ORIGINAL RESEARCH

Exploring new frontiers in nursing education: Assessing the role of generative AI (chat GPT) in aligning family nurse practitioner coursework to AACN's new essentials

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ABSTRACT

Background and purpose: Integrating Generative Artificial Intelligence (Gen AI) in higher education, specifically within health sciences, is increasingly recognized for its potential to enhance educational outcomes and efficiency. The American Association of Colleges of Nursing (AACN) mandates the alignment of Family Nurse Practitioner (FNP) programs with its 2021 Essentials, a competency-based educational framework encompassing hundreds of specific standards. This study aims to evaluate a novel use of Gen AI: how effectively can a custom-trained gen AI tool (custom GPT from ChatGPT), align FNP course assessments with the AACN's New Essentials, thereby potentially reducing faculty workload and improving curriculum accuracy.
Methods: Through dialogue and uploading of relevant documents, a custom GPT (called Mapper) was trained from one FNP course to the subcompentencies within the 2021 Essentials. The Mapper was then used to align the assessments from one FNP course. The Mapper's output was then compared to content expert alignments to assess accuracy.
Results: Across all 10 domains of the AACN Essentials, the Mapper aligned with expert analysis with moderate to high accuracy. Initial analysis indicated correct alignment rate from 44% to 93% (average 66%), which improved to 70% ($p < .05$) upon further refinement of the Mapper tool by content expert. Potential novel alignments (average 26%), and misalignments (average 9%), provided by the Mapper were critically reviewed, leading to adjustments to the content expert's original alignment, which enhanced the overall precision of the alignment. For example, misalignments were reduced to only 5% ($p < .05$). In post-analysis, Mapper aligned AACN subcompetencies incorrectly on average 4%, while the lead faculty was incorrect on average 6%.
Conclusions: Gen AI has the potential to streamline the complex process of aligning curriculum to national standards. The GPT demonstrated a significant capacity to assist in this task with minimal error rates, but expert oversight remained crucial to ensure accuracy and relevance. This synergy between Gen AI and human expertise points to a promising avenue for enhancing curriculum development and alignment processes in nursing education and other disciplines.

Key Words: Generative AI, ChatGPT, American ssociation of Colleges of Nursing, 2021 Essentials, Nursing education, Curriculum alignment, Family Nurse Practitioner, Subcompetencies, National standards

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1. INTRODUCTION

1.1 Background

The importance of generative AI (Gen AI) and its potential for advancing almost every aspect of life is immeasurable. Gen AI has permeated language arts, artistic expression, productivity, research, analysis, programming, education, and more. In higher education, gen AI increases faculty productivity in practically every aspect of education.[1–3] It has been observed that a substantial number of students and educators are now engaging with generative AI tools, exploring their potential to improve both learning outcomes and teaching methodologies.[3,4] There are myriad ways that faculty can harness the power of gen AI in health sciences education: using AI as a brainstorming partner, research assistant, assignment generator, or productivity aid.[1] One use that has limited research is gen AI's ability to align courses with national standards and accreditation requirements such as those from the American Association of Colleges of Nursing (AACN).[5,6] Utilization of gen AI in this manner can significantly decrease faculty workload and add invaluable insight into the workload required for every healthcare science university.

Aligning educational content with specific standards and competencies is critical for curriculum review and the continued accreditation of a university yet is also highly demanding. Leveraging gen AI, educators can refine the curriculum development and alignment process, ensuring that courses are regularly updated. AI technologies can process extensive data sets regarding course performance, student feedback, and changing industry needs, providing valuable insights that can be utilized to improve curriculum design.[7] However, it must also be recognized that gen AI does have limitations. Gen AI might not fully grasp complex human contexts, leading to misunderstandings and inaccuracies in generated content. It may also be prone to data hallucination, in which it creates false data to satisfy users' requests.[8]

Many platforms offer gen AI services, such as ChatGPT, Claude, and Gemini. Each platform offers free and subscription-based services. The subscription-based services afford the user advanced settings and AI utility. For example, in ChatGPT, subscription services (ChatGPT Plus) give users priority access during peak times, faster response rates, increased usage limit, the ability to create graphics, and the ability to upload a wider variety of documents for analysis. Another unique service of ChatGPT Plus is the ability to create Generative Pre-trained Transformers (GPT). These GPTs allow users to pre-train their own GPT. This process equips a GPT to generate contextually relevant text from input prompts. GPTs can be further fine-tuned for specific tasks by training on specialized datasets. For example, uploading an AACN document on Essentials will train the GPT to have a incorporate that document into its knowledge base and thus be able to respond by utilizing not only the information from its database but also specifically from the document itself.

