mitigate the risks of isolation, frailty, and cognitive decline. Key concepts central to this review include interactive wellness programs, defined as structured activities encouraging active participation and feedback, and health outcomes, encompassing physical, cognitive, and emotional well-being.

Studies focusing on non-interactive or solely pharmacological interventions were excluded, as were those addressing populations outside the geriatric age range, specifically those less than 60 years old. The review incorporates randomized controlled trials, cohort studies, and systematic reviews from peer-reviewed journals.

By synthesizing findings from diverse research, this review aims to elucidate whether interactive wellness programs offer measurable benefits to the health and well-being of older adults, particularly in the areas of reducing loneliness, promoting physical exercise, enhancing occupational therapy (OT), and improving health education. These factors are critical to addressing the multifaceted health challenges faced by the geriatric population. Through examining the effects of social engagement, structured physical activity, cognitive stimulation, and educational components, this review seeks to provide actionable insights for developing interventions that not only extend life expectancy but also enhance the overall quality of life for this growing population segment.

This entire project was conducted and facilitated through a 3 course online class series and highlights digital tool adoption and remote learner support. This study demonstrates that brief, structured educational interventions can significantly increase confidence, even when immediate behavior change is limited. This reinforces the value of short, focused modules, scaffolded instruction, and confidence-building activities in virtual classroom settings.

Loneliness and Social Isolation in the Elderly

Loneliness and social isolation are highly prevalent within the geriatric population. Dr. Mays and her team conducted a study called Leveraging Exercise to Age in Place (LEAP), which evaluated the impact of community-based exercise programs on loneliness and social isolation. It found modest improvements in social connectedness within six months, which suggests that group-based exercise may be effective in addressing isolation, although reductions in loneliness required more time (Mays et al., 2021). Kemperman's study, *Loneliness of Older Adults: Social Network and the Living Environment*, shifted the focus to environmental and sociodemographic factors, demonstrating that satisfaction with social networks and neighborhood safety strongly influences loneliness in the geriatric population (Kemperman et al., 2019). This study complements the LEAP study by emphasizing external factors, such as the living environment, as an important point of consideration for program effectiveness. Martinez-Velilla and his team conducted a randomized controlled trial (RCT) that examined the impact of exercise programs among hospitalized older adults. It revealed that while loneliness and isolation levels did not significantly impact the benefits of exercise, individuals who were isolated experienced substantial improvements in quality of life (Martínez-Velilla et al., 2024). This suggests that exercise offers benefits for both physical and emotional health, though it has limitations in directly addressing loneliness.

As for methodologies, the *LEAP Study* used validated scales and mixed-effects modeling to handle missing data, and its integration into a health system enhanced participant recruitment and retention. However, the high loss to follow-up, exceeding 50%, as well as the absence of a control group, limit the reliability of the conclusions. Kemperman's use of Bayesian Belief Network (BBN) modeling provided a comprehensive understanding of the causal factors contributing to loneliness, highlighting the indirect effects of factors such as neighborhood safety and satisfaction. While this approach seems theoretically strong, its focus on a specific region limits its wider use, and the stigma surrounding loneliness may have caused some people to underreport their experiences. Martinez-Velilla's RCT incorporated a strong design and utilized validated tools, such as the De Jong Gierveld scale for loneliness and the Lubben scale for isolation. However, the brief three-day intervention and small sample size limit the ability to apply its findings more broadly.

A universal strength across these studies is their use of validated tools to integrate physical, social, and environmental factors, offering a comprehensive understanding of health outcomes. They highlight the importance of social connections and physical activity, as well as support for multifaceted intervention strategies. However, some significant gaps remain. Dr. Mays's *LEAP Study* and Martinez-Velilla's RCT lack long-term follow-up data, which makes it challenging to evaluate the sustainability of their findings. Furthermore, none of the studies sufficiently addresses scalability or retention strategies, both of which are essential for practical implementation. Kemperman's study did not fully explore psychological comorbidities such as depression or anxiety, which could influence the relationship between loneliness and social connectedness.

There is a consensus among these three studies on the critical role of physical activity and social engagement in improving health outcomes for older adults. They each suggest that group-based interventions are effective in fostering social connections and enhancing emotional well-being. However, there are debates regarding the most effective strategies to combat loneliness. While Dr. Mays's LEAP Study and Martinez-Velilla's RCT highlight the benefit of group-based exercise, Kemperman's research emphasizes the importance of external environmental factors, such as neighborhood safety and amenities, which are often overlooked when designing interventions.

OT and Exercise on Health Outcomes

Another key component is evaluating the effectiveness of occupational therapy (OT) and wellness programs in promoting functional independence and preventing declines in physical and cognitive function in older adults. Current research examining OT interventions, while showing promise, presents varying outcomes and highlights several gaps in the current evidence base.

A central area of exploration is the role of OT in acute geriatric care. Cuevas-Lara et al. (2019) conducted a systematic review of OT interventions for elderly individuals hospitalized due to acute medical conditions. Their review found moderate evidence supporting the positive impact of OT on activities of daily living (ADLs). Five out of the six studies discussed in the review demonstrated significant improvements in functional outcomes. One study also found OT to be effective in reducing delirium and improving cognitive function. However, the review emphasized that OT did not significantly impact psychological outcomes such as anxiety, perceived safety, or quality of life. Additionally, there was no evidence supporting OT's role in reducing hospital readmission rates or shortening the length of stay. The authors noted that the variability in intervention protocols and the limited number of studies hindered their ability to draw definitive conclusions. These findings underscore the need for more rigorous, standardized research to identify which specific components of OT are most beneficial for hospitalized older adults.

A closely related theme is the effectiveness of exercise interventions in reducing the risk of falls and maintaining physical function. Sherrington et al. (2019) reviewed exercise programs designed to prevent falls among community-dwelling older adults. The review found strong evidence supporting the effectiveness of exercise, particularly programs that integrated strength, balance, and flexibility training. These programs reduce the risk of falls and improve mobility, which are crucial factors in maintaining independence among older adults. The study also emphasized the importance of tailoring exercise regimens to individual capabilities, as personalized interventions were more effective than generic programs. Although the findings were promising, Sherrington et al. (2019) noted that long-term adherence to exercise programs remains a significant challenge, particularly for individuals who are frail or socially isolated. This suggests a need for further research on strategies to enhance engagement and ensure sustained participation in fall prevention programs.

Building on the theme of holistic approaches to aging, Lee and Park (2021) investigated the long-term benefits of wellness programs on functional status and independence. Their cohort study demonstrated that wellness programs, which combined exercise, nutrition, and social engagement, led to sustained improvements in physical function and overall life satisfaction among older adults. This study supports the idea that multi-component wellness programs have the potential to produce lasting effects on the independence of aging adults. However, the observational design of the study limited its ability to establish a direct causal relationship between the wellness program and the observed benefits. Without a control group, it is unclear whether the improvements were solely attributable to the wellness program or if other factors played a role.

Despite the encouraging outcomes of these interventions, several gaps remain. There is no consensus on the optimal duration or intensity of OT and wellness programs, particularly when it comes to maintaining long-term benefits. Sherrington et al. (2019) and Lee and Park (2021) both emphasize the importance of consistent engagement in exercise programs. However, questions remain about how to structure these programs to maximize adherence and effectiveness. Additionally, while Cuevas-Lara et al. (2019) found positive effects on ADLs and cognitive function, the lack of evidence on psychological outcomes like anxiety and quality of life suggests that future OT interventions should address these aspects of care more comprehensively. Furthermore, maintaining participant adherence, especially among frail and cognitively impaired older adults, remains a key challenge across all forms of geriatric intervention.

The study by Abizanda et al. (2011) further contributes to this body of evidence, demonstrating the effectiveness of short-term OT interventions in acute geriatric care. Their randomized clinical trial found that OT improved functional recovery, particularly among patients with cardiopulmonary disease, where the adjusted relative risk of functional recovery was 1.57 (95% CI 1.06–2.32). Participants with other conditions also benefited, showing a reduction in acute confusional episodes (RR 0.48, 95% CI 0.26–0.87). These findings emphasize the potential of OT to address both physical and cognitive challenges in older adults, particularly in acute care settings, and underscore the value of such interventions in preventing further declines in function.

A key consideration for the success of OT interventions is motivation, which plays a significant role in ensuring that older adults remain engaged in their therapy and wellness programs. The qualitative study by Janssen and Stube (2013) explores older adults' perceptions of physical activity, emphasizing that intrinsic motivation—driven by a person's interests, preferences, and perceived benefits—was a crucial factor in sustained participation. They found that when physical activities aligned with the individual's interests and goals, older adults were more likely to maintain motivation and adhere to therapy regimens. This highlights the importance of understanding each patient's unique preferences in OT interventions. Tailoring activities to those interests not only improve engagement but also enhances the therapeutic outcomes, suggesting that a person-centered approach is essential for optimizing functional gains in older adults.

Expanding beyond OT, exercise interventions have proven to yield significant benefits in improving both psychological well-being and cognitive function, which are essential for maintaining quality of life as populations age. Shahtahmassebi et al. (2022) evaluated the impact of including trunk-strengthening exercises in a multimodal exercise program on physical activity and psychological functioning. The study found that participants in this program exhibited higher levels of physical activity and experienced improvements in mood and anxiety reduction. While cognitive function was not a primary outcome, the positive changes in psychological health suggest potential indirect cognitive benefits, as mental well-being is associated with better cognitive resilience in aging populations. By using secondary data analysis from a randomized controlled trial (RCT), this study offers a reliable approach to understanding the effects of multimodal exercise on psychological functioning (Shahtahmassebi et al., 2022). However, its limitations include a lack of direct cognitive testing, leaving questions about how trunk-focused exercises specifically contribute to cognitive health. The study's findings highlight the value of multimodal exercise programs for comprehensive mental and physical well-being, suggesting that trunk-focused exercises could enhance overall exercise adherence and quality of life without isolating specific cognitive impacts.

In comparison, Northey et al. (2018) provide a more targeted approach, focusing on the effects of strength training on cognitive function in adults over 50. This systematic review and meta-analysis found that strength training significantly improved cognitive outcomes, with the most significant benefits observed in executive function and memory. Executive function, essential for managing complex tasks and decision-making, and memory are both critical cognitive domains that tend to decline with age, making these findings particularly relevant. The use of multiple RCTs, assessed through standardized cognitive tests, adds to the validity of these findings, strongly supporting the direct cognitive benefits of strength training (Northey et al., 2018). Nevertheless, Northey et al. did not investigate the psychological effects of strength training, which may also indirectly influence cognitive function. Furthermore, questions remain about the longevity of the observed cognitive benefits, as the study does not address the duration of these effects over time.

Comparing these studies highlights both consensus and debate regarding exercise modalities for older adults. While both studies suggest that exercise has a positive impact on mental health and cognitive functioning, they employ different approaches that emphasize either psychological or cognitive outcomes. Shahtahmassebi et al. (2022) demonstrate the holistic benefits of multimodal programs that include trunk-strengthening exercises, though their focus on physical and psychological health does not isolate cognitive impacts. Conversely, Northey et al. (2018) emphasize the cognitive advantages of strength training alone, particularly in terms of executive function and memory, but do not account for psychological well-being, which may also influence cognitive health.

Together, these studies suggest that exercise, whether multimodal or strength-based—offers significant benefits for aging adults, although debate persists about which exercise type is most effective in enhancing cognitive health. Shahtahmassebi et al. (2022) suggest that multimodal approaches may support broad mental and physical benefits. Still, Northey et al. (2018) provide evidence that focused strength training may be more effective in targeting specific cognitive domains. Future research should aim to integrate cognitive assessments into multimodal studies and examine the long-term sustainability of cognitive improvements in strength training programs. Overall, both studies emphasize the value of exercise interventions for older adults, though further research is needed to fully understand the impact of various exercise types on aging populations.

Health Education in Wellness Programs

Complementing physical and cognitive interventions, health education is another critical component of promoting wellness among older adults. A key focus of health education involves understanding the perceived barriers to and benefits of exercise in the geriatric population. Bilecik and Kilc (2022) demonstrated that the perception of exercise benefits is higher among individuals with a history of falls and systemic diseases compared to older adults who exercise regularly. Bilecik and Kilc (2022) also reported a positive correlation between depression and the perceived benefits of exercise. Older adults may be aware of the benefits of exercise, but they are often insufficiently motivated to act. In line with this observation, Santanasto et al. (2017) demonstrated how the physical activity intervention improved short physical performance battery (SPPB) scores, walking speed, and chair-stands over the health education intervention. This study indicates that exercise-only interventions are more effective than education-only interventions. However, it did not evaluate how exercise-only compares to a combined approach of exercise and education. Expanding on the evaluation of health, Nivestam et al. (2023) found that most recommendations in preventative home visits focused on addressing current mental or physical illness rather than fall prevention, physical activity, or social participation. Notably, when fall recommendations were given, they were more likely to be made to patients in good health rather than those in poorer health (Nivestam et al., 2023). This highlights that health education is divided between addressing current conditions and preventative actions. Building on the exploration of different health education methods, Uremura et al. (2021) compared the effectiveness of active learning to the traditional didactic method in low-literacy older adults. Active learning included group discussions, homework to research information, and personal self-reflection. Increased communicative health literacy, decreased symptoms of depression, and enhanced social interaction were observed in the active learning group, demonstrating how the delivery of education influences outcomes (Uemura et al., 2021). Their study raises the question of how well health education is delivered.

Regarding the strengths of these studies, Bilecik and Kilc's (2022) study provided valuable insights into the barriers and benefits of exercise by considering variables such as gender, systemic conditions, and past medical history. This multidimensional analysis highlights the diverse factors influencing older adults' exercise habits. However, the study falls short in addressing key health disparities that influence both the perception of barriers and the adoption of exercise habits. For instance, it did not account for women’s higher risk of osteoporosis when comparing exercise habits between men and women. This undermines the validity of their conclusion that women exercise less due to a larger BMI, less education, and more perceived barriers.

Building on the importance of detailed evaluations, Santanasto et al. conducted a rigorous study over 2.6 years in a single-blind randomized design of 1,635 older adults with a sedentary lifestyle. The long duration of a large sample size strengthens the reliability of their results, demonstrating the effectiveness of exercise interventions. However, the study did not clearly specify the methods used to deliver health information or identify the educational topics covered. This gap raises concerns about the applicability of this model to other health education models and interventions.

In contrast, Uemura et al.'s study shifts the focus to the delivery method of health education for older adults with low health literacy. A notable strength is the diverse and active learning methods they incorporated within the same class duration as the standard didactic lectures. However, the study used participants from a previous observational study instead of recruiting a newly diverse sample population. This weakens the study’s applicability to the general older adult population, as the sample group may not reflect the actual response of geriatric patients engaging with a program for the first time.

Nivestam et al. (2023) adopted a different approach by examining the comprehensiveness of health education recommendations through the lens of the ICF model. The ICF model was utilized to divide health education into body functions and structure, activity, participation, and environmental factors. The study demonstrated the model's potential as a guide for holistic geriatric care by highlighting the frequency of discussion on specific topics. Nonetheless, the study failed to address contextual factors that affect patients' health status and the reasons for the patient's education. The study reported that fall recommendations were lower in older adults with poor health, but without information on participants' medical conditions, the significance cannot be fully appreciated.

Altogether, these studies highlight the complexities of health education in encouraging lifestyle changes such as increased physical activity and reduced fall risk. Although health education may not be the most impactful on its own, it remains valuable in enhancing the health outcomes of older adults. Uemura et al.'s study demonstrated the importance of delivering information effectively for the success of the intervention. The application of an active learning curriculum combined with physical activity for older adults has yet to be thoroughly addressed, thus necessitating further research.

AI and Geriatric Wellness

Artificial Intelligence (AI) has increasingly been integrated into geriatric care to address the complex health needs of older adults. AI technologies, such as virtual assistants and smart speakers, have been shown to enhance medication adherence, monitor health metrics, and provide social interaction, thereby improving the quality of life for seniors (Banaee et al., 2022). Additionally, AI-driven cognitive health programs have demonstrated effectiveness in preventing cognitive decline and supporting mental well-being in older populations (Topol, 2024). These AI-based interventions provide personalized, scalable solutions that are particularly beneficial in contexts with limited healthcare resources.

Resource connectors powered by AI are emerging as valuable tools for older adults seeking assistance with healthcare, social services, and community resources. Studies have highlighted the potential of AI-enhanced chatbots and virtual assistants in providing timely and accurate information, thereby facilitating access to necessary services (Taha et al., 2024). Moreover, AI-driven platforms have been found to enhance healthcare usability for older adults by providing customized information and support, thereby addressing challenges such as cognitive decline and technological barriers (Fitzpatrick et al., 2025). These AI resource connectors not only empower older adults to manage their health more effectively but also alleviate the burden on caregivers and healthcare systems.