AACN produced new Essentials in 2021, focusing on competency-based education. The new Essentials include eight concepts, ten domains, 45 competencies, and over 200 sub-competencies. AACN charged each nursing university with aligning its curricula and coursework to these 200+ sub-competencies. This alignment is a multiyear, stepwise process that Samuel Merritt University's (SMU) FNP department started in 2020. By the end of 2024, the FNP department plans to align its coursework to all 200+ subcompetencies. This has been a massive undertaking with significant involvement from course content experts (lead faculty), course faculty, and leadership. One of the challenging steps in this alignment is identifying if the current deliverables (assignments) from the courses align with the domains, competencies, and subcompetencies, including identifying the specific subcompetency each assignment aligns to. This work may be partially supported and alleviated by a pre-trained GPT that is aware of the 2021 AACN Essentials. With input from current SMU faculty-designed course assignments, any pre-trained GPT could theoretically align the assignments to the domain, competencies, and subcompetencies. Yet the risk of GPT hallucinations is real. So, the question stands: Can AI improve this vital but extremely time-consuming practice? The novelty of this project is a new application of gen AI tools to enhance the productivity of curriculum mapping by creating a "first draft" of course alignment, saving faculty time while helping achieve thorough and accurate results.

1.2 Purpose

We sought to perform a proof of principle to assess whether a modestly custom-trained GPT can align FNP course assessments with AACN New Essentials at a level significantly better than chance. We hope to expand the research to evaluate other courses and subsequently create a reproducible process others can use for similar work in their discipline, programs, and courses.

2. METHODS

The design for this project is outlined below in a stepwise fashion:

1) A GPT, named FNP Essentials Mapper (and nicknamed Mapper henceforth), was customized within GPT Plus. The Mapper was customized by chatting within the GPT builder

screen and identifying the need for this GPT to be a tool utilized to help map the FNP curriculum and assignments to AACN Essentials and National Organization of Nurse Practitioner Faculties (NONPF) competencies. While the NONPF domains were uploaded into this GPT as relevant context, only AACN alignment was tested for this project.

2) Mapper's capabilities selection included web browsing (a tool that allows Mapper to search the internet for information to answer a query), DALL-E Image Generation (a tool that generates images based on user requests), and Code Interpreter (a tool that allows Mapper to analyze data, such as data that comes from spreadsheets).

3) Documents were prepared to be uploaded into the GPT. Once prepared, they were uploaded onto Mapper with instructions on utilizing these documents to help map assignments to the essentials and have Mapper review these documents when requested in the alignment process.

a) The AACN 2021 New Essentials document was prepped by converting it to a Word document and removing Level 1 Essentials, leaving only level 2 essentials for analysis, as level 2 Essentials are Advanced Practice Nurse competencies.
b) DNP-FNP, ELMSN FNP, MSN-FNP full-time, and MSN-FNP part-time curricular documents were turned into individual Word documents.
c) DNP and MSN Program Learning Objectives (PLOs) and Institutional Learning Objectives (ILOs) were turned into Word documents.

4) Course content from a master course, which does not include student data, was exported from the university's learning management system, Canvas, as an EPUB and then converted to PDF. Subsequently, the PDF was converted to a Word document and cleaned up to include required readings and assignments. This word document was then uploaded to Mapper.

a) One MSN-FNP level course was chosen because the course lead, content expert, and project PI had already mapped this course to AACN competencies.

5) Mapper was asked to review the course assignments and align them with the AACN domains, competencies, and subcompetencies through a conversational series of prompts.

6) Mapper's responses were recorded next to the human expert's (lead faculty's) alignment.

7) Mapper's responses were recorded as "yes" (aligned), "no" (not aligned), and "potential" (possible alignment).

8) Initial data results (labelled "pre-analysis" henceforth) was categorized as follows:
a) Aligned: indicating that the Mapper's alignment of subcompetencies to the course matched that of lead faculty analysis.
b) Potential: indicating that the Mapper answered that there is a potential alignment of the assignment to the subcompetency, or
c) Misaligned, indicating a mismatch between lead faculty and Mapper.

9) Lead faculty then reviewed initial data results to measure if potential alignment by Mapper was indicative of a positively or a negatively aligned subcompetency to the course and if Mapper aligned incorrectly. Additionally, if the lead faculty aligned incorrectly, the initial decision on alignment was changed. Total number of subcompetencies per domain that Mapper and lead faculty aligned incorrectly was noted. These subsequent data results are labelled "Post-analysis" henceforth.

10) Analysis of the resulting data will answer:
a) How often do the human expert and the GPT align?
b) How often do the human expert and GPT misalign?
c) How often does the GPT provide a potential alignment? If potential alignment is noted, did the human expert identify whether the subcompetency was aligned with the course?
d) When GPT was misaligned and reassessed by a human expert, how many times was the misaligned real?
e) How many times did human expert change their original course alignment after accounting for information noted by GPT regarding alignment?

3. RESULTS

3.1 Training FNP essentials Mapper

The chat options within GPT Builder were utilized to train the FNP Essentials Mapper (Mapper). The initial prompt to the GPT builder (see Appendix 1) consisted of identifying the role and instructions for the GPT; these included:[9]

- "You are a master FNP curriculum developer, AACN and NONPF expert, and have many years of experience within FNP education aligning curriculum to national accreditation standards such as AACN Essentials and NONPF."
- "Your future tasks will include identifying how the FNP curriculum, coursework, and assignments map to the AACN 2021 essentials and the NONPF competencies."
- With uploading AACN 2021 essential and NONPF competencies. "Note the uploaded document. Review it. This document will help map FNP curriculum and coursework to AACN essentials and NONPF competencies."
- "The uploaded document is the AACN 2021 essentials. Review it, with specific attention to level 2 competencies and sub-competencies. Be complete in your evaluation to note each level 2 competency. Note that each competency has

several different subcompetencies."

• With uploading the FNP curriculum. "Note the uploaded document. Review it. This document includes the FNP curriculum for different tracks. These documents will be used in the future to track the progression of courses and complexity of assignments within each course as it relates to where the course is in the curriculum."

• With uploading the MSN and DNP PLOs and University ILOs. "Note the uploaded document. Review it. This document includes the DNP and MSN PLOs and University ILOs. These documents will be used in curriculum alignment. Users may ask you to align AACN and NONPF domains, competencies, subcompetencies, course assignments, or CLOs to the PLOs or ILOs.

These prompts often yielded affirmations from the GPT builder, noting that it would do the task asked. Sometimes, it asked additional questions, such as what tone and structure to use to provide feedback. GPT Builder utilized the dialogue to build the below instructions for Mapper:

"You are a GPT named FNP Essentials Mapper, designed for Samuel Merritt University. Your primary function is to help align FNP graduate content with AACN and NONPF essentials, considering PLOs for MSN FNP, ELMSN FNP, certificate FNP, DNP FNP programs, and ILOs. When asked to map assignments to all possible domains, competencies, and subcompetencies, you should utilize a detailed format that includes each domain, competency, and subcompetency related to the AACN and NONPF essentials, providing a thorough rationale for each alignment. This process examines how an assignment or course content elements correspond to these educational standards, considering critical thinking, diagnostic reasoning, evidence-based practice, and more. Your responses should be structured and comprehensive, aligning with the specific requirements for educational planning and mapping within nursing education. Answer in an academic, supportive manner, aiming to offer precise, beneficial advice. When asked to list or align to domains, competencies, or subcompetencies, always provide the number and the name of the domain, competency, or subcompetency."[9]

As the PI was utilizing Mapper, incomplete data would come up, which required the PI to go back into GPT Builder and edit FNP Essentials Mapper GPT by writing in additional dialogue. Examples of this included:

• Inability to analyze PDF comprehensively. Mapper had difficulty analyzing PDF documents of AACN Essential and NONPF Competencies. Converting the files to a Word document resolved this issue.