Methods

As the older adult population grows, so does the need for community-based strategies to support healthy aging. Some of the most prevalent issues that need to be addressed for older adults are falls, physical inactivity, and limited access to nutritious foods. If these factors are not addressed, they can significantly impact their morbidity, independence, and overall quality of life. These challenges are compounded by barriers such as navigating complex healthcare systems and identifying trustworthy local resources. One possible way to bridge this gap is by incorporating educational interventions that are both concise and accessible.

This study was designed to evaluate the effectiveness of a structured, in-person educational wellness session paired with the utilization of LumaLink, an AI phone-based community resource connector, in improving older adults' confidence and behaviors related to fall prevention, physical activity, and nutrition. The study aimed to measure self-reported changes in health-related knowledge, behaviors, and access to resources over a 3 to 4-week period following the intervention. Participants included both older adults (aged 65 and above) and caregivers, who were recruited from community-based settings such as senior centers and local health organizations. By integrating health education and access to a simple, AI-assisted support tool, this pilot study sought to generate early evidence on whether these interventions are both usable and impactful in helping seniors age safely and independently in place.

Study Design

Philosophy

This study was grounded in a pragmatic approach that prioritized real-world application and outcome-driven evaluation. The intervention targeted fall risk, physical inactivity, and limited access to nutritional resources through a brief, structured wellness session and an introduction to LumaLink, a phone-based artificial intelligence community resource connector. The research approach reflected the practical goal of determining whether this combination of education and technology could measurably improve participants' confidence and behaviors across these domains in a short period. Rather than focusing solely on theoretical constructions, the study was rooted in immediate applicability and sought to inform future public health initiatives that can be implemented in community settings with minimal barriers.

Research Type

Aligned with this philosophy, this mixed-methods study employed a deductive research approach from both quantitative and qualitative data. It was structured around specific, theory-informed assumptions that participants who engage in the intervention will show measurable improvements in health confidence and self-reported behaviors related to fall prevention, physical activity, and nutrition. Furthermore, the study hypothesized that participants who interacted with LumaLink would report higher satisfaction with their ability to access relevant health and social resources. These assumptions are drawn from existing literature on older adult health behavior change and the impact of digital resource tools, and they guided the development of the structured survey instruments used at baseline and follow-up. By collecting pre- and post-intervention data on a defined set of variables, the research design enabled direct testing of these hypotheses and supported objective evaluation of short-term outcomes.

Research Strategy

The study's research strategy incorporated a quasi-experimental pre–post design conducted in community-accessible senior centers. This design enabled the assessment of intervention effects without the need for a control group, which is particularly suitable for pilot studies focused on feasibility and short-term impact. Eligible participants—aged 65 and older or their caregivers—were recruited through partnerships with Senior Source and Cedar Hill Senior Center. Residents of the Dallas-Fort Worth region, who frequented these geriatric community centers, were invited through their respective community centers to attend our educational seminar. Upon arrival, they reviewed and signed informed consent forms, then completed a paper-based baseline survey assessing their confidence, habits, and challenges in the domains of fall prevention, physical activity, and nutrition. After completing the survey, participants attended a standardized 30-minute educational presentation featuring visual aids and printed handouts, which concluded with instructions on how to use LumaLink. Participants were offered an as-needed, one-on-one guided demonstration of LumaLink, allowing them to test the phone-based system with assistance from trained staff.

Approximately three weeks after the in-person session, research staff conducted follow-up phone surveys. The baseline questions were re-administered to allow direct comparison of reported confidence and behaviors. For participants who used LumaLink, additional questions assessed ease of use, perceived helpfulness, and actions taken based on its recommendation. To maximize retention, staff attempted follow-up calls once daily for up to three consecutive days, with voicemails left after each attempt; this process was disclosed in the initial consent form. All phone surveys were administered using a standardized script to ensure consistency and minimize interviewer bias.

Participants completed the surveys independently on-site at the senior centers, with minimal assistance available as needed. The surveys themselves were de-identified, with no personal information collected directly on the forms. Each survey was assigned a unique numeric code linked to a record on a separate master list. The master list included each participant's first name, last initial, and phone number (if provided), allowing for follow-up contact with those who consented.

This list was securely stored in a password-protected electronic file, accessible only to authorized members of the research team. This approach ensured that participants' responses remained anonymous while still allowing for necessary follow-up to assess short-term outcomes. All completed surveys were subsequently entered into an electronic spreadsheet for later statistical analysis.

Time Horizon

The study employed a longitudinal design to assess changes in participants' attitudes and behaviors over time. The primary objective was to evaluate whether exposure to an educational seminar, with or without the supplemental use of LumaLink, resulted in measurable shifts in perceptions and habits related to fall prevention, social engagement, and nutrition. Data were collected at two time points, separated by a three-week interval. During the follow-up data collection, an additional set of three qualitative questions was administered exclusively to participants who had utilized LumaLink in order to gather insight into their experiences and perceptions of the AI tool.

Sampling Strategy

This study used the convenience sampling method to recruit participants. Participants were recruited from various senior centers that regularly offered wellness events and classes. Older adults or caregivers who attended these events were invited to participate voluntarily in the survey, which was provided by the research team as part of the wellness event for that facility.

Convenience sampling was chosen for its practicality and accessibility within the community setting. Although this approach limited generalizability and introduced potential sampling bias, it enabled the research team to efficiently collect valuable feedback from a high-risk, targeted population: community-dwelling older adults who stood to benefit most from increased awareness of fall prevention resources, socialization, and nutrition education.

Data Collection Method

Data was collected using a structured 15-question quantitative pre-study survey distributed in paper form at the senior centers and a post-study survey conducted over the phone three weeks later. The surveys included closed-ended questions, utilizing multiple-choice items and Likert-type scales (e.g., 1 = Not at All Confident to 5 = Extremely Confident) to assess participants' knowledge, confidence, and experiences regarding fall prevention, current social habits, and access to nutrition. Qualitative dominant survey questions were utilized to maintain a standardized question format and sample larger groups within the time constraints of the seminar.

The pre-survey obtained demographics, including age, residence type, and chronic medical conditions. Participants' confidence in accessing food, housing, and healthcare resources was also assessed. The survey explored fall risk through recording recent fall history, the presence of home safety measures, confidence in preventing falls, and concern about future falls. Physical activity was evaluated through questions about weekly activity levels, barriers to activity, and confidence in using community resources to overcome these barriers. Lastly, participants' nutrition was explored by assessing difficulty obtaining healthy foods, barriers to accessing food, and confidence in understanding dietary needs for specific health conditions.

The post-survey consisted of 15 questions that assessed the same domains as the pre-survey, excluding demographic data. Instead, it included follow-up quantitative and qualitative questions assessing participants' experiences with LumaLink and whether they acted on the resources recommended by LumaLink. A total of fifty-three participants completed the pre-survey. Twenty-one participants completed the post-survey, with thirty-two lost to follow-up.

Data Analysis

The data were compiled into an Excel spreadsheet prior to analysis, where it was reviewed for completeness and the presence of missing values. Incomplete data sets, including a lack of post-study survey responses, were excluded from analysis.

The response variables were ordinal in nature, primarily derived from Likert scales and categorical multiple-choice responses. As such, non-parametric statistical methods were employed due to the violation of normality assumptions and the inappropriate use of means with ordinal data. Modes were used to assess the participants' confidence levels, fall concerns, and perceived barriers before and after the seminar, regardless of AI usage. For demographics, physical activity barriers, current fall safety measures, and nutrition barriers, frequency and percentages were used.

The Wilcoxon Signed-Rank test was utilized to assess within-subject changes from pre- to post-seminar surveying. This assessed whether the seminar had an impact on the aforementioned variables. As non-parametric tests were used, formal model fit statistics were not applicable. However, assumptions regarding data scale and independence were reviewed to confirm the appropriateness of the test. The data analysis was conducted using JASP software. Statistical significance was set at a p-value of 0.05 for all analyses.

Results

A total of fifty-three individuals were recruited from two community sites. Thirty-two participants were lost to follow-up or had incomplete data, resulting in twenty-one participants (n = 21) with complete pre- and post-survey data sets included in the analysis. The majority of participants (90.5%) lived independently in a house or apartment, while 4.8% resided in assisted living, and 4.8% selected "other." Over half of the participants (57.1%) were between 75 and 84 years of age, 38.1% were aged 65 to 74, and 4.8% were aged 85 to 94. Only 9.5% identified as caretakers (Table 1.1, Table 1.2).

Table 1.1

Participant Demographics (Age)

Age	Frequency	Percent (%)
65-74 years old	8	38.1
75-84 years old	12	57.1
85-94 years old	1	4.8
Total	21	100.0

Table 1.2

Participant Demographics (Living Situation)

Living Situation	Frequency	Percent (%)
Assisted Living	1	4.8
House/Apartment	19	90.5
Other	1	4.8
Total	21	100.0

Nearly all participants (90.5%) reported at least one chronic medical condition. Arthritis was the most prevalent, affecting two-thirds (66.7%) of participants, followed by diabetes and osteoporosis (each 19.0%), heart disease (14.3%), and hypertension and lung disease (each 9.5%). Hyperlipidemia and other medical conditions were each reported by 4.8% of participants, while 9.5% reported having no chronic medical conditions (Table 2).

Table 2

Reported Medical Conditions Among Participants

Condition	Frequency	Percent (%)
Arthritis	14	66.7
Diabetes	4	19.0
Osteoporosis	4	19.0
Heart Disease	3	14.3
Hypertension	2	9.5
Lung Disease	2	9.5
None	2	9.5
Hyperlipidemia	1	4.8
Other	1	4.8

More than half of the participants (52.4%) reported experiencing no food-related challenges. Among those who did, the most common barriers were cost (23.8%), transportation difficulties (14.3%), and lack of knowledge (14.3%). A smaller number of participants cited poor food availability at stores (9.5%) or physical limitations (4.8%) as obstacles to accessing or preparing food (Table 3).

Table 3

Reported Healthy Food Challenges and Barriers

Challenge	Frequency	Percent (%)
None	11	52.4
Cost	5	23.8
Transportation	3	14.3
Lack of Knowledge	3	14.3
Poor Availability	2	9.5
Physical Limitations	1	4.8

Pain or health-related limitations were the most frequently reported exercise challenges, affecting more than half of participants (57.1%). One-third (33.3%) reported difficulties with motivation, while an equal proportion (33.3%) indicated having no exercise-related barriers. Additional reported factors included financial constraints (19.0%), lack of social support (9.5%), limited transportation (4.8%), and lack of a safe environment (4.8%) (Table 4).

Table 4

Reported Exercise Challenges

Challenge	Frequency	Percent (%)
Pain/Health Limitations	12	57.1
Motivation	7	33.3
None	7	33.3
Financial	4	19.0
Lack of Social Support	2	9.5
Lack of Transportation	1	4.8
Unsafe Environment	1	4.8

Fall frequency remained low throughout the study period. At baseline, 71.4% of participants reported no falls in the preceding three months, while 14.3% reported one fall and 14.3% reported two falls. Post-survey data showed a slight improvement, with 85.7% of participants reporting no falls and 14.3% reporting one fall; no participants reported two or more falls after the intervention. The rate for both pre- and post-surveys was zero, and the maximum number of falls decreased from two to one, which reflects a slight reduction in fall occurrence after the intervention (Table 5, Figure 1). Regarding engagement with LumaLink, no participants had actively used the platform by the time data were collected (Table 6). However, over a quarter of them (28.6%) indicated plans to use it in the future.

Table 5

Frequency of Falls Pre- and Post-Survey

Falls	Pre-Survey (n, %)	Post-Survey (n, %)
0	15 (71.4)	18 (85.7)
1	3 (14.3)	3 (14.3)
2	3 (14.3)	0 (0.0)
Total	21 (100)	21 (100)

Table 6

LumaLink Engagement Among Participants

Utilized LumaLink	Frequency	Percent (%)
Yes	0	0.0
No	15	71.4
No, but I plan to	6	28.6
Total	21	100.0

Wilcoxon signed-rank test results revealed statistically significant improvements in several self-efficacy domains after the wellness intervention. Significant improvements were observed in participants' confidence regarding resource use ($p = 0.003$), fall prevention ($p < 0.001$), and overcoming challenges ($p = 0.013$). Non-significant but positive trends were observed in safety confidence ($p = 0.346$), concern about future falls ($p = 0.530$), exercise frequency ($p = 0.122$), and food challenge frequency ($p = 0.586$) (Table 7, Figure 1).

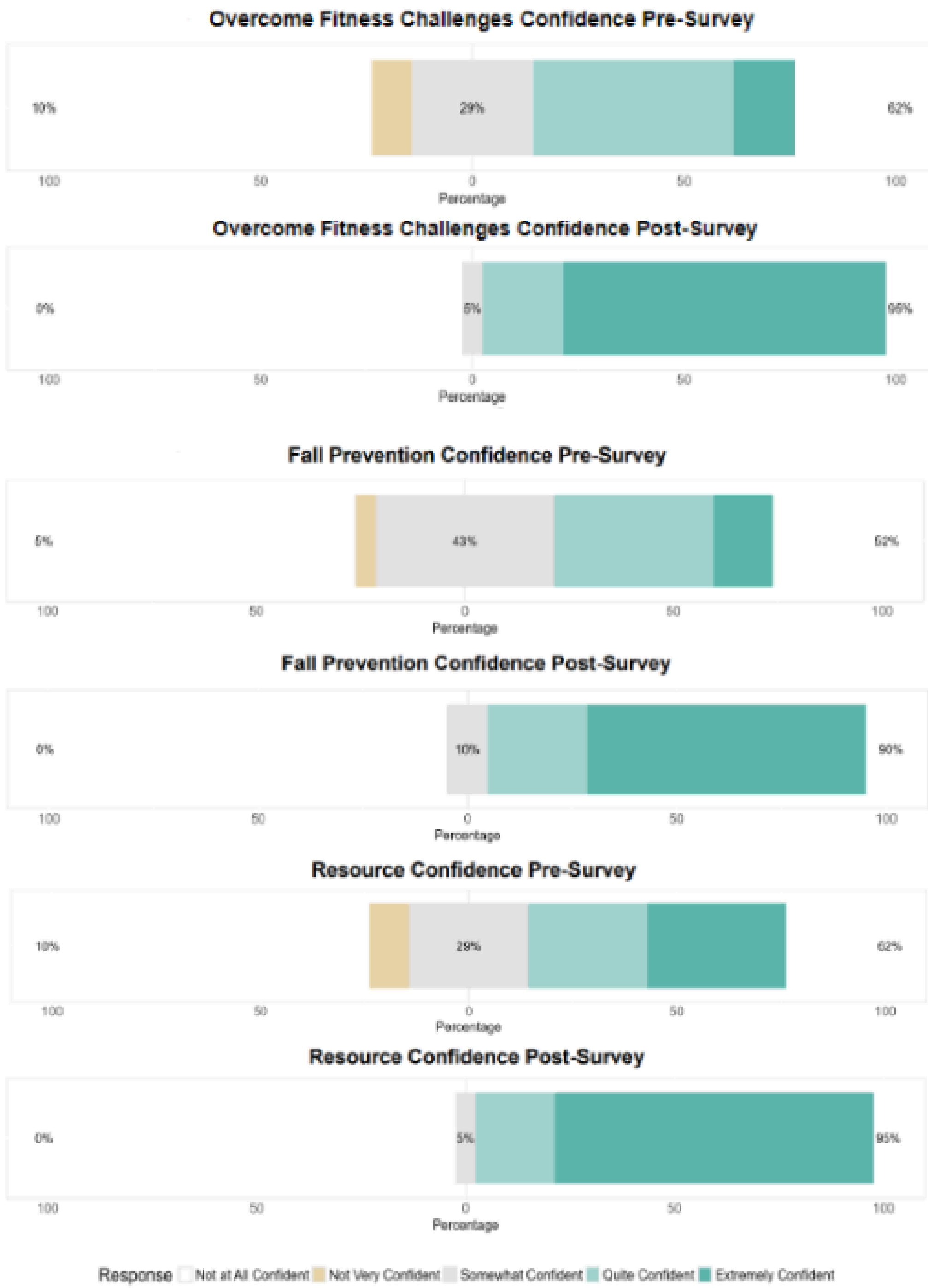
Table 7

Wilcoxon Signed-Rank Test Results for Confidence and Behavioral Measures

Pre-Survey	Post-Survey	W	z	p	Rank-Biserial Correlation	SE Rank-Biserial Correlation
Resource Confidence		4.000	-2.900	.003	-0.912	0.305
Safety Measures		0.000	-1.342	.346	-1.000	0.632
Fall Prevention Confidence		6.500	-3.314	< .001	-0.915	0.269
Future Fall Concern		90.000	0.639	.530	0.176	0.269
Exercise Frequency		19.500	-1.530	.122	-0.500	0.316
Overcome Challenges Confidence		5.000	-2.490	.009	-0.848	0.328
Food Challenge Frequency		39.500	0.578	.586	0.197	0.328

Figure 1

Distribution of Fall Prevention, Resource Knowledge, and Overcoming Fitness Challenges Confidence Levels Pre- and Post-Intervention



Discussion

The primary aim of this study was to evaluate the impact of AI utilization on both confidence in and the adoption of healthier behaviors. Although participants did not actively engage with LumaLink during the study period, nearly one-third reported having a future intent to use it. One participant reported not having a smartphone and was delighted that he could use his flip phone to access the AI service. This data suggests that exposure to technology-informed solutions can increase awareness and perceived accessibility of health resources. Furthermore, increased awareness will lead to greater engagement with such resources through repeated exposures.