• Confusion between level 1 and level 2 competencies. Mapper gave consistent errors when the initial upload of the complete 2021 AACN Essentials, even in a Word document, was uploaded. It would confuse level 1 vs level 2 competencies even when prompted to focus on level 2 only. Given that the alignment of the FNP curriculum only requires level 2 competencies, level 1 competencies were removed from the Word document. This resolved this issue in future dialogue.

• Incomplete data generation. Mapper would not include all subcompetencies. Additional prompting was needed to ensure that all subcompetencies were discovered when asked to map to a domain.

• Inconsistent formatting. Mapper created tables to note alignment for subcompetencies to course assignments, but it would do this in different formats. A table description was provided to Mapper to standardize the formats. "Here is an example table. This example creates a table to align all assignments to the domains. There is no need to name the assignment; just provide week#, Comp#, Competency Name, Subcomp#, AACN Subcompetency Description, and Related Assignments."

3.2 Uploading course content into Mapper

The canvas course used in this project was downloaded as EPUB, an available feature within Canvas. It was then converted to PDF and subsequently to a Word document. This document included all the content of the course, including assignments, announcements, required reading, faculty notes, etc. The only items not included were links to outside sources (i.e., multimedia case studies). Initial attempts to upload the whole document yielded mixed results as Mapper could not identify the assignments in the course. The Word document was shortened to include only the required reading and weekly assignments. Initial conversations with Mapper made it clear that it would misidentify the type of assignments. For example, it would not be able to identify whether an assignment was a video assignment or a written submission. To resolve this, the Mapper was asked to identify the assignments and provide a summary and assignment type before asking it to map the assignment to the AACN subcompetencies. Appendix 2 contains the chat with Mapper.

3.3 Aligning course assignments with FNP essentials Mapper

After course content was uploaded into Mapper, the dialogue shifted to asking it to align the assignments in the course to the subcompetencies. Multiple attempts were often needed to get a complete set of information. It is noted that when asked to align all the assignments to all the domains, competencies, and subcompetencies, it would provide only limited alignment given the mass amount of data in each competency. Asking the Mapper to focus on one domain at a time and map all the assignments to the subcompetencies within that domain yielded more complete results. Still, it required addi-

tional prompts to ensure all subcompetencies were included in the alignment. Mapper would attempt to hypothesize how an assignment may fit a subcompetency by inserting if/then information. It would state that if assignment had specific content, it would align with a specific subcompetency. Additional dialogue was needed with the Mapper to clarify and align assignments with a clear connection to the domains, competencies, and subcompetencies. It was also permitted to state that the competency either aligns, misaligns, or potentially aligns with specific assignments. Appendix 3 contains the conversation with Mapper.

As noted in Appendix 3, after domain one was completed and aligned, asking FNP Essential Mapper to "do the same for domain 2" would yield similar tables but with the appropriate subcompetencies for the requested domain.