The lack of LumaLink utilization, despite education and demonstration, reflects a common hesitancy among older adults in adopting new technologies. Previous studies on AI and virtual assistants in geriatrics have emphasized that while technology can enhance healthcare access, adoption depends on simplicity, cultural familiarity, and perceived personal relevance (Fitzpatrick et al., 2025; Taha et al., 2024). Therefore, future implementations of AI resource connectors should include extended hands-on training, caregiver involvement, and repeated exposure to enhance adoption and utilization.

The study also evaluated the effects of a brief educational seminar on confidence and behaviors of older adults who did not utilize LumaLink. Overall, the participants demonstrated a statistically significant increase in confidence in accessing community resources, preventing falls, and overcoming fitness challenges following the intervention. Most maintained or slightly improved exercise habits and reported fewer falls during the follow-up period. These findings suggest that a brief, structured wellness education session can significantly improve older adults' confidence in fall prevention, resource navigation, and overcoming health-related challenges, even in the absence of direct AI use. These results align with the consensus in literature that wellness-based educational interventions improve self-efficacy and health-related behaviors in older adults. Consistent with findings from Sherrington et al. (2019) and Lee and Park (2021), this study supports the value of multi-component wellness strategies in promoting independence and confidence. However, unlike studies where engagement in structured physical activity or therapy yielded behavioral change, the limited behavioral improvements of exercise frequency in this study likely reflect barriers such as mobility restrictions, poor exercise insight, and a lack of motivation that were not overcome by education alone. The increased confidence observed in the data suggests that educational interventions may serve as a precursor to behavioral change rather than an immediate catalyst.

An unexpected trend noted in the study was that over half of the participants reported not experiencing barriers to food access. Additionally, most participants were extremely confident in their knowledge of what foods are considered healthy. This implies that the conflict in nutritious eating for older adults may not lie in a lack of resources or knowledge of healthy foods, but rather in the limitation of their motivation or the difficulty in combining healthy foods into balanced meals. Further research is needed to assess the impact of motivation and cooking skills on nutrition in older adults.

Limitations

This study has several limitations. Firstly, the use of convenience sampling introduced potential selection bias, as participants were likely to be older adults who were already engaged in wellness activities or possessed higher health literacy. Consequently, the findings may not accurately reflect the experiences of more socially isolated or medically underserved populations, thereby limiting their external validity.

Second, the absence of a control group restricted the ability to make causal inferences. Although comparisons of pre- and post-surveys provided insight into potential shifts in confidence and behavior, it is challenging to determine whether these changes were directly attributable to the educational seminar or to unrelated external factors, such as seasonal health campaigns or advice from healthcare providers, during the study period.

Third, the reliance on self-reported data increased the risks of recall and social desirability bias. Participants may have overestimated positive health behaviors or underreported challenges, especially when surveyed by phone. Furthermore, because the surveys are completed in person and then followed by phone, differences in environment, as well as respondent comfort levels, may impact on the consistency of reporting.

Lastly, the three-week follow-up period may have been too short to capture sustained behavioral changes or potential use of LumaLink. Long-term tracking is needed to better understand the integration of new behaviors into daily life. These limitations highlight the need for larger, controlled, longitudinal studies to confirm and expand upon these findings.

The lack of LumaLink adoption—despite demonstration and accessibility— may mirror other online challenges that the distance education professionals face when introducing new technologies (LMS tools, tutoring platforms, AI supports). The findings show that exposure alone does not ensure usage, emphasizing the need for repeated training, guided practice, usability-focused design, and ongoing support—key responsibilities of instructional designers and distance education administrators.

We know Community colleges serve aging populations, caregivers, offer multiple, OTA, nursing, health aide programs, emphasize applied workforce readiness and have high proportions of first-generation and tech-hesitant learners. Our study works to address technology adoption barriers, health literacy, applied preventive education, and practical community implementation which are often vital to many community college mission and vision statements.

Conclusion

This study demonstrated that targeted wellness education can significantly enhance older adults' confidence in fall prevention, resource navigation, and overcoming health challenges. No participants utilized LumaLink; however, multiple participants who expressed an intent to use the AI-based resource connector demonstrated an openness to integrating technology into health management. These outcomes suggest that education serves as an introduction and confidence-building tool for healthier habits, while AI tools like LumaLink can serve as a secondary support mechanism to implement behavior modifications when reinforced over time through repeated exposure and hands-on guidance.

Although changes in exercise frequency, food access, and nutrition confidence were not statistically significant, positive trends suggest early behavioral shifts may be occurring. The absence of participants reporting zero exercise post-intervention, along with increased confidence in food-related decisions, supports this trajectory. However, limitations include a small sample size, convenience sampling, the absence of a control group, a short three-week follow-up period, and reliance on self-reported data, which restricts broader generalizability.

Future studies should incorporate longer follow-up periods, larger and more diverse samples, and direct engagement trials using LumaLink or similar AI tools. Integrating repeated technology demonstrations, usability training, and in-person follow-ups may bridge the gap between awareness and adoption. Despite limitations, this study supports the feasibility and potential impact of combining wellness education with accessible AI-based resource connectors to empower healthy aging and support independent living in older adults.

The study highlights issues of digital literacy, motivation, and technology hesitancy, which are common among community college student populations, particularly adult and non-traditional learners served in online programs. Overall, we believe we have created transferable model for: designing confidence-building online instruction, evaluating short-term intervention impact using pre–post assessment, understanding barriers to digital tool adoption and supporting equitable access to technology in distance learning environments.

Here we offered both pedagogical and implementation insights that align closely with the mission and challenges of community college distance education professionals.

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Exploring the Integration of Artificial Intelligence in Formal Physician Assistant Curricula: A Review of Current and Future Applications

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Abstract

The integration of artificial intelligence (AI) into physician assistant (PA) education has gained increasing attention as AI-driven tools become embedded in healthcare. A mixed-methods cross-sectional online survey was distributed to Texas PA students to collect demographic data, self-reported familiarity with AI concepts and applications (including large language models such as ChatGPT), frequency and context of AI use, instructional preferences, and perceived barriers. Forty-six students from ARC-PA–accredited Texas programs completed the survey, with over 70% representing West Coast University. ChatGPT, AI-based test preparation tools, and clinical simulations were the most used applications. Over 78% reported using AI several times per week or daily. Only 36.8% supported formal AI curriculum inclusion, and just 26% felt adequately prepared to use AI clinically. Despite this, over 90% agreed that AI literacy is essential for future healthcare providers. These findings highlight both enthusiasm and concern, suggesting that concise, practical AI instruction may enhance preparedness.

Introduction

Artificial intelligence (AI) is increasingly becoming integrated into the healthcare sector and is influencing how clinicians deliver patient care, from rendering a diagnosis to formulating a treatment plan. With the unlimited potential to expedite and enhance patient care, AI implementation has cemented itself in modern medicine. Artificial intelligence is described as reproducing human learning into computer learning models that can perform data analytics, problem-solve, and generate decisions based on algorithms (Alam et al., 2023). A notable example of this technology is ChatGPT, a language model AI tool that can be used to support learning difficult concepts in education (Jebreen et al., 2024).

As these technological advancements permeate healthcare, developing clinicians in school now face a steep learning curve when transitioning into the workforce, which begs the question of whether formal AI education should be integrated into higher-level medical education. Jebreen et al. (2024) also emphasize the pressing need to address algorithmic bias within AI systems, arguing that many medical students are unprepared to confront the ethical dilemmas posed by AI in healthcare. Their research revealed that over 70% of surveyed students reported minimal exposure or education on the possible ethical challenges surrounding AI, despite AI tools being used increasingly in clinical practice (Jebreen et al., 2024). In this context, physician assistant (PA) programs, which are notably shorter in length than medical school programs, could particularly benefit from the inclusion of AI-assisted education.

A study by Weidener and Fischer (2024) further supports these notions, highlighting that only 5.3% of surveyed students across Germany, Austria, and Switzerland received formal AI training in their curriculum, with just 4.3% exposed to AI ethics education, which shows the level of urgency for integrating AI literacy and ethics into medical education, as 74.9% of students advocated for its inclusion and emphasized the importance of addressing topics like bias, data privacy, and informed consent. Without robust ethical and AI-focused education, students may continue to rely uncritically on AI outputs, potentially undermining the clinical judgment essential for effective and safe patient care. Furthermore, one distinct obstacle that cannot be ignored is how AI will be incorporated into healthcare education effectively.

Sun et al. (2023) consider this by explaining how AI can promote immersive learning using virtual simulations. Virtual patient systems allow students to interact with AI-based avatars that mimic real patient encounters. This gives students the opportunity to practice communication, diagnostic reasoning, and clinical decision-making in a non-pressure environment. Virtual patients can present with a wide array of symptoms, medical histories, and conditions, offering students diverse learning experiences that are typically un-replicable in the clinical setting.

The question now is, in PA education, does the deployment of formal AI education in the curriculum improve student comfort, proficiency, and familiarity with AI tools and clinical technology compared to PA programs without a formal AI curriculum? As a result, this study investigates how AI is being integrated and how it could potentially impact PA education, specifically in PA schools located in Texas. Ultimately, this study aims to provide a comprehensive understanding of the current landscape and the implications of AI for the future of PA training. Because there is little research on AI in PA programs specifically, we also reviewed broader studies in medical school education.

To answer these questions, a short anonymous survey was conducted for current PA students enrolled in ARC-PA-accredited programs in Texas. The survey asks about AI awareness, usage, and perception. The goal is to understand better how students currently engage with AI, how they see it fitting into their education, and whether they believe formal AI instruction would help prepare them for future clinical practice.

Methods

Participants

A convenience sample of physician assistant (PA) students was recruited from ARC-PA–accredited PA programs across Texas including Austin College, Baylor College of Medicine, Franklin Pierce University, Hardin-Simmons University, Interservice PA Program of Fort Sam Houston in San Antonio, South University-Austin, Texas Tech University Health Sciences Center, University of Mary Hardin-Baylor, University of North Texas Health Science Center at Fort Worth, University of Texas Health Science Center San Antonio, The University of Texas Medical Branch, UT Southwestern Medical Center, University of Texas - Rio Grande Valley, and West Coast University. Eligible participants were current Texas PA students aged 18 years or older. The participants had to be willing to participate and have access to AI-related tools. Individuals were excluded if they were not actively enrolled in a Texas PA program, were practicing PAs or faculty members, exited the survey, or submitted an incomplete survey. The study protocol was approved by the Institutional Review Board (IRB) at West Coast University (IRB: tynesMPA_06062025_AIPAC). Informed consent was acquired by voluntary initiation of the online questionnaire, as described in the survey introduction and all IRB protocols were followed as outlined in initial IRB submission.

Recruitment Procedures

Recruitment was conducted in coordination with program directors and faculty participating in PA programs. Faculty were provided with a standardized recruitment script and a QR code linked to the online survey, which was disseminated through classroom announcements, learning management systems, and email communications. Additional outreach was conducted through the Texas Academy of Physician Assistants (TAPA) newsletter and the TMF Health Quality Institute's student forum. Participation was entirely voluntary and anonymous; no incentives were offered.

Study Design

This study employed a mixed-methods cross-sectional, single-time-point survey design using a self-administered anonymous online questionnaire. No independent variables or dependent variables were manipulated. The survey evaluated PA students' awareness of artificial intelligence (AI), self-reported use of AI tools in academic and clinical contexts, confidence in applying AI, perceived benefits and barriers to its use, and preferences for curricular integration.

A structured literature review informed survey development of studies indexed in PubMed, Scopus, and Google Scholar using search terms such as "AI in healthcare education" and "physician assistant curriculum." Studies were included if they addressed AI awareness or integration within health professions education. Based on these findings, the survey was organized into five sections: (1) demographics, (2) AI awareness, (3) AI tool usage, (4) perceived value and barriers, and (5) preferred instructional approaches. A total of 15 questions were developed and reviewed by faculty. Seven questions were multiple choice, which included demographic information, frequency of AI use, format preference for learning AI, and future-oriented perceptions of AI usage in clinical practice. 1 question about which AI tools were used was a ‘select all that apply’. A five-point Likert scale was used to gather quantitative data regarding AI perceptions in education and future practice for six questions. Finally, two free-response questions were employed to collect qualitative data about suggestions for AI tool availability and concerns about AI integration in medical education. The draft survey was piloted with ten volunteer PA students to assess clarity and estimated completion time (10–15 minutes); minor wording modifications were made accordingly. No personally identifiable information, such as names, DOB, emails, and phone numbers was collected.

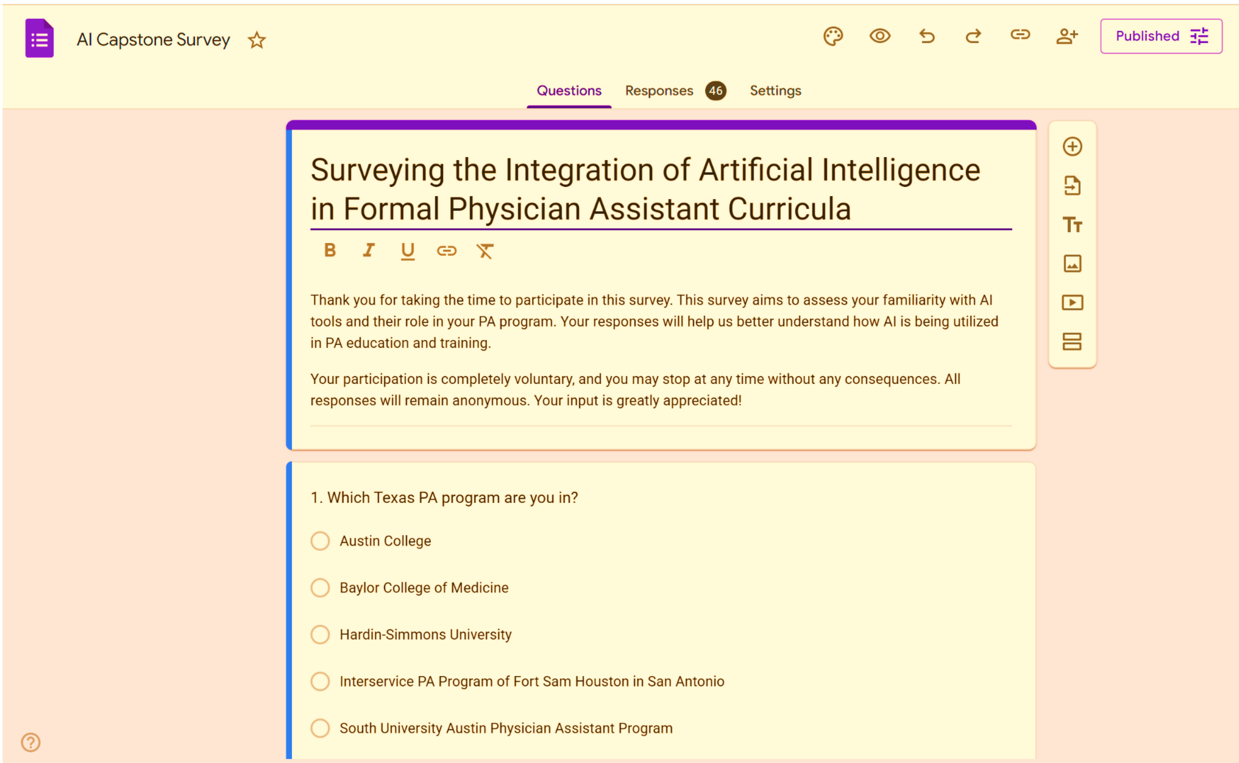
Data Collection Instruments and Management

The survey was administered once per student through a Google Forms QR code, which allowed access via any internet-enabled device (Figure 1). Google Forms was selected for its ease of use, accessibility, and built-in privacy protections. The survey was conducted to prevent the collection of email addresses or IP addresses. Participants could skip non-mandatory items or exit the survey at any time.