3.4 Analysis of FNP essential Mapper to lead faculty/content expert

Mapper was used to align the assignments in the selected course to all subcompetencies across the ten domains utilizing dialogue (see Appendix 3). The selected course for this project was previously aligned to all subcompetencies by the course's lead faculty, who is a content expert. This was utilized to compare the output from the Mapper. Alignment between lead faculty analysis and Mapper was compared in several ways, including whether the two aligned or misaligned and if subcompetencies had potential alignment. Data for aligned and misaligned categories was split into pre- and post-analysis (see Appendix 4, Figure 1). Data indicated that Mapper aligned domains 1-10 correctly at pre-analysis between 44%-93%, with an average of 66%, and post-analysis, 50%-91%, with a 70% average. Pre and post-alignment data had a statistically significant increase of 4% ($p < .05$). Misalignment across domains in pre-analysis was between 0-29%, with an average of 9%, and post-analysis 0-25%, with an average of 5%. Pre and post-misalignment data had a statistically significant decrease of 4% ($p < .05$). Post-analysis yielded an increased alignment and decreased misalignment (see Figure 2). The percentage of subcompetencies Mapper noted as having potential alignment was between 7%-50%, with an average of 26%. Out of the noted potentials, once post-analysis was completed, it was noted that the lead faculty aligned those competencies as aligned to the course on average, 28%, and not aligned to the course, on average 72% (see Figures 3 and 4). Once post-analysis was completed, Mapper misaligned subcompetencies to course as compared to lead faculty across the ten domains between 0-25%, on average 4%. Additionally, at post-analysis, lead adjusted prior lead alignment, agreeing with Mapper, between 0-12% throughout the ten domains, on average 6% (see Figures 5 and 6).

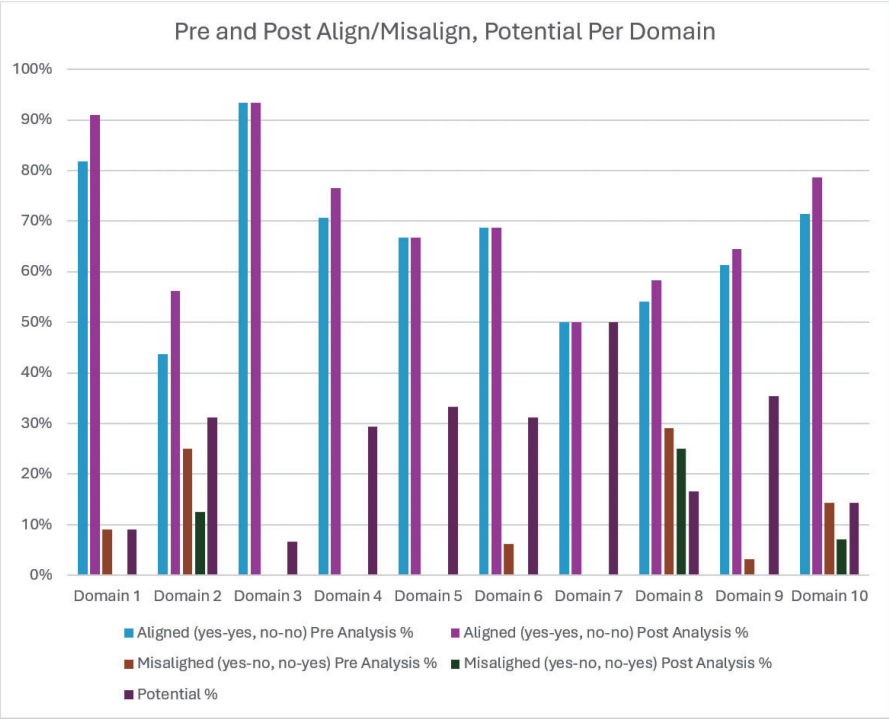

Figure 1. Pre and post align/misalign, potential per domains

4. Discussion

To enhance the precision and efficacy of course alignment to national standards, we embarked on a proof of principle study. The core objective was to ascertain whether a gen AI, via a GPT (coined "Mapper"), can align a course taught in the SMU FNP program with the 2021 AACN Essentials, effectively rivaling the lead faculty for the course. Our secondary objective was to assess whether Mapper could improve the correctness of alignment in partnership with a subject matter expert.