Completed survey responses were automatically stored in a password-protected Google Drive folder accessible only to the four student investigators and three faculty advisors. Two-factor authentication was used to further protect the students’ data. Participants may contact the student researchers through email if they wish to withdraw from the survey post-submission. All data will be retained securely for three years per IRB requirements, after which it will be permanently deleted. To maintain respondent anonymity, any demographic subgroup representing fewer than 5% of participants will be aggregated with a larger category in reported results.

Figure 1

Surveying the Integration of AI in Formal PA Curricula



Note: This figure is the Google Forms self-administered, anonymous online questionnaire used to collect data from Texas physician assistant students. The survey includes a description at the beginning to ensure voluntary participation.

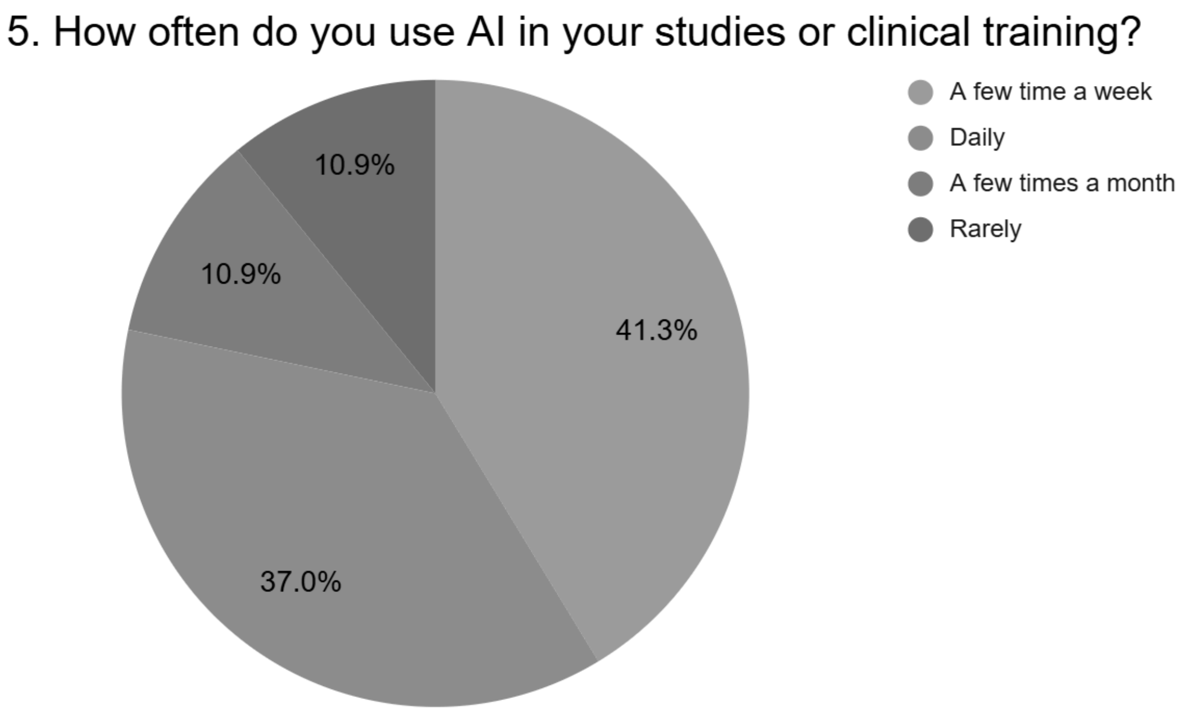
Results

A total of 46 PA students from Texas-based ARC-PA-accredited programs participated in the survey, with the majority (over 70%) representing West Coast University (n=34), followed by the University of Texas Medical Branch (n=4), the University of North Texas Health Science Center (n=4), and a smaller subset from Franklin Pierce University (n=4) completing clinical rotations in Texas.

AI tools most used included ChatGPT or other large language models, AI-driven test preparation tools, virtual patient simulations, AI-assisted documentation tools, and AI-powered diagnostic platforms, with 41.3% of students reporting use several times per week and 37% indicating daily use when asked how they were using AI in studies (Figure 2). When asked about the impact of AI on their critical thinking, 50% agreed that AI was helpful, though cautioned against overreliance, while 10.9% felt it diminished independent reasoning, and a small percentage was neutral due to lack of experience (Figure 3). On questions evaluating educational value, 65.3% of students agreed or strongly agreed that AI tools improved their ability to study and retain information (Figure 4), and 37% agreed that AI supported clinical reasoning and decision-making (Figure 3).

Figure 2

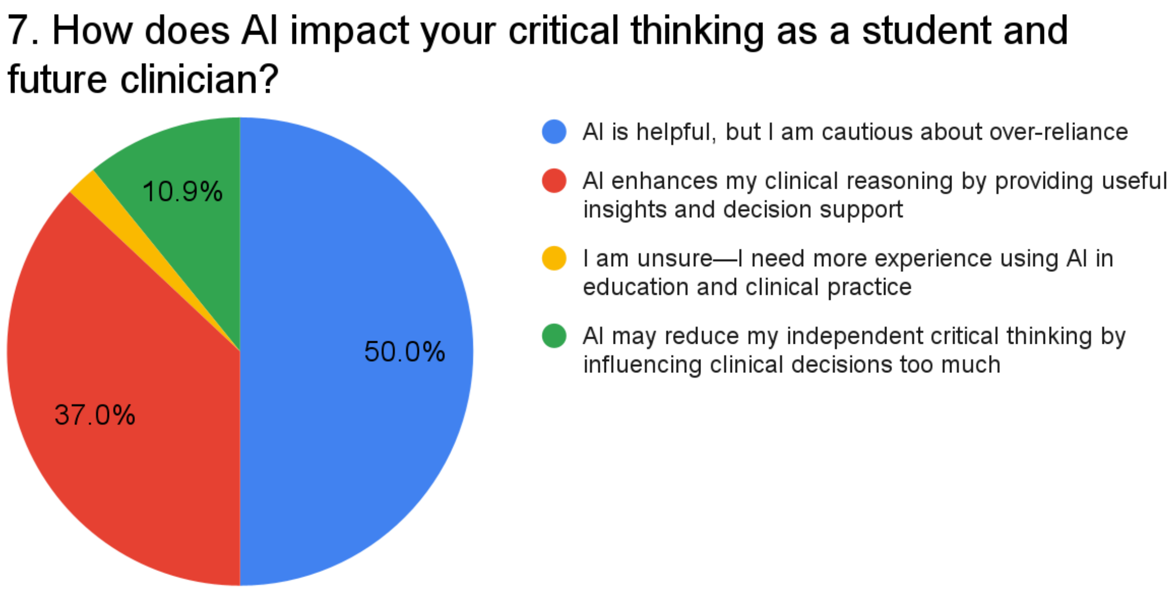
Frequency of AI Usage in Educational and Clinical Settings



Note: This figure illustrates the frequency of AI usage among PA students across educational and clinical settings. The data highlight the prevalence of AI usage and showcase how often students interact with AI tools for learning, diagnostics, and in clinical practice. The figure also emphasizes variations in utilization, reflecting differing levels of exposure and comfort with AI technologies among students.

Figure 3

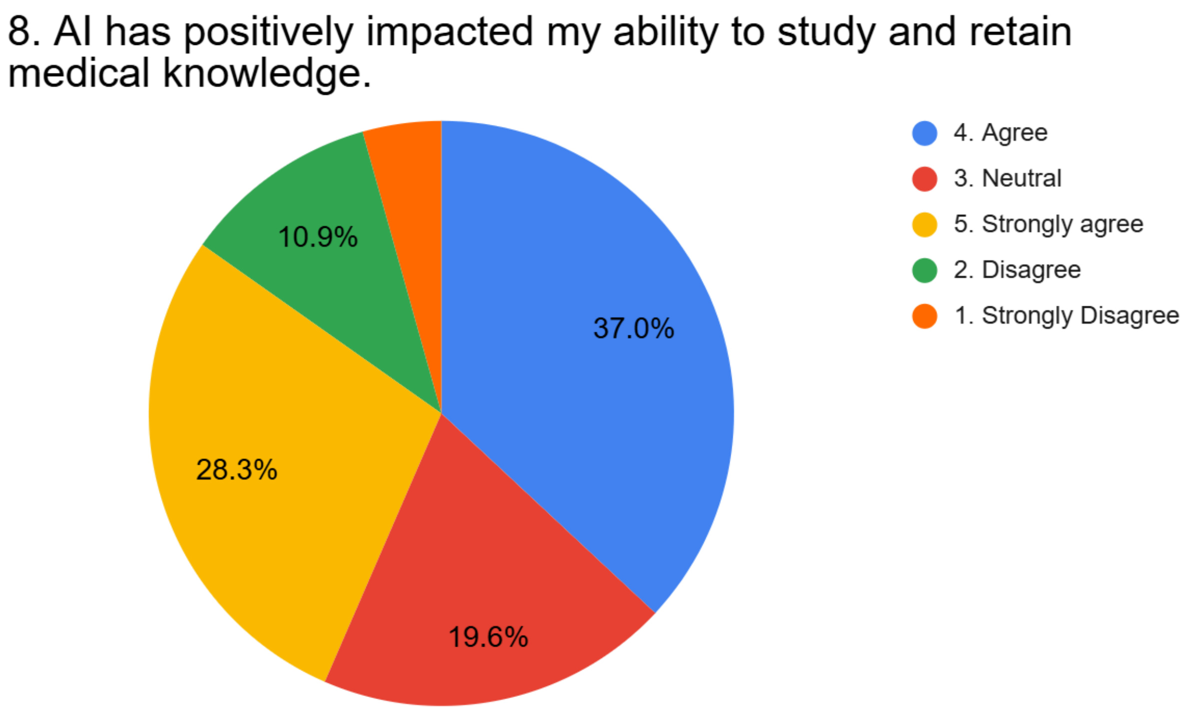
Viewpoints About Critical Thinking With AI Usage



Note: This figure illustrates the perspectives of PA students regarding the use of AI in educational or clinical practice settings and its perceived impact on critical thinking skills. The figure reflects how the majority of students view AI in a favorable light in terms of utility, yet are cautious of overreliance, reflecting the potential loss of critical thinking skills.

Figure 4

Viewpoints About AI Usage and Knowledge Retention



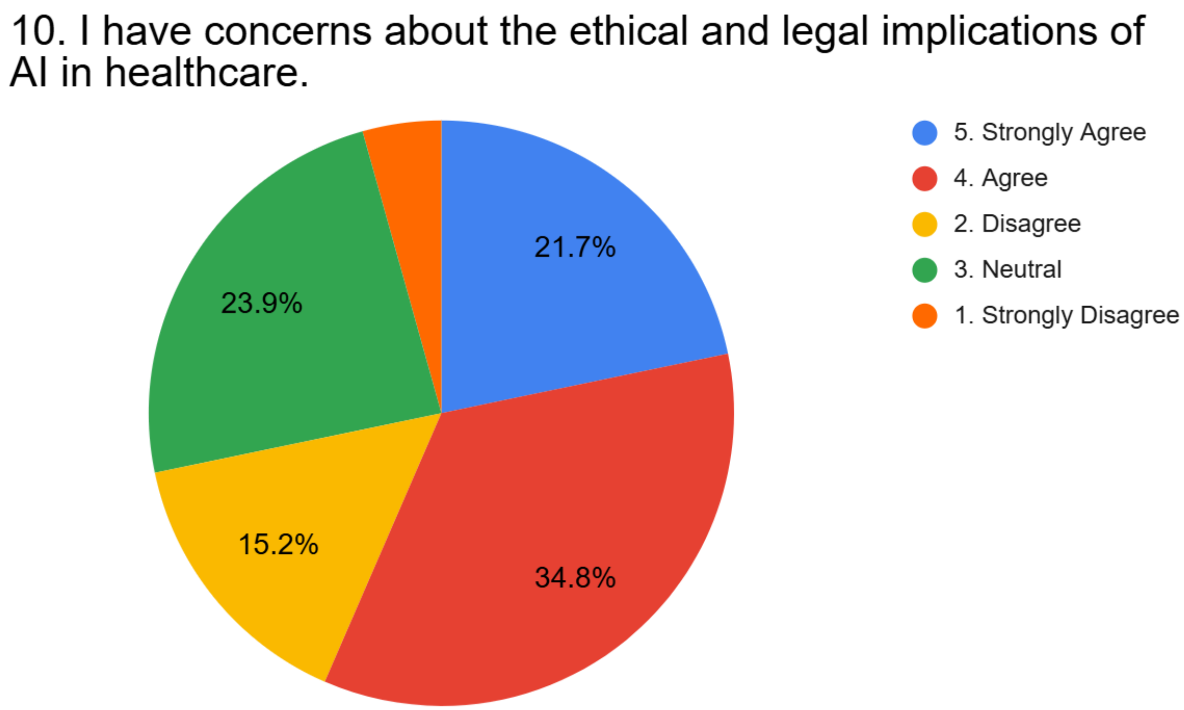
Note: This figure presents PA students' viewpoints regarding the impact of AI on the ability to study and knowledge retention. Responses were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. This figure emphasizes the benefits of the inclusion of AI in study methods to reinforce topics and improve retention.

In the question associated with ethical implications, a majority (56.5%) expressed concerns about the ethical and legal implications of AI in healthcare, particularly regarding privacy, bias, misinformation, and the risk of reduced critical thinking (Figure 5). When asked if

AI should be integrated into curriculum, 39.1% supported formal inclusion of AI education, 32.6% were neutral, and 28.3% opposed it, with only 26.1% agreeing that their current programs adequately prepare them for future AI use based on one of the questions (see Figures 6 & 7).

Figure 5

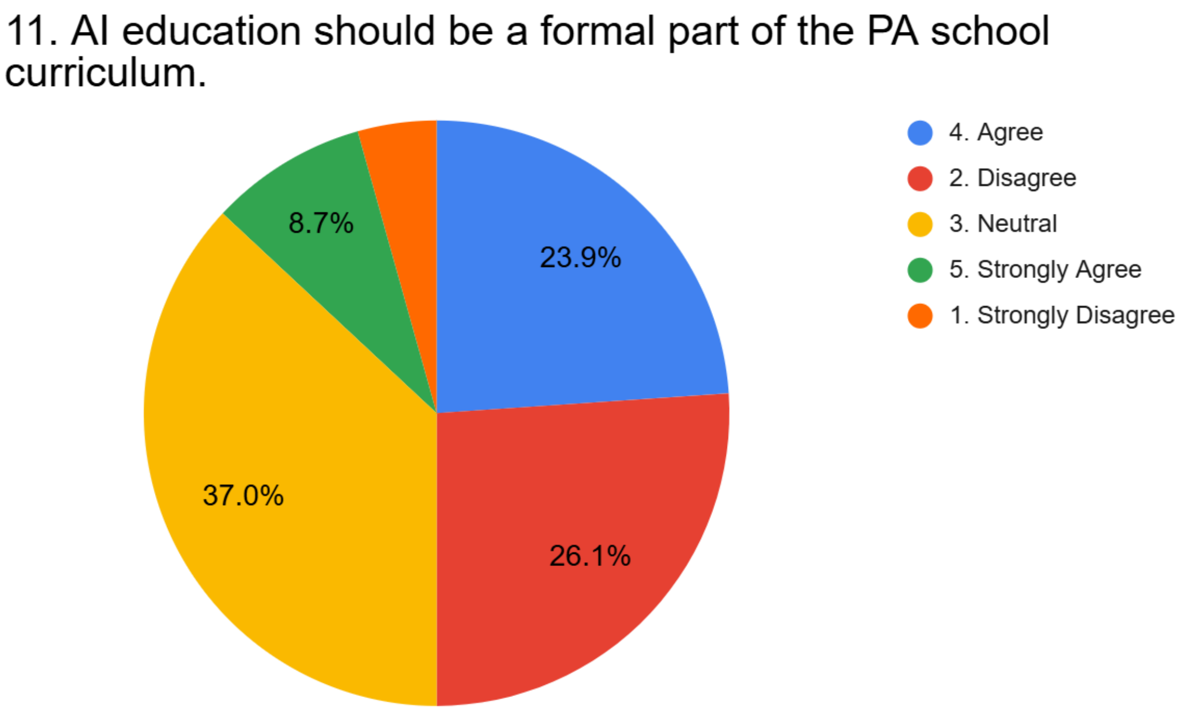
Viewpoints on the Ethical and Legal Implications of AI in Healthcare



Note: This figure depicts PA students' perspectives on the ethical and legal implications of AI in healthcare. Responses were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. The majority of respondents strongly agreed with the statement and expressed concern regarding the potential ethical challenges and legal responsibilities associated with AI integration in clinical practice. The concerns about ethics and legalities pose a consideration for the integration of AI into education.