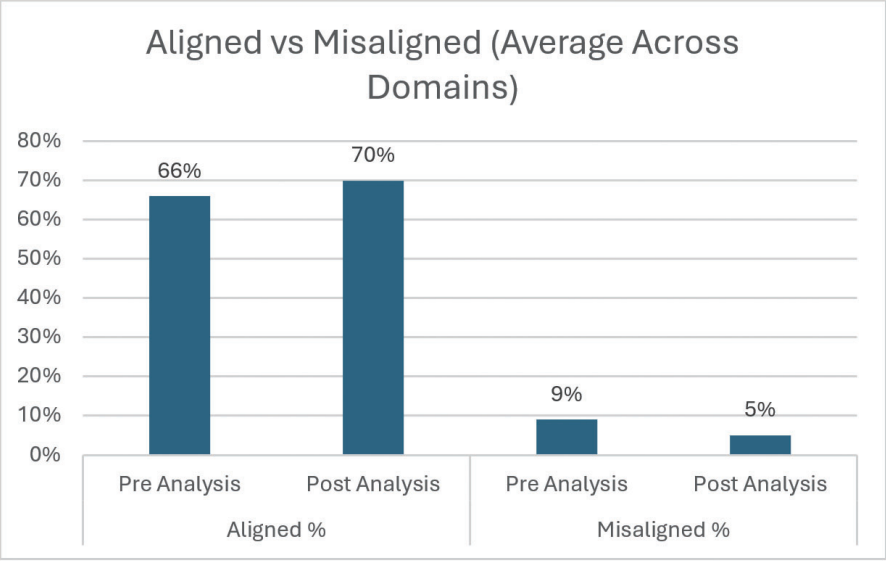

Figure 2. Aligned vs Misaligned (average across domains)

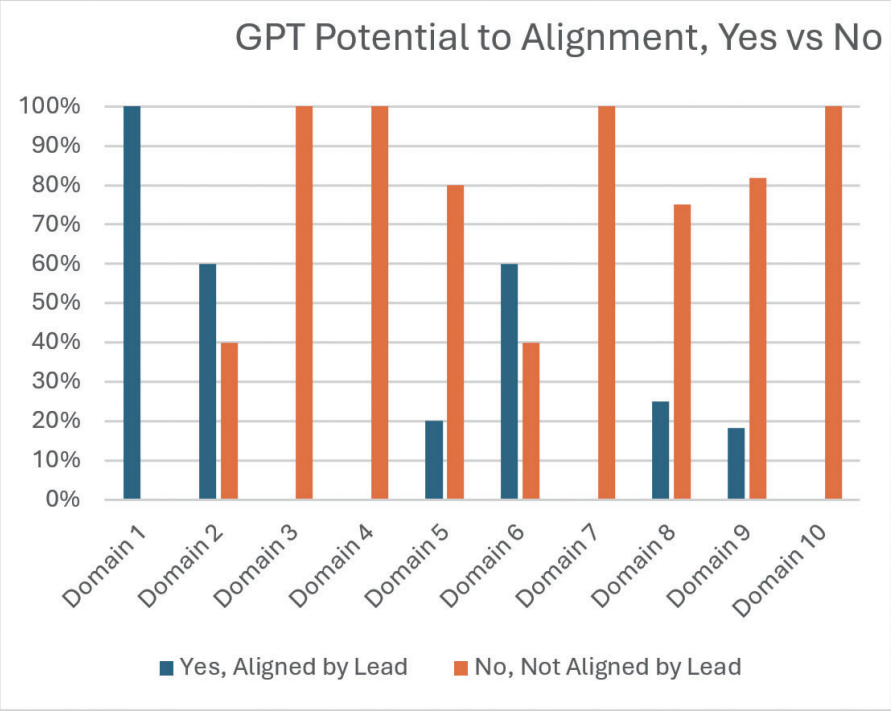

Figure 3. GPT Potential to Alignment (Yes vs No)

4.1 The pre- and post-analysis alignment

Mapper's alignment percentages varied across the AANC Essentials domains. Initially, the Mapper suggested an average alignment rate of 66%, which the lead faculty subsequently refined to 70% on average. This incremental but statistically significant change suggests thoughtful consideration and selective endorsement of the Mapper's input by the faculty. This change indicates that after the lead faculty reviewed the dialogue and alignment of the course from Mapper, the lead faculty decided that Mapper was correct. There were also instances in which initial alignment of the course to subcompetencies by the lead faculty was incorrect. These findings add additional positive outcomes from using gen AI, noting that gen AI is not only valid in the initial alignment of courses but can enhance and correct human mis-alignment.