Figure 6

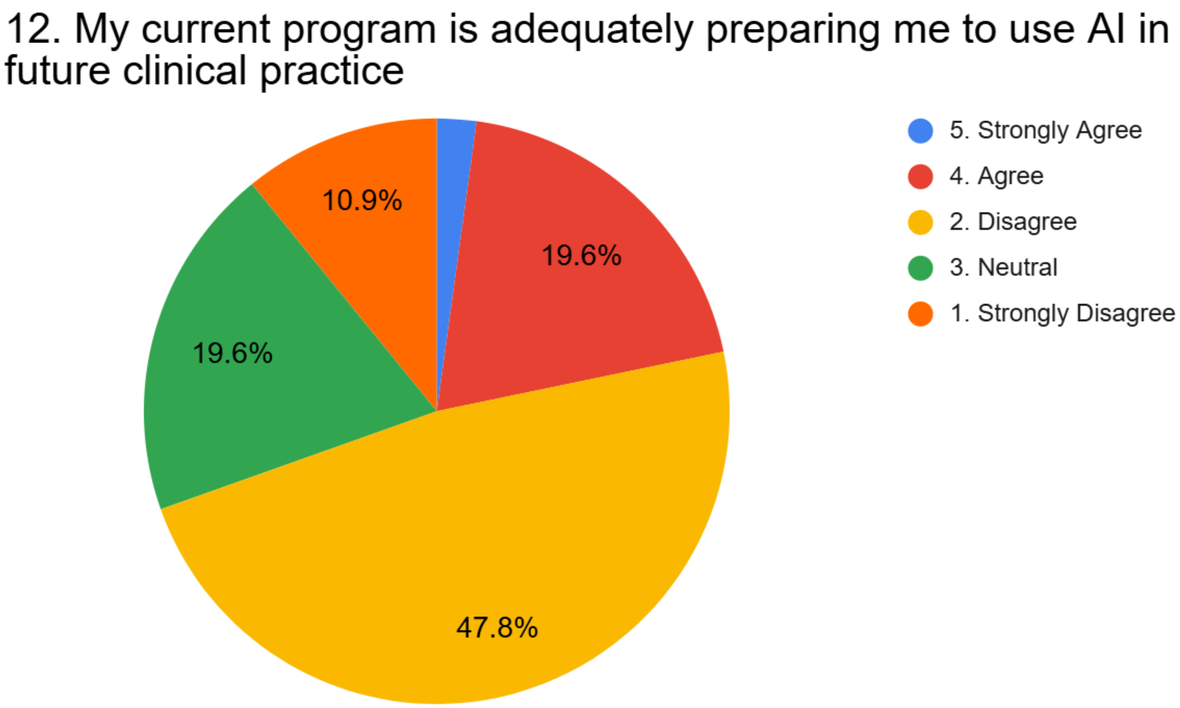
Viewpoints on the Necessity of the Inclusion of Formal AI Education



Note: This figure illustrates PA students' perspective on whether formal AI education should be included within the PA curriculum. Responses were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. The figure highlights a divided perception, with some students supporting curriculum integration while others remain neutral.

Figure 7

Program Preparation in AI Usage

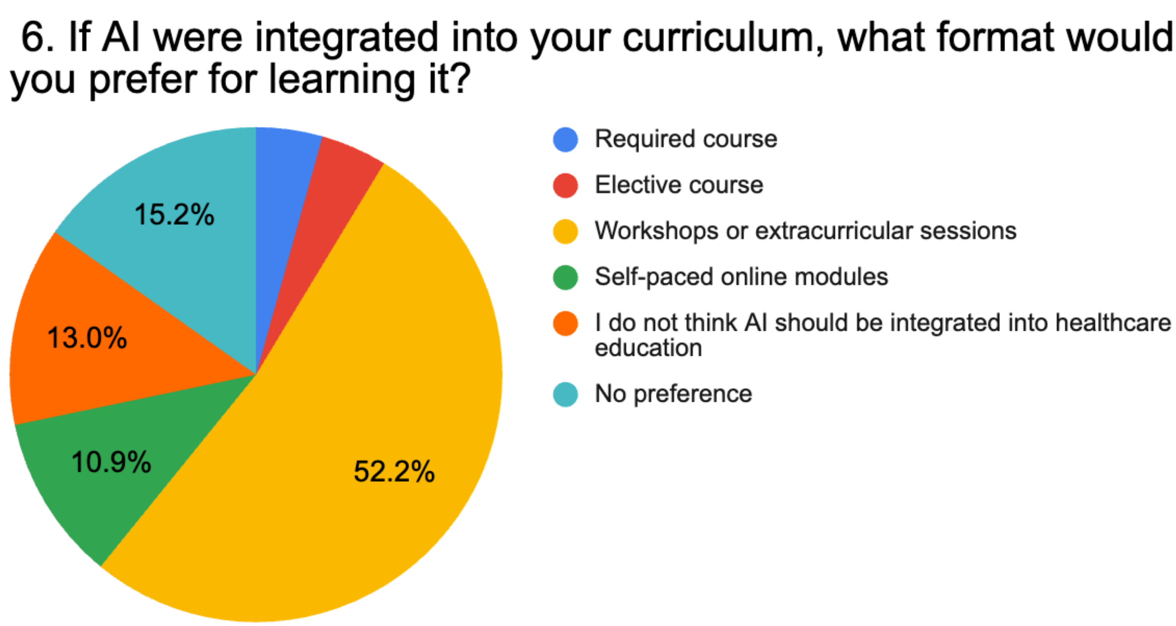


Note: This figure depicts PA students' self-assessed preparedness for using AI in education and clinical settings. The data reveal that most students feel underprepared for future AI integration, suggesting a need for enhanced training and curricular development focused on emerging technologies.

When asked about preferred instructional formats for learning AI, 52.2% of the students selected concise hands-on formats, such as elective courses, integrated modules within existing classes, and the majority favored incorporating workshops. This reflects a desire for practical, faculty-led training rather than purely theoretical instructions (see Figure 8). Unsurprisingly, more than 91% of respondents agreed that AI has clinical relevance to future practice (see Figure 9). In open-ended feedback, students most often requested expanded tools for charting, SOAP note generation, patient simulations, and exam preparation, while consistently emphasizing the need for balanced use to prevent overreliance.

Figure 8

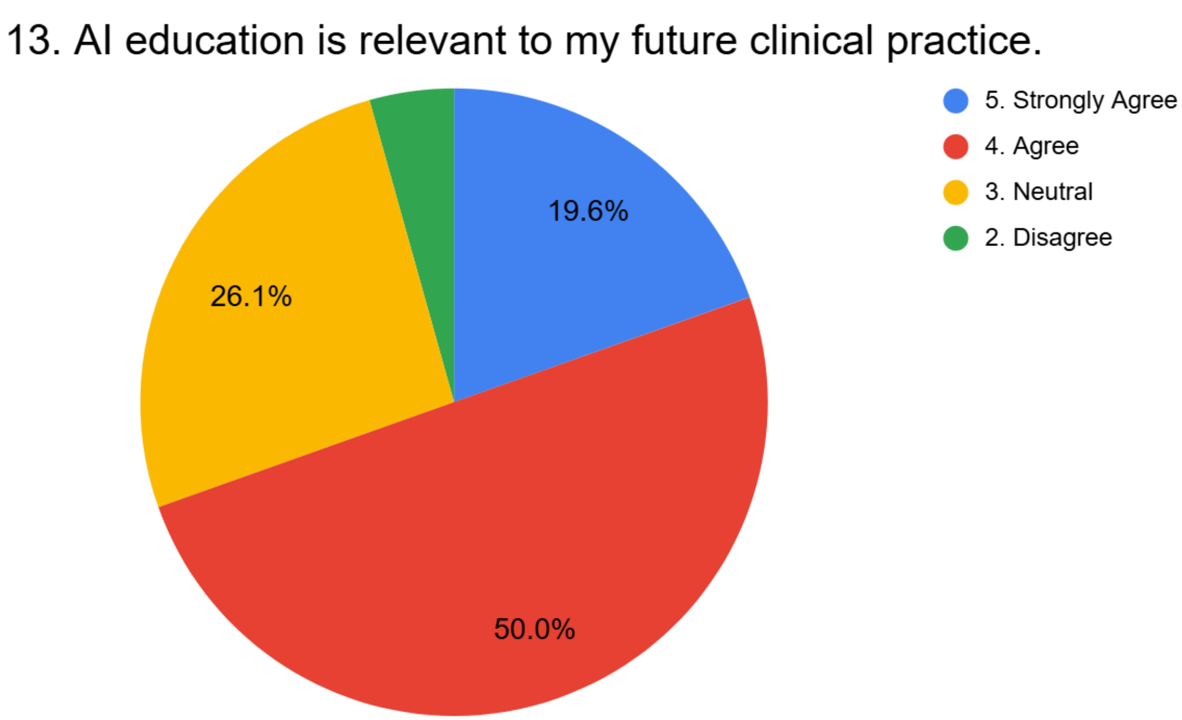
Preferred Format for AI Training in PA School Curriculum



Note: This figure presents PA students' preferences for how AI education should be implemented within PA programs. Commonly selected formats include workshops, elective courses, and integrated modules within existing classes, reflecting a desire for hands-on, practical training and AI applications.

Figure 9

AI Relevance in Future Clinical Practice



Note: This figure demonstrates students' beliefs regarding the relevance of AI in future clinical practice. The overwhelming majority agreed that AI will play a significant role in patient care, emphasizing the growing importance of AI competence for future healthcare professionals.

Discussion

The results of this study depict how PA students in Texas are encountering, using, and judging the value of AI tools during their training. Overall, these patterns show both openness and caution. Students are using AI independently to support learning and clinical workflow, but they desire clear guidance and guardrails. The frequency and types of tools reported indicate that PA students are self-directing their AI use to meet immediate educational needs, concept clarification, exam preparation, simulated cases, and documentation. The strong support for improved studying and knowledge retention, as well as perceived support for clinical reasoning, suggests AI is functioning primarily as a cognitive scaffold. It helps students access explanations, summarize material, and run through clinical scenarios more efficiently.

Students' preference for concise, hands-on learning formats such as electives, short integrated modules, and workshops suggests that implementation should emphasize practicality and minimize additional time burdens (see Figure 8). Given the condensed timeline of PA programs, lengthy standalone courses may not be feasible. Instead, modular content integrated within existing clinical or skills courses, paired with short, focused workshops on documentation tools, simulated patient encounters, and charting automation, would likely align better with student needs. This workshop-centered model acknowledges current student workflows and enhances them rather than attempting to replace informal AI use, increasing the likelihood of successful adoption.

A key element in this process is faculty readiness. Effective AI integration depends on well-prepared instructors who can model safe and responsible use of AI in education. Lee et al. (2023) found that many medical educators lack the technical literacy and pedagogical frameworks needed to confidently teach AI concepts. Their study emphasized the importance of competency-based guidelines that outline specific AI learning outcomes for both students and instructors, promoting consistency across programs and accountability in AI education.

Approximately 60% of surveyed students reported feeling unprepared by their programs for AI use, indicating potential gaps in faculty training, curricular capacity, and institutional policy. Addressing these challenges will require institutional commitment to faculty development, clear policies regarding the use of educational and clinical AI tools, and adapted assessment standards. Programs should establish defined competencies for AI literacy and implement objective evaluations such as AI augmented OSCE stations, graded documentation exercises, and assignments that require students to identify, justify, and correct AI generated errors.

Despite perceived benefits, a significant minority expressed concern over diminished independent reasoning, and many emphasized the risk of overreliance (Figure 3). These concerns are meaningful, as education foundations that are not properly structured can lead to dependency and shallow learning. The coexistence of perceived utility and anxiety about cognitive offloading suggests that curricular design should cultivate introspection. Students need both opportunities to use AI to enhance learning and to be mindful to continue structured practice that requires independent problem-solving and validation of AI outputs.

Curricular responses must address not only technical literacy (how models work, their limitations, and typical failure modes) but also ethics, regulatory context, documentation expectations, and risk mitigation (e.g., consent, privacy-preserving workflows, and bias detection). This is evident as more than half of the respondents raised ethical or legal concerns.

Incorporating case-based discussions of real-world ethical dilemmas and requiring students to critique AI-generated suggestions would reduce naive trust and increase responsible use. Moreover, AI implementation in healthcare education should adhere to the guiding ethical principle of do no harm, ensuring that patient safety and confidentiality remain paramount. Goldberg et al. (2024) argue that AI-driven tools can enhance efficiency, improper or premature deployment without adequate oversight risks compromising privacy and perpetuating inequities in care. They emphasize the necessity for medical education to include structured instruction on data governance and ethical AI use to safeguard patient trust.

While the findings provide valuable insights into AI's potential role in PA curricula, several contextual limitations should be addressed. One major limitation is the study's small sample and uneven institutional representation, which limits generalizability. Additional limitations include self-selection and response biases inherent to voluntary surveys, the cross-sectional design that captures attitudes at a single point in time, and reliance on self-report rather than objective measures of AI competency or outcomes. Research priorities include longitudinal studies to assess whether curricular exposure changes competence and downstream clinical behavior, experimental comparisons of different instructional formats (workshop vs. integrated module vs. elective), and objective outcome measures (e.g., documentation quality, diagnostic reasoning under AI-augmented and non-augmented conditions). Qualitative work should explore how students resolve conflicts between convenience and accuracy when using AI in clinical tasks, thereby helping pinpoint nuanced attitudes and behavioral patterns.

Conclusion

This study represents one of the first focused examinations of how physician assistant students in Texas perceive and engage with artificial intelligence in educational and clinical settings. The findings show that students are already using tools such as ChatGPT, diagnostic platforms, and AI scribing, often without structured guidance from their programs. Most participants agreed that artificial intelligence enhances study efficiency, clinical reasoning, and knowledge retention, but many also expressed concerns about overreliance, ethical and legal implications, and the potential decline of independent reasoning. This combination of enthusiasm and caution signifies the need for thoughtful and ethically informed integration of artificial intelligence into physician assistant education.

Students who had prior exposure to artificial intelligence reported greater confidence and preparedness in applying these tools effectively, suggesting that structured instruction can foster competence and responsible use. Rather than implementing extensive separate courses, programs may benefit from incorporating concise, hands-on workshops and case studies within existing didactic coursework and clinical rotations. These learning experiences should address both technical and ethical considerations, including accuracy, bias, patient privacy, and professional accountability. Faculty development will also be essential to ensure that educators can model proper use and guide students toward critical and responsible engagement with artificial intelligence in healthcare.

While the small sample size and focus on Texas programs limit how widely these findings can be applied, the results still offer meaningful insight into how future physician assistant students view and use artificial intelligence. As technology continues to shape patient care and the clinical environment, physician assistant education will need to adapt. Future studies should involve more programs across different regions and explore how structured teaching affects confidence, ethics, and clinical performance over time. Bringing artificial intelligence into physician assistant training in a way that is practical, ethical, and centered on practical skills will help prepare graduates to provide safer, informed, and effective care in a modern healthcare setting.

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Navigating Uncharted Waters: Faculty Perspectives on Artificial Intelligence (AI) Policy Use in Higher Education

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Abstract

Higher education institutions across the country are facing the rapid growth of artificial intelligence (AI). This has prompted the development of inconsistent, vague AI policies aimed at ensuring the appropriate and ethical application of AI. Thus, many organizations are not adequately prepared for the use of generative AI (GenAI) on their campuses. This article evaluates the application of AI policies in higher education, focusing on faculty members' awareness, perceptions, and support needs. The degree to which current AI policies are identifiable by faculty, as well as their distinguishability from other institutional policies, is discussed. The article features data from a 2025 study that involved higher education faculty members. Results demonstrate that nearly half of the faculty lack knowledge about any institutional AI policy. The study findings highlight the concern of inadequately implemented or nonexistent AI policies, as well as the gray area in which many faculty members operate in the current AI landscape. The article discusses why higher education institutions need clear AI policies to support faculty expectations and clarify appropriate AI use for students.

Keywords: artificial intelligence (AI), faculty, higher education, instructional technology, policies, technology adoption

Navigating Uncharted Waters: Faculty Perspectives on Artificial Intelligence (AI) Policy Use in Higher Education

In recent years, artificial intelligence (AI) has become a major topic of discussion in higher education. Specifically, generative AI (GenAI) is defined as a form of machine learning that takes a set of samples as input and learns from those samples to create new content (Hodges & Ocak, 2023). Before GenAI became widely available, it was not mainstream or highly visible in higher education. In fact, most students and faculty were not directly aware of its presence. Because it was not commonly used to produce academic work, there was little to no perceived need for specific higher education policies beyond general technology use guidelines. More recently, institutions have started drafting AI policies and guidelines to address its use in response to rapid technological advancements.

At the AI in Education (AIED) conference in the United Kingdom in 2018, a workshop on the ethics of AI in education was held. Low attendance suggested limited interest from the wider educational community (Holmes et al., 2022). At the conference, it was noted that there has been little to no research conducted, no shared guidelines established, no formal policies created, and no regulations implemented to address the use of AI in education. Since that time, higher education has been pushed into uncharted waters of developing AI policies in response to AI tools becoming widely accessible and increasingly embedded in teaching, research, and administrative work.

The public release of GenAI tools such as ChatGPT and its sudden popularity accelerated this shift, prompting colleges and universities to quickly design and implement AI policies. Chan (2023) explained that this change created an urgent need for universities to develop AI education policies that prepare stakeholders to work with and understand the principles of this technology. However, questions remain about whether institutions are truly prepared for this transition and whether these policies effectively support faculty in their use of AI.

This article presents data from a Fall 2025 study of higher education instructors, with a specific focus on faculty use and perceptions of AI policies in higher education. The study was conducted to better understand how higher education instructors are incorporating AI applications into their teaching. The researchers explored faculty perceptions of AI in higher education and examined the types of support instructors need, including guidance related to institutional AI policies.

Statement of the Problem

Existing research (Jin et al., 2025; Miao et al., 2021; Ofosu-Ampong, 2024) indicates that instructors recognize the potential of AI, which has contributed to a growing interest among faculty in exploring AI use within their professional practice. In 2021, UNESCO encouraged colleges and universities to create clear policies to guide the use of AI in higher education. However, many institutions have not yet put these recommendations into place or are starting to with uncertainty. As a result, faculty and students often struggle to understand the guidelines for using AI in their work.

In a study exploring faculty perceptions and acceptability of AI in teaching practices, Ofosu-Ampong (2024) found a significant relationship between organizational policies and teachers' acceptance of AI. This means that when teachers had a clear organizational AI policy or incentive in place, they were more likely to embrace AI in academia. Nevertheless, one of the most prominent obstacles for AI adoption is the absence of clear, comprehensive institutional policies governing the use of AI (Jin et al., 2025; Ofosu-Ampong, 2024). Even as interest in AI technologies increases, many faculty members remain hesitant to integrate them into their teaching due to uncertainty about expectations.

Miao et al. (2021) highlighted that AI policies in education tend to be generic or underdeveloped.

Further emphasizing this issue, Farazouli et al. (2024) argued that the introduction of intelligent technologies without clearly defined usage policies or ethical guidelines creates ambiguity and insecurity among instructors. In such uncertain environments, faculty may choose to avoid using AI altogether. Consequently, the absence of clear institutional AI guidance not only slows adoption but may also undermine faculty confidence in experimenting with using AI in higher education teaching and learning practices.

Purpose of the Study

During Fall 2025, a study was conducted by several authors of this article to examine how higher education instructors integrate AI applications into their teaching. This study explored faculty perceptions of AI and support needs, including the use of institutional AI policies. The study employed a survey-based methodology to gather instructors' perceptions regarding the adoption and use of AI in higher education. The survey included 23 questions, most of which were closed-ended and produced quantitative data. Three of the questions were open-ended, which generated qualitative responses. Prior to data collection, Institutional Review Board (IRB) approval was obtained. Data were collected over a four-week period using an online survey. Participants included full-time and part-time faculty members from a private liberal arts university in the northeastern United States. Table 1 discusses the survey totals.

Table 1

Survey Totals

Category	Description	Total
Survey Distribution	Surveys Distributed	100% (n= 509)

	Completed Responses	11% (n= 56)
Employment Status	Part-time Faculty	58.2%
	Full-time Faculty	41.8%
Teaching Level Distribution	Graduate Courses	41.8%
	Undergraduate Courses	32.7%
	Both Graduate and Undergraduate Courses	25.5%

*Note***.** Field of study was not included as a survey item in the instrument used for this research.

Limitations

The Fall 2025 study had several limitations that should be considered when interpreting the findings. The use of purposive sampling and data collection from a single university in the United States, along with a response rate of 11%, limited the generalizability of the results to the broader global faculty population. Additionally, the reliance on self-reported survey data may introduce bias, as responses reflect participants' perceptions rather than actual behavior or competence in using AI tools. Another limitation was the cross-sectional design of the study, which captured faculty perspectives at a single point in time and did not account for changes in attitudes or AI usage over time. Finally, technical issues related to the survey platform or institutional email systems, such as emails being filtered as spam or overlooked, may have contributed to nonresponse and reduced overall participation.

Literature Review

History of AI Policies

The history of AI use dates back to the 1950s, with Alan Turing publishing his renowned paper, "Computing Machinery and Intelligence" (Turing, 1950), on the creation of thinking machines. AI advanced over the next few decades, with machines becoming increasingly effective at computational and mathematical problems. As we grew closer to the 21st century, AI also grew proficient in following rule-based systems and directions; similarly, coding and game-play systems such as chess saw the emergence of AI and its capability of succeeding at both linear and complex problems. Through the early 2000s, AI's capabilities advanced to basic image and language recognition processing, and the explosion of the Internet enabled large-scale data exploration for the first time. Funding started to slowly ramp up for AI startups in the mid-2010s, and in 2016, Luckin et al. (2016) published "An argument for AI in Education" through Pearson.

While the integration of AI technologies into teaching and learning began as early as the 1970s, policies were either nonexistent or generic because there was little concrete evidence of their implementation (Chan, 2023). Well-defined AI policies were not on the radar of any educational institution during AI's development in the 20th century. However, by the early 21st century, educators and administrators began to speculate loosely about the potential of AI and computerized tutors (Holmes, 2019). Over the last few years, adaptive learning systems have progressed to become fully operational and capable of individualized instruction, along with the proliferation of intelligent chatbots in GenAI (Hodges & Ocak, 2023). GenAI today can generate human-like outputs in text, images, video, audio, and other modalities, thereby enhancing teaching and learning.

Today, the most common GenAI tool is ChatGPT, and as ChatGPT and other AI tools have gained widespread popularity, research on AI policies has expanded rapidly and continues to evolve. Chan's (2023) work on AI policy design focused on the growing need for higher education institutions to develop AI education policies that help stakeholders work with these modern tools. Institutional stakeholders include students, faculty, and administrators. At the core of Chan's research, it is conveyed that AI is being increasingly used in major sectors like finance, healthcare, and transportation, meaning graduates will need a solid grasp of AI to succeed professionally. The research also reveals that AI has the power to transform education itself by offering personalized learning, real-time feedback, and adaptive teaching methods. Hence, students and faculty should be prepared to engage with and shape these changes. As AI becomes more common in academic settings, individuals must understand the technology's principles to maintain academic integrity. Also, universities must provide training that helps students and instructors navigate its ethical, social, and economic implications and become responsible users.

Schiff's (2022) research finds that AI use in education is absent from many policy conversations, though the value of education in supporting an AI-ready workforce and training more AI experts is overwhelmingly prioritized (Chan, 2023). Often, AI policies can be determined by administrators who lack hands-on knowledge or a stake in the specific policy being developed. The faculty and students who will be using the technology may not be considered in the conversation. Yet, given the pressure to advance AI use, these policies may be pushed forward without much thought or research.

Another issue is the gap between traditional plagiarism policies and AI-specific academic integrity policies. A recent study by Alsharefeen and Al Sayari (2025) found that faculty perceived traditional plagiarism policies as higher in quality and more consistent than AI plagiarism policies, pointing to the need for more adaptable frameworks that could keep up with rapidly evolving AI technologies. Although the AI policies may have been visible and available, they were often viewed as ineffective because they did not adequately address real-world challenges such as AI detection limitations, increased workload, faculty discretion, and contextual complexities.

AI Policy Ethical Concerns

The use of AI creates a host of ethical considerations for faculty and students alike. For faculty, the use of AI presents new challenges about how instruction may be delivered and the assessments that are used to evaluate learning. For example, a faculty member may use instructional strategies that inadvertently disadvantage students who have not had access to technologies that other students have, creating an imbalanced learning environment. This could harm students from underserved and underrecognized communities. In other words, some students may be more equipped to achieve higher marks because of AI technology competency rather than on merit. Students are currently grappling with the ethical use of AI to enhance their learning and the dangerously blurred lines of having AI complete their assigned tasks. Since AI has the ability to write papers, answer questions, and complete other assessments, students are faced with the choice of doing their own work or letting technology do it for them (Holmes et al., 2022).

It is undeniable that AI can replace some of the tasks that require students to use their own critical analysis to achieve certain student learning outcomes. An argument can be made that the faculty has a responsibility to ensure the integrity of the work being submitted is authentic and genuine. However, the challenge is verifying that the work was actually done by the student, and not by using AI. The counterargument to be recognized is that faculty also have a responsibility to teach about the use of AI to best prepare students for their careers, as many will use AI regularly to complete job tasks. This leads to a deep conversation about where higher education is presently in addressing the AI dilemma, particularly with respect to ethical considerations surrounding its use and application (Holmes et al., 2022).

AI Policy Creation

There are diverse perspectives on what an effective AI use policy should look like in higher education. Many institutions are moving quickly to develop such policies in response to emerging technologies and increasing use of high-end language learning models, yet they often lack a clear understanding of what these policies should entail or who should be involved in the creation of the policy. Consequently, AI policies are often developed without meaningful stakeholder involvement in the decision-making process. This lack of clarity and collaboration has important implications for how such policies are perceived and implemented.

For example, Buele and Llerena-Aguirre (2025) argued that educators may view the introduction of AI policy as a top-down technological imposition rather than as a pedagogical tool. This perception often leads to defensive or indifferent attitudes, particularly when institutions fail to provide time for critical reflection or ongoing professional development in AI. Moreover, Farazouli et al. (2024) claimed that implementing technologies without clear usage policies can create ambiguity and insecurity. When expectations of using AI are not clearly defined, students and faculty may feel uncertain about its appropriate use in academia. As a result, instructors may choose to avoid using AI altogether to safeguard their professional autonomy, largely because there is no defined, collaboratively developed policy.

According to Caulfield (2025), an analysis of AI policies at 100 leading United States universities showed that many institutions have not yet established guidelines for the use of AI, leaving decisions largely to individual instructors. The report findings were grouped into four categories: 51% allow individual instructors to determine their own policies; 27% have no formal policy in place; 18% prohibit the use of AI by default unless explicitly permitted by instructors; and 4% allow the use of AI with proper citation unless instructors choose to restrict them. These findings revealed inconsistencies in AI policy development, with many universities leaving decisions to individual instructors. Consequently, there is a demand for clear AI policy creation guidelines.

Ultimately, AI policy development should be grounded in enhancing present-day academia and preparing instructors and learners for present-day work and societal contributions. Miao et al. (2021) stated that the primary goal of using AI in education should be to enhance learning. To achieve this outcome, there are four recommendations: (1) adopt interdisciplinary planning, (2) develop policies that ensure AI is used equitably, inclusively, and ethically, (3) create a master plan for applying AI in education management, teaching, learning, and assessment, (4) conduct pilot testing to build a strong evidence base, and (5) support local AI innovations for education.

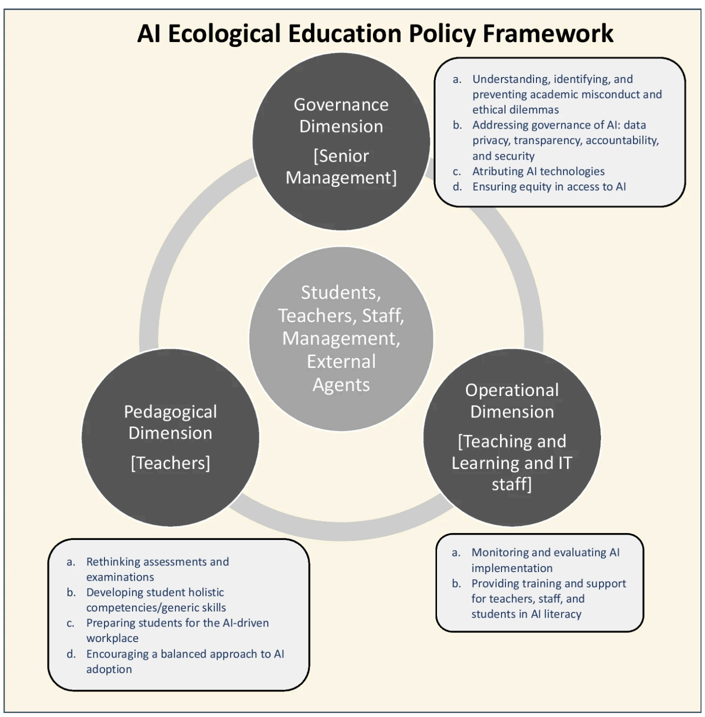
UNESCO has expanded this conversation by publishing a guide for higher education titled *AI and Education: Guidance for Policy Makers* (Miao et al., 2021). This publication provides policymakers with guidance on how to capitalize on opportunities and address the risks arising from the growing integration of AI in education. It includes sections on AI use in education management, learning and assessment, and supporting instructor and teaching practices. Hodges and Ocak (2023) noted that UNESCO has more recently released guidance specifically addressing ChatGPT, offering an overview of its potential applications in higher education and its associated challenges and ethical considerations. Taken together, numerous guidelines call for AI policies that are proactive, ethically grounded, and aligned with institutional goals.

In addition to general guideline recommendations, there are some existing policy frameworks that higher education institutions can follow. Chan (2023) proposed the AI Ecological Education Policy Framework (see Figure 1) to address the implications of AI integration in university settings. Chan's framework consisted of three dimensions: (1) pedagogical, (2) governance, and (3) operational. Chan suggested that each dimension should be led by a responsible party. Chan explained,

> This structure allows for a more comprehensive understanding of AI integration implications in teaching and learning settings and ensures stakeholders are aware of their responsibilities. By adopting this framework, educational institutions can align actions with their policy, ensuring responsible and ethical AI usage while maximizing potential benefits. (p. 22)

Figure 1

AI Ecological Education Policy Framework



Miao et al. (2021) described another specific way to address AI policy design, using three main approaches: (1) independent, (2) integrated, and (3) thematic. The independent approach involves creating stand-alone AI policies or strategies that focus specifically on AI. The integrated approach incorporates AI considerations into existing education or information and communication technology policies. Finally, the thematic approach concentrates on a single issue related to AI and education, such as data privacy.

Designing higher education AI policies can be challenging because it requires balancing innovation with structured campus management. In the study of national and regional AI policy creation, Miao et al. (2021) emphasized four summarized areas of concern that must always be considered. Policymakers must protect data privacy while still allowing AI systems to use large amounts of data. They must also promote openness and transparency to provide fair access to AI, which can be difficult due to cost and ownership issues. In addition, higher education institutions need to update curricula to prepare students for an AI-driven future, a process that requires time, training, and coordination. Finally, effective AI policies require significant financial investment, which not all institutions can afford.

Results and Analysis

The results of the Fall 2025 study revealed several key themes regarding faculty members' perceptions of AI policies and their use. The following section examines faculty members' current AI policy knowledge and identifies the types of support they require to implement AI policies effectively.

AI Policy Knowledge

The survey results provided insight into faculty AI policy knowledge. When asked whether their institution had policies in place, nearly half of the respondents (49.1%) reported that they did not know, compared to 38.2% who said yes and 12.7% who said no. This finding was particularly striking given that the faculty surveyed were actively involved in teaching and academic decision-making, highlighting a significant gap between AI policy development and faculty awareness.

AI Policy Support

Regarding AI policy support and training, the survey revealed considerable uncertainty among faculty. While 43.6% of participants anticipated needing future support to use AI, 21.8% believed they would not, and 34.5% were unsure. The fact that more than one-third of respondents were uncertain about their future support needs suggests that many faculty members do not yet fully understand how AI may affect their teaching or professional responsibilities. This uncertainty highlights a significant gap in faculty awareness of AI policy use and reiterates that AI integration in higher education remains largely uncharted territory for many instructors.