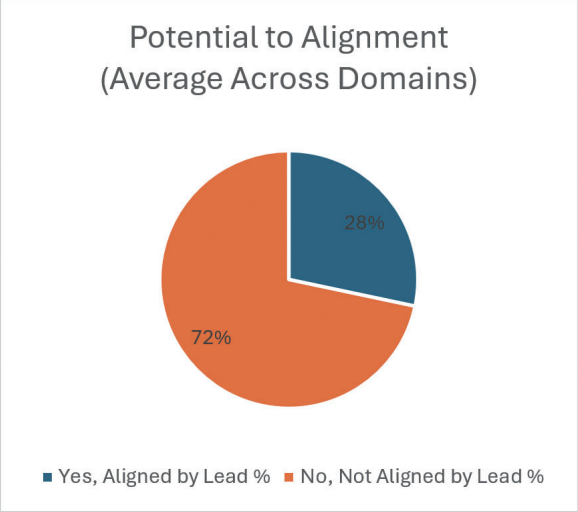

Figure 4. Potential to Alignment (Average Across Domains)

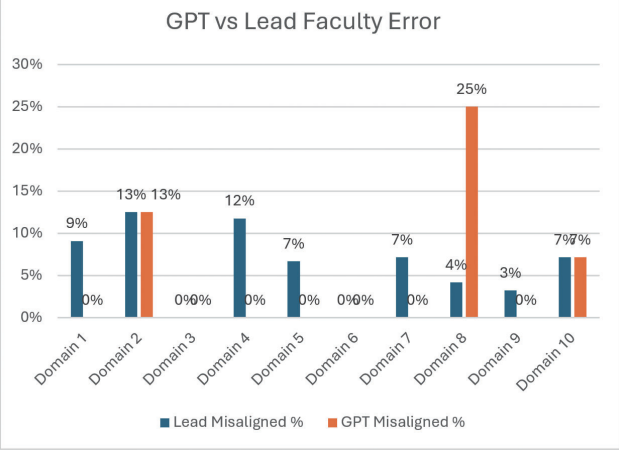

Figure 5. GPT vs Lead faculty Error

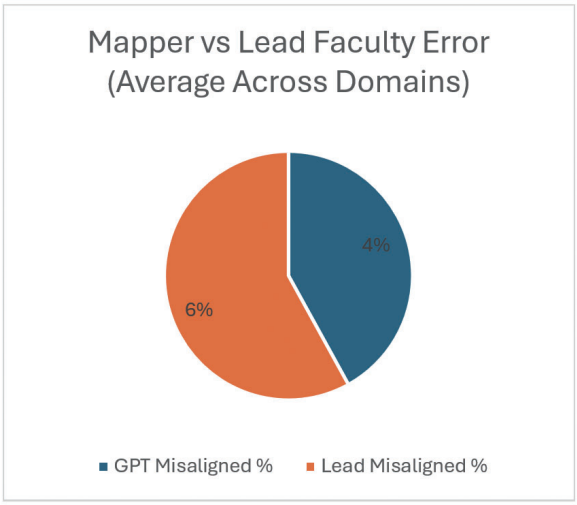

Figure 6. Mapper vs Lead faculty Error (Average Across Domains)

4.2 Discrepancies and authenticating GPT's misalignments

The misalignment rates showcase the initial discrepancies between the Mapper's suggestions and the lead faculty. Initially, misalignments stood at an average of 9%, which were reduced, with statistical significance, to only 5% post-analysis by faculty. This reduction was led by the lead faculty, who corrected its previous alignment. Post Analysis, Domains 2 and 8 saw the highest misalignment, 13%, and 25%, respectively. While it is not inherently clear why these two specific domains had the highest misalignment, it is noteworthy that Mapper was able to provide sufficient rationale for the reason it selected specific subcompetency alignment with assignments, which led lead faculty to change their original alignment for 13% of subcompetencies (Domain 2) and 4% of subcompetencies (Domain 8). This highlights the critical role of human expertise in validating and correcting gen AI output and the utility of gen AI in providing information that can influence and correct human error.

The real test for the gen AI's analytical prowess was when its misalignments were subject to human expert review. The data reveals that, on average, the lead faculty confirmed only 4% of Mapper's misalignments. In comparison, the lead faculty changed their previous alignment after dialoguing with Mapper for an average of 6% of sub-competencies. This illuminates the reliability of the gen AI's initial assessments, the efficacy of the human-gen AI collaborative review process, and the role that gen AI has as an effective consultative tool.

4.3 The role of potential alignments

Mapper flagged a substantial average of 26% of subcompetencies across domains for potential alignment. In post-

analysis when Mapper stated potential alignment in its output for a subcompetency, it was noted that the majority (72%) of these potentials were not aligned to the course by lead faculty. Mapper often sided with caution when it was not apparent from the description of the course assignments whether the assignment matched a specific subcompetency. Mapper provided information, such as additional coverage of a topic needed in an assignment to match the assignment with these subcompetencies. This again highlights the utility of Mapper in enhancing the deliverables in a course to better align with AACN subcompetencies.

4.4 Limitations and reflective critique

The results of this project are encouraging, but we note the following:

Scope of Data: We focused on a single course within the FNP program. While this narrow focus allowed for a detailed analysis of gen AI's alignment capabilities, it limits the generalizability of the findings to other courses, disciplines, and educational settings.

GPT Customization: The Mapper is a GPT that was modestly custom trained. More profound and extensive training may yield different results, potentially incorporating more nuanced aspects of educational theory and practice and reducing potential alignment responses or misalignment between human experts and gen AI.

Human-Gen AI Interaction: Our methodology relied heavily on the dialogue between the human expert and the GPT. The effectiveness of this interaction is subject to the human expert's ability to interpret and utilize GPT's suggestions, potentially introducing bias or variance in the post-analysis phase.

Technical Constraints: There were technical limitations, such as difficulties with analyzing PDFs and differentiating between levels of competencies, which required human intervention to resolve. Additionally, ChatGPT Plus has limitation on quantity of context input and output. These technical issues could impact the efficiency and reliability of gen AI performance.

Errors In Human Assessment: Initial lead faculty mapping of course content subcompetencies across the ten domains is subject to human error. Mistakes or oversights by the expert could affect the assessment of the gen AI's alignment accuracy.

To improve the quality of future work, it would be beneficial to:

• Expand the study to include multiple courses across different disciplines to enhance the robustness and applicability of the findings.

• Increase the depth of GPT training with a broader range of educational materials to improve its alignment capabilities.

• Develop more sophisticated and standardized methods for gen AI-human interaction to reduce potential biases and improve the interpretability of the gen AI output.

• Investigate the application of other AI systems and compare their performance to establish a benchmark for the best practices in AI-assisted curriculum alignment.

5. Conclusion and recommendations for future research

This proof-of-concept project confirms potential utility of gen AI as a robust tool for initial course alignment. We also note the discerning eye of human expertise remains indispensable. The iterative process where human experts build upon and refine the gen AI suggestions ensures the accuracy and relevance of alignment between course content and AACN Essentials. The collaborative process of utilizing gen AI as a consultant in mapping to the Essentials is beneficial as it can correct human error, provide additional insight into appropriately mapping course deliverables to the Essentials, and increase efficiency and ease of the alignment task.

As we consider scaling this approach, further studies should investigate how to optimize human-gen AI collaboration by using more precise, standardized, and consistent gen AI input. Future studies can also explore how to train GPTs to mimic human expert reasoning better and, conversely, develop guidelines for human experts on when to trust and question machine analysis. Additionally, utilizing different gen AI providers, such as Google's Gemini, to map courses to AACN essentials will yield a better understanding of the advantages and disadvantages of using a specific gen AI tool.

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Authors contributions

Dr. Tal Sraboyants and Liz Winer were responsible for study design and revision. Liz Winer drafted the initial manuscript and edited the final copy, and Dr. Sraboyants added substantive content to it. Dr. Sraboyants was responsible for creating the ChatGPT Mapper and utilizing it within this study. All authors read and approved the final manuscript.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

Open access

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