In addition, when faculty were asked whether their institution provided training or professional development related to the use of AI in education, responses again reflected uncertainty. While 61.8% said AI-related training was available, 14.5% said it was not, and 23.6% said they were unsure. This means that nearly as many faculty members either believed training was unavailable or were unsure as those who believed it was available. The level of uncertainty is especially concerning because not knowing whether support exists suggests a significant gap in communication. This reinforces the notion that AI adoption in education remains an uncharted area for many institutions and educators. Table 2 discusses the support needs of the faculty in the study, along with suggested examples for implementation.

Table 2

AI Policy Support Needs

Support Needs	Percentage (%)	Examples
Hands-on	67.3%	Synchronous trainings, asynchronous

Training/Workshops		modules
Clear Policy Guidance on AI Use	52.7%	Written guidelines, policy manuals, presentations
Webinars	45.5%	Recorded sessions of policy regulations
Access to AI-powered Assistants or Tools (Chatbots)	41.8%	Written guidelines for use of AI-powered assistants or tools
Peer Collaboration or Communities of Practice	35.5%	Peer learning communities, school or departmental discussion groups
Technical Support for AI Tool Implementation	34.5%	Protocols for how to access technical support for using AI
I am not interested in AI support at this time	14.5%	N/A
Unsure about Support Needs	3.6%	N/A

Faculty responses showed a desire for institution-level guidance on how AI should be used responsibly and ethically. More than half of respondents (52.7%) said policy guidance would be especially helpful, noting the need for clear rules about what is and is not acceptable. Faculty expressed a need for lists of approved AI tools and consistent expectations across the university. Many faculty also expressed concern about student misuse of AI, which reinforced the importance of having well-defined AI policies that support academic integrity and give instructors confidence in how to address AI use in their teaching.

Discussion & Implications

The discussion and implications focus on key themes that emerged from the data analysis, particularly focusing on faculty perceptions of AI policies and AI policy use. A central finding was that many faculty members were unaware of the AI policies in place at their institution or how to apply them. This lack of clarity may have contributed to uncertainty about using AI in their work, as well as an uneasiness in addressing ethical AI use with students. The results highlighted that many AI policies exist in largely uncharted waters and may contribute to faculty being uncertain about using AI.

AI Policy Knowledge

When asked whether their institution had any AI policies in place, nearly half of the faculty in the Fall 2025 study were unsure whether AI guidelines even exist at their institutions. This finding suggested that they are without a clear framework for responsible AI use. If they are unable to identify the AI policy at their institution, how are they to teach students to use AI responsibly and consistently, in accordance with authorized procedures across the university? Holmes et al. (2022) warned that "without a more targeted approach to the ethics of AIED, the work conducted by the community may remain largely invisible to the rest of the AI subfields and related policies, also potentially stifling the impact of the AIED research" (p. 522).

Even when AI policies may be present, the lack of awareness indicates that they are not being effectively communicated or integrated into faculty practices. This finding can create confusion and inconsistent implementation across departments. Nearly half of the participants (43.6%) expected they would need support for using AI in the future, while 34.5% remain unsure, indicating that many faculty members felt unprepared for using the AI policies at their schools. A study participant claimed,

> To use AI more effectively in my work, I would benefit from access to high-quality datasets,

> better integration tools with existing systems, and scalable computing resources. Training on best practices, ethical use, and human-in-the-loop workflows would further enhance productivity, along with having a peer community to share knowledge and solutions.

In other words, while AI is increasingly present in higher education, many faculty members do not yet have a clear understanding of the rules and expectations that should guide its use. AI policies must be clearly written and easily understood by all stakeholders (e.g., faculty, students, administrators) in order to be effective.

AI Policy Support

Although 61.8% of faculty reported that their institution offered training or professional development on AI, nearly a quarter (23.6%) still did not know whether such support exists. This suggests that training is unevenly communicated or accessed across the institution, leaving many faculty members without a clear understanding of how to get help. One participant suggested,

> Create a resource hub with vetted AI tools, examples, and ethical guidelines so I don't have to sift through the noise. Facilitate peer learning groups where colleagues share how they're using AI in their workflows. This would be especially helpful for exchanging tips and building trust.

Overall, these findings indicate that while AI policies may exist, they are not widely understood, creating an environment where faculty must navigate AI adoption with incomplete directions and limited support.

Future Research Directions

Future research could build on the topic in this article in several ways. One approach would be to conduct a comparative study by replicating the Fall 2025 study with students as participants to examine their knowledge of AI policies and how these policies shape their use of AI tools. With stakeholders' needs at the forefront, AI policy development should be guided by a human-centered approach (Holmes, 2022). Students, faculty, and administrators should be involved in this process. It is also recommended that AI policies should be reviewed regularly and transparently, as the need for amendments and revisions will likely occur frequently. The results could then be compared with faculty data to identify similarities and differences between the two groups.

Another future research option is to focus an entire study on AI policy design and implementation to explore faculty and student perceptions in greater depth. At a broader level, institutions need to prioritize AI strategic planning and evidence-based implementation by defining the purpose of AI policies and identifying who is responsible for implementing them. Policymakers can assess institutional readiness, consider costs and benefits, and set realistic priorities (Miao et al., 2021). This process should include collaboration and ongoing evaluation to meet stakeholders' needs. Specifically, researchers could examine faculty and student perspectives before and after the implementation of an AI policy to collect empirical data on how awareness and practices change once formal AI guidelines are in place.

Conclusion

The integration of AI in higher education has created a landscape in which technological developments occur at such a rapid rate that institutional policies have not kept pace. It must be noted that the research in this study was based on data collected from one university using purposive sampling. Because of this limited scope, the findings may not represent faculty at other institutions or in other countries. Yet, the overall results reflect a broader trend suggesting that although many colleges and universities are beginning to develop AI-related policies, these policies are not always clearly communicated or consistently implemented, leaving many faculty members uncertain about what guidance currently exists.

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Online Program Quality: What Learners Say

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Northern Virginia Community College's NOVA Online

Abstract

This qualitative case study explores how community college students define quality in asynchronous online learning programs. As the share of online enrollments continues to rise, institutions face growing pressure to ensure program-level quality that supports learner success. Drawing on semi-structured interviews with 10 students enrolled in asynchronous programs at Northern Virginia Community College, the study foregrounds learner perspectives often absent from existing evaluation frameworks. Inductive thematic analysis revealed four key dimensions shaping student perceptions of program quality: modality choice, sense of belonging, support services, and faculty engagement. While students cited flexibility as a primary reason for choosing asynchronous learning, they also emphasized challenges related to isolation, resource awareness, and inconsistent instructor presence. Faculty engagement—manifested through active presence, perceived care, and timely guidance—emerged as a critical determinant of success, underscoring the need for robust training and institutional expectations. Findings suggest that program quality is not a static construct, but a lived experience shaped by diverse learner circumstances. Institutions should integrate student voices into program design and evaluation to ensure supportive, learner-centered online learning environments.

Keywords: Distance learning, learner perspectives, program quality

Online Program Quality: What Learners Say

At a time when higher education enrollments face systemic demographic pressures (Knox, 2024), online learning programs contribute to some positive trends. This is particularly the case at the community college level (Garrett et al., 2023). For example, 88% of students taking courses within the Virginia Community College System (VCCS) do so partially or entirely online, and 10 of its 23 colleges report that over half of their enrollments are in asynchronous formats (Joint Legislative Audit and Review Commission [JLARC], 2025). This growth coincides with a narrowing achievement gap between online and campus-based modalities across the system (JLARC, 2025). The present study examines asynchronous learning, defined by structured pacing, active instructor involvement, and the absence of real-time interaction (Sener, 2015).

Alongside the expansion of online learning, there is a growing recognition that the for-profit online program management companies which developed and facilitated many college and university distance learning programs have had a negative influence on student outcomes (Hamilton et al., 2023). As institutions increasingly recognize the importance of running their programs, they must also deepen their understanding of how to ensure program quality that supports learner success. To explore how students define and experience quality in asynchronous programs, this study draws on interview data that centers their perspectives. Foregrounding themes derived from learner voices, it goes beyond previous studies focused on administrative viewpoints (Hirner & Kochtanek, 2012; Institute for Higher Education Policy [IHEP], 2000; Shelton, 2010), offering institutions a more grounded and stakeholder-informed understanding of program quality.

Literature Review

Scholarship on distance education continues to grow, propelled in large part by efforts to enhance the quality of online learning experiences (Martinez-Garcia et al., 2023). However, much of this research concentrates on discrete aspects—such as course-level design or instructional delivery—rather than examining how these elements function within the broader context of integrated, online programs (Zhou & Rouse, 2024). The literature on online learning program quality assessment has focused primarily on developing rubrics and draws heavily on the experiences of upper administration and—to a lesser extent—online learning program staff (Hirner & Kochtanek, 2012; IHEP, 2000; Shelton, 2010). The exclusion of online students' input in shaping evaluation processes reflects a broader trend in program evaluation, where those most affected by educational programs often have little influence over the criteria used to assess their effectiveness (Mertens & Wilson, 2019). Incorporating data from student interviews represents a critical step toward amplifying the voices of this key stakeholder group. Learner perspectives are essential to constructing a comprehensive framework for online learning programs; without them, such frameworks risk being fundamentally incomplete (Zhou & Rouse, 2024).

Research Question

Drawing on this context, the current study poses the following research question: *What do learners value most in an asynchronous online learning program?* The current qualitative study collected data from 10 online community college students via semi-structured interviews. The findings from the analysis of that data are described and discussed below, following an overview of the study's methodology and theoretical framework.

Author Positionality

It is important to note that the author has worked in online learning for 15 years as both an adjunct instructor and as a staff member focused on quality online instruction. These experiences have taken place at the same institution from which the current study's participants were drawn, and have likely helped inform his own perceptions of what matters for online learner success. His awareness of these potential biases help protect him against possible influence on data collection and analyses (Ravitch & Carl, 2019). Further, his focus on the importance of participants speaking to their own perceptions of what matters when it comes to online learning program quality has increased his awareness of the need to keep all analyses grounded solely in the participant-derived data (Mertens & Wilson, 2019).

Methods

Study Design

Focusing on how individuals make sense of their experiences within their world, the current study is grounded in a constructivist research paradigm (Merriam, 1998). This research employed a case study methodology (Stake, 1995; Yin, 2017) performed in order to identify and describe emergent themes (Thomas, 2021). The author collected individual participant data followed by analysis—by participant and then again holistically as a collective case. Framed within a constructivist understanding of case study (Merriam, 1998), a central purpose guiding the research was to gather, examine, and report what students—the key constituency of online learning programs—had to share regarding what mattered when considering program quality. Within this context, the research involved interviewing, describing, and thematically analyzing the cases of participants bound by their participation as students in online learning programs at Northern Virginia Community College during summer 2025.

Participants and Institutional Context

Participants were required to be current students at Northern Virginia Community College who had taken courses within programs run by NOVA Online, the college's division in charge of asynchronous online learning. Ten individuals took part in the study, and they were identified through purposive sampling methods (Cohen et al., 2018). These included both direct referrals from NOVA Online senior leadership and responses to anonymous participant interest surveys posted as announcements in summer 2025 NOVA Online course sites hosted on [Institution's] Canvas learning management system. Each participant received a $25 gift card at the conclusion of the interview, but only the researcher knew who took part so that there was no possibility of academic reward. Table 1 provides selected self-reported participant characteristics. Pseudonyms are used to protect participant confidentiality.

Table 1

Self-Reported Participant Characteristics

Pseudonym	# of Async Courses Taken	Age	Gender	Race
Albert	4-6	18-21	Man	Black
Breanna	2-3	22-29	Woman	Black
Elizabeth	1	30+	Woman	White
Fatima	7+	18-21	Woman	Asian
Priya	4-6	22-29	Woman	Asian
Ramesh	7+	18-21	Man	Asian
Rita	7+	30+	Woman	Hispanic
Salim	4-6	18-21	Man	Asian
Vicky	1	18-21	Woman	Hispanic
Yusuf	2-3	18-21	Man	Asian

Data Collection

Data was collected through 30- to 60-minute semi-structured interviews conducted via Zoom and initially transcribed using Rev.com. Participants were provided a list of potential questions ahead of time (see Appendix) with the intent of focusing on the subject of online programs as a whole rather than individual course design and delivery. The semi-structured format of the questions framing data collection was chosen in the interest of capturing in-depth participant insights (Ruslin et al., 2022). The study was reviewed and approved by the Northern Virginia Community College and Northern Virginia Community College Institutional Review Boards (IRB Protocol # 00000262).

Data Trustworthiness

Initial interview transcriptions were generated using Rev.com. To ensure accuracy, the author systematically reviewed the corresponding audio and video recordings, refining the transcripts to reflect participants' responses faithfully. To enhance the trustworthiness of the data, a member-checking process was implemented (Ravitch & Carl, 2019), whereby participants were invited to review their transcripts and identify discrepancies. This step also served to reinforce rapport and transparency between the researcher and participants (Jones et al., 2021). Throughout the analytic process, the author engaged in ongoing memo writing as a reflexive practice to critically examine positionality and maintain alignment with participants' narratives while developing interpretive claims (Birks et al., 2008).

Data Analysis

Transcripts were manually coded through iterative readings of the data, allowing codes to emerge inductively rather than being predefined. This approach aligned with the case study methodology's aim of producing thematic summaries grounded in participant narratives

(Creswell & Poth, 2025). A two-cycle coding process was employed to support this objective. The initial cycle utilized structural coding to identify key topics and concepts across interviews, particularly useful when working with data from multiple participants (Saldaña, 2021). In Vivo coding was also applied when participant language offered a direct lens into emergent themes. The second cycle involved pattern coding, which facilitated the consolidation of initial codes into broader thematic categories. This strategy enabled the author to distill extensive qualitative data into themes that were both case-specific and cross-case in nature (Saldaña, 2021).

Theoretical Framework

The IDEAS framework (Martin & Ritzhaupt, 2023) was created as a guide for online educators that goes beyond the course design focus of most rubrics in distance education (e.g., Quality Matters, n.d.; State University of New York, 2018). Table 2 provides the key components of the framework.

Table 2

IDEAS Framework Domains and Selected Associated Items

Domains	Items
Inclusion	Know your learners; situational/contextual factors; belonging; accessible course design; extended learning resources
Design	Course organization; learning outcomes; instructional alignment; activity and assessment design
Engagement	Instructor availability; timely response, grading, and feedback; facilitate discussions; foster learner interaction; model appropriate behaviors; facilitate community building; monitor learner progress
Evaluation	Learner feedback; peer instructor feedback
Assessment	Formative and summative assessments; traditional and authentic assessments; provide tailored feedback
Support	Administrative support (e.g., scheduling, registration); instructional personnel support (e.g., teaching assistants, mentors); learner technology support

Note. Items summarize the core components of the IDEAS framework

The five dimensions around which this framework is organized—inclusion, design, engagement, assessment, and support—can all usefully translate to program level considerations, and in a way that privileges the student view. These dimensions, beginning with *inclusion*, and structured holistically as a multiplicity of intersecting components, parallel the complexities inherent in thinking about both program quality and learner needs (Martin & Ritzhaupt, 2023).

Consider how one participant in the current study, Albert, concluded his interview saying, “a quality online learning program is a program that is designed for student success, first and foremost. I think that's the most important thing, just making sure that student success is prioritized in a multitude of different ways.” His characterization of program quality may appear obvious and straightforward, but throughout all 10 interviews, it became clear that “a program that is designed for student success” is not a simple or generalizable construct. In a way, there is a paradox presented within the student data —online learning programs need to base decision making on their student population while maintaining awareness that their students, especially at the community college level, defy easy categorization. The multiple, intersecting components of the IDEAS framework helps make sense of how these two aspects coexist in important ways.

Findings and Discussion

Martin and Ritzhaupt's (2023) IDEAS framework effectively organizes the emergent themes presented in the following discussion. IDEAS' first dimension, *inclusion*, begins with “know your learners,” an element emphasizing the need for institutions to understand the contextual factors shaping their student populations—particularly relevant in online education, where enrollment decisions often reflect personal, logistical, or economic constraints (Baugus, 2020). This leads to the first theme: *modality choice*. The second and third themes, *belonging* and *supports*, also align with *inclusion*, specifically its “belonging” and “extended learning resources" elements. The final theme, *faculty engagement*, corresponds to IDEAS' *engagement* dimension, encompassing elements such as "instructor availability," "responsiveness," and "monitoring of student progress" (Martin & Ritzhaupt, 2023).

Modality Choice

Students take part in asynchronous learning for varied reasons (McPartlan, 2021). Sometimes this is not due to student need or preference, but rather institutional constraints—particularly when low enrollment numbers make synchronous course options financially unfeasible (Burke, 2025). Such was the case with Breanna, who found synchronous interaction important but whose peers in her small, career-oriented degree program worked such varied hours that courses could only be offered asynchronously. More often, though, participants selected asynchronous courses to accommodate their life circumstances. These circumstances include having to navigate around work schedules or deal with transportation challenges, factors that help explain the prevalence of asynchronous learning at community colleges (Baugus, 2020).

One participant, Salim, assumed that all college students need to work: "obviously as being a college student, I need to work in order to make what's needed to save up for next year. Asynchronous is better because I have to negotiate my work schedule for Zoom." His use of the word "obviously" speaks to the extent to which many of these students consider the need to balance school with work a given for those navigating higher education, something that might reflect their experiences within a specifically community college context (Brauer & Foust, 2020). For another participant, Priya, navigating work is further complicated by a job without a consistent schedule, making week-to-week availability too uncertain for her to enroll in her preferred campus-based modality.

Others found that asynchronous offerings better fit their learning styles. Ramesh described his preference for asynchronous learning, primarily the ability to work at his own pace and without the distraction of others. But he also chose to take certain disciplinary offerings synchronously in cases where he found real-time support useful. He was not alone in his decision to enroll in multiple modalities, though the majority of the current study's participants completed most or all of their coursework asynchronously.

Those who preferred asynchronous learning described the learner qualities that led to successful learning in this modality. These qualities included ease in dealing with technology; problem solving skills; a general resilience when solutions were not immediately apparent or help easy to access; strong organizational skills; and willingness to reach out to faculty or staff when they could not figure something out. For those who found asynchronous programs difficult to navigate, three particularly strong challenges stood out: belonging, support, and faculty engagement.

Belonging

As with the multiplicity of reasons leading participants to take part in asynchronous program offerings, the extent to which having a sense of belonging mattered for these students varied from very important to not at all. For those who felt that being a part of the college community was important, those reasons were themselves multifaceted.

Among those who expressed no desire for their programs to focus on learners' sense of belonging, there was a direct overlap with the two students—Ramesh and Salim—who expressed a preference for asynchronous learning. Ramesh actively appreciated a lack of attempt to make him feel part of a larger community: "I can just put my head down, get my stuff done, fly under the radar. So I like that aspect." Given his preference to interact only when he needed help, it is unsurprising that he saw the asynchronous modality's tendency to isolate peers as a benefit (Kaufmann & Vallade, 2022). Salim also assumed that those taking part in online learning at two-year institutions were particularly uninterested in feeling a sense of belonging:

> Most people, socializing in the community college where people just go in, go out, they find it pointless. It's not like I didn't make friends, just, it was more of a go-in go-out place. And trying to boost, make use of an online hub for a college where people don't, if people don't socialize in person, online is just even more that.

The implication is that if one accepts that community college is already a space where students have limited interest in peer or institutional connection, this will be even more true for students who take part in a modality without any physical or synchronous interaction.

Participant perspectives on the importance of feeling a connection within the college context, however, were far from uniform, and the reasons why some felt a desire for belonging were equally varied. For Priya, her experience that the college intentionally designed courses with student introduction activities and trained faculty to foster community building were "things that were helping me keep taking more classes, and I'm loving it." She viewed the program's efforts to cultivate belonging not merely as affirming, but also as a catalyst for sustained academic momentum.

Fatima and Albert also expressed a need to feel that they were a part of the community, though for them it was less about peer-to-peer connection and more about feeling valued as equals with their campus-based counterparts. Fatima shared her belief that those in online learning were not perceived as "real" students taking part in rigorous programs: "people work just as hard as in person, and we have to study online just to stay in school." But she then added that, if given greater chances to connect with others, they would feel included and considered on par with those enrolled in a traditional learning modality. Albert interestingly acknowledged that he started out with the “get-in, get-out” mentality described by Salim above. He soon found, however, that he benefited from getting involved in the college community. As an online learner, though, he felt that the college could provide more opportunities to give voice to their needs and concerns, making it easier for him and his peers to feel like true stakeholders.

Supports

Even those participants who did not prioritize sense of belonging communicated the need for available support services, and they often did so in the context of how certain resources increased the “ease” with which they could progress through their remote learning programs. Overall, fully half of the participants spoke to the importance of ease of navigation through the program and its various systems. Albert, who credited his support system for helping him overcome obstacles, said that the stakes are high for those who do not have the same: “I do know that there are people who probably saw the system say, ‘oh, I can’t figure this out,’ and they just gave up.” He continued, “I could see how it's quite easy to get lost as a student here. A lot of people, they need it smooth to make it to the finish line.” Ease was expressed in a number of ways, including not only having specific resources, but also knowing about the supports available, how to use them, and having access both online and in person.

Among the specific resources discussed, participants made particular mention of advising (Beaudin & Breiner, 2001). Priya, a first-generation college student and recent immigrant whose goal in taking part in her online program was to transfer and complete a Bachelor’s degree, was appreciative that she was made aware that she had to take specific courses in order. Yusuf also shared a positive experience. He described how an earlier experience with a four-year, campus-based program required that he book a meeting two weeks in advance. He shared that his current online program enabled him to set up a Zoom advising meeting within minutes.

More generally, Albert—the participant who felt able to make his way through without supports—expressed strong conviction that the support services the college offered were important for some of his peers and signified a quality program capable of helping online students succeed. It became clear, however, that having resources available was not sufficient. A number of participants lacked awareness of available resources, including some that other students discussed using. Some learned about resources from acquaintances, often after they would have been helpful.

In Yusuf's case, he shared with peers his positive experience with advising. He added, though, that his peers had given up trying to get guidance within the timeframe that they needed it. Similarly, some students who relied on friends or family for help locating services were never able to find them. Fatima, for example, eventually asked her sister who was unable to help. Unaware who to approach at the college, Fatima attempted to work through school requirements and procedures on her own.

Participant narratives revealed other cases in which available resources were not communicated. Breanna struggled to stay organized until she found Google Calendars online. She mentioned how helpful it was to track assignments and due dates that were easy to forget without the structure of a face-to-face environment. Albert referenced the same tool, suggesting that if the college offered such a calendar, then his peers would likely feel less overwhelmed. Although this calendar was embedded in all asynchronous course sites and automatically populated with due dates, many students were unaware of its existence—highlighting a gap in resource communication that can hinder student success in online modalities (Kellam et al., 2025).

Finally, multiple participants shared how helpful it was to have various services available both virtually and on campus. Priya faced challenges when needing to travel to the physical school's location but, at the same time, she added that physical services are "better for an immigrant like me, it's really hard to connect with these devices. The front desk, they will help you, even the students can lead you. So I feel like both online and physical classes are equally important." Still, she said that there were times when she could not make her way to campus and so took advantage of online resources for help. Interestingly, Priya added that for services such as tutoring, she found that she sometimes benefited more from online support and sometimes from in-person support depending on the subject. For example, going to the physical writing center helped her write in English, a language that was relatively new to her, while she benefited from recorded math tutoring sessions because she could return to them.

Faculty Engagement

Tutoring services and student awareness of them also showed up in the participant data under a final theme: faculty engagement. Rita mentioned tutoring in this context when discussing two online faculty teaching different asynchronous courses required by her program. She struggled with each course, but had a far worse experience with the first. The instructor of that one, she said, did not offer feedback, and when asked for explanations, he pointed only to the PowerPoints and videos embedded in the course that had already proved insufficient. The second course had similar design challenges, but the instructor offered individualized guidance and—when unable to find a time that worked to meet synchronously with Rita for additional help—pointed her towards tutoring. She stressed that simply directing her to a resource to help overcome issues related to the asynchronous modality made her feel supported: “He tells you, ‘Hey, we have tutors available, and this is a person you can contact.’ It's amazing when you have somebody who cares.”

As noted in the literature review, this study emphasizes program-level impacts on online learning quality due to the scarcity of research in this critical area as most existing work focuses on course-level design and delivery (Zhou & Rouse, 2024). Despite efforts to elicit insights on broader programmatic factors, faculty engagement—a seemingly course level concern—consistently arose as a key factor in student perception of program quality. This theme extends beyond the course context, however. Fatima’s observation illustrated this point: “I have some teachers that do things really well, and others just post stuff without explaining anything and then they don't reply or anything. They might need more training on how to do online better.” Her insight aligns with the online program literature, underscoring the need for substantive faculty training in asynchronous modalities and protocols for ongoing evaluation of instructional practices (Grincewicz, 2025; JLARC, 2025).

Across the participant sample, students consistently returned to faculty engagement as a central factor in their success. Albert captured the overall sentiment well when he shared that, “it is super important, just letting people know that they're not alone, even though it might feel like it, because asynchronous can feel that way.” As with previous themes, expectations for faculty training and adherence to best practices in asynchronous delivery varied among participants, but participants most often framed engagement in terms of active instructor presence, perceived teacher care, and timely guidance.

Active Instructor Presence

Whether participants shared positive or negative experiences with online faculty, it was clear that an active instructor presence in asynchronous courses (Wang et al., 2021) had a significant impact on perceptions of learning quality and on success. Breanna and Rita, both enrolled in career-focused programs, expressed such differences well. For Breanna, “when you have a professor who's engaging with your class, it makes you want to learn and to take a look at the material, even if it's something that you don't have an interest in.” She went on to add that, “the professors I've had have been wonderful as far as responding and giving substantive feedback instead of just like, ‘Hey, great job.’ And forcing us to do some work. And that has been wonderful.” In contrast, Rita shared that the lack of instructor effort to actively engage with her and her questions influenced her decision to cheat on her coursework : “I’m getting an ‘A,’ but I don't know nothing, honestly.” This rationale for cheating is backed up by the research literature (Murdock et al., 2008). Rita expressed concern that she will not pass her program certification exam.

Perceived Teacher Care

Expanding on the need for programs to make students aware of available supports, Albert emphasized that instructors’ proactive sharing of resources exemplifies “perceived teacher care,” noting:

> All faculty, administration, everyone has the student's best interest in mind. And I think that reminding the students that is the case is super important. Just even for morale, confidence, things like that. Just letting them know that “we're all here for you. We only want you to do well. We're not trying to, because some classes are hard, so it might feel sometimes, oh, this class is designed for students to fail.” That's never the case really. Just

> making that clear, showing them that there's all these support systems available. Some professors do reach out. They're like, “Hey, I noticed you're struggling here. Is there anything that you need from me? If you need any resources, here they all are.”

Similarly, Rita—the participant who described cheating at least in part as a response to low instructor engagement—observed that resource sharing fosters a sense of support even when direct help is limited. The perspectives of Albert and Rita—focused on just one of the many aspects of teacher care shared by study participants—underscore the need for programs to set clear expectations that faculty take advantage of their frontline role to actively communicate care, identify student needs, and connect learners to available supports (Rotar, 2022).

Timely Guidance

Participants mentioned several other beneficial asynchronous teaching practices, central among them the timely provision of guidance. Priya, for example, discussed the value of prompt email responses and faculty preparing their courses ahead of time with clear due dates. For Priya, these faculty behaviors mitigated the challenges of studying while working fulltime, such as limited windows in which to complete work and difficulty keeping track of deadlines. A number of other students identified quick grading, paired with helpful feedback, as central to their success as online learners.

Along with instructor presence, care, and guidance, participants articulated additional online teaching practices that helped them succeed, such as a willingness and ability to help with learning technologies, being available for synchronous office hours, and providing weekly reminders and wrap ups. Some of what participants identified as important may seem minor, but as Yusuf said, “even the small stuff really helps out in the long run.”

Listening to these students reveals that quality in online learning is multifaceted, shaped by individual circumstances, institutional practices, and the human need for connection and support. These accounts remind us that program quality is not an abstract metric but a lived reality, best understood through the voices of those navigating it every day.

Implications for Practice and Future Research

The local nature of findings drawn from participant data collected at one community college institution underscores a key implication from this research: Institutions developing and delivering online programs must ground decisions in a clear understanding of who their students are and why they choose distance learning (Martin & Ritzhaupt, 2023). Equally important is recognizing that there is no single construct of the "online student" and any individual student may take courses across modalities in a given semester, year, or degree program. Within one college, learner needs both overlap and vary widely, and program leaders would do well to engage directly with students to identify priorities and deploy resources effectively.

Institutions need to recognize that many students who do not prefer online learning nonetheless rely on it as their only viable path to higher education. Accordingly, programs must cultivate a sense of belonging for asynchronous learners, mitigate the inherent isolation of the modality, and ensure that both online and on-campus support services are clearly communicated and easily accessible. In addition, institutions should equip faculty with the training and oversight necessary to deliver consistent instructor presence, care, and responsiveness in asynchronous environments.

The current study suggests a number of directions for future research. One is to consider the specific mechanisms by which institutions can identify what students may need based on their particular situations. A second is to determine strategies that can guide them towards an awareness of the challenges and opportunities of online modalities based on their learning style, life circumstances, and intended program. A third area for future exploration centers how best to assess whether online learning programs are meeting learner needs in terms of how they are constructed, resourced, and implemented. Research-informed decision making is essential, but so too is revisiting outcomes to ensure assumptions translate into improved online student success.

Limitations

Participants were drawn from a single large two-year college, which may limit the representativeness of the sample and constrain the generalizability of the findings. Including participants from a variety of regions and institutions of different sizes and types would represent a broader range of economic, racial, cultural, and other demographic contexts. Fortunately, the Northern Virginia Community College student body is itself quite diverse ([School System Name], 2024). Further, the experiences of learners from even a limited population sample offers perspectives largely absent from online learning program quality literature (e.g., Online Learning Consortium, 2018; Quality Matters, n.d.; Shelton, 2010) and, as such, provides value in an exploratory sense.

Conclusion

This study reveals an apparent paradox in defining online program quality: Learner needs are both highly individualized and shaped by shared situational contexts. Even within one institution, students differ markedly in their priorities—some value belonging, others do not; most emphasize faculty engagement, yet its perceived importance varies. Reasons for choosing asynchronous learning likewise range from logistical necessity to personal preference to subject matter.

On the other hand, the fact that these diverse learners were all part of one online community college system may help explain some of the commonalities that emerged from the data. Public two-year institutions typically enroll a greater number of first-generation students, students of immigrant origins, speakers of languages other than English, minoritized populations, and those from lower income households (Yu, 2017). Multiple study participants self-identified as belonging to one or more of these demographic groups.

The literature makes clear that, in the context of online learning program quality, such learners have particularly strong needs for a range of resources offered in multiple ways (Travers, 2016), as well as access to opportunities for meaningful connection despite inherently limited peer interaction (Grincewicz, 2025). They also require strong faculty involvement (Lancaster & Lundberg, 2019), and participant insights highlight the need for programs to set expectations for faculty to support their distance learners through comprehensive engagement practices. Examples from the findings include Priya's positive experience of how tutoring offered in multiple modalities helped support her specific needs; Fatima's insight into the way that opportunities to make human connections made her feel more like a real student; Albert emphasizing how active faculty presence reduced his sense of isolation; and Fatima's sense that some instructors need additional training in effective online teaching.

The stories this study's participants shared help explain why learners sometimes take part in a modality that might not best fit their learning style (McPartlan, 2021), and institutions offering online learning should actively solicit student perspectives to inform program designs capable of supporting them, from registration to graduation and beyond. Taken together, these findings underscore that supporting online learners requires more than strong course design—it demands an institutional commitment to creating environments where diverse students can thrive. By showing how modality choice, belonging, supports, and faculty engagement intersect in the lived experiences of community college learners, this study demonstrates that program quality is not a static checklist but an ongoing, relational, and context-dependent process. Ultimately, enhancing online program quality means centering student perspectives in every stage of program planning and evaluation, ensuring that institutional structures evolve in response to the complex realities students bring to their learning.

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Appendix

Framing Questions for Online Student Interviews

1. What does a quality online program look like to you?
2. What does an "online student" look like at your institution?
3. Do you consider yourself a stakeholder in your online learning program?
4. What supports do you need as an online student?
    a. What has been most helpful for your success as an online learner?
    b. What is not available or robust enough that you would find valuable?
    c. What is available that is not important to you?
5. What is an area of a successful online program that you think may get overlooked?
6. What do institutions need to have in place to be ready to offer quality fully online programs (from pre-application to graduation and beyond)?
7. What is something that you think is important in terms of online learning program quality that you don't think is well understood?
8. What do you think should be assessed when determining if an online program is a quality one?
9. How do you measure quality in online learning programs?
10. What do you think online faculty need in terms of support/knowledge from others in order to better support students?
11. Is there anything else that you would like to add?