**Leveraging AI and Girvan–Newman Analysis to Explore Student Use of AI in Learning and Integrating Pharmacology**

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**Introduction:** The integration of artificial intelligence (AI) tools into educational environments has accelerated, with students increasingly relying on generative AI platforms to support their learning. Understanding how students engage with these tools is essential for informing instructional strategies, curriculum design, and policy development. Network analysis methods—particularly the Girvan–Newman algorithm—offer a novel approach to uncovering community structures within student response data, enabling researchers to identify patterns in behavior and sentiment related to AI usage.

**Aims:** The purpose of this study was to (1) examine dental student use of AI tools for studying and learning, (2) identify distinct communities of AI usage behavior using the Girvan–Newman algorithm, and (3) evaluate the utility of AI language models in assisting with both qualitative and quantitative analysis of survey data.

**Methods:** A total of 100 first-year dental students were surveyed regarding their use of AI tools to integrate general pharmacological principles into their understanding of gastrointestinal physiology. The survey, administered via the PollEverywhere platform, included both structured questions and an open-ended comment section. Survey items were categorized to assess student attitudes toward AI-assisted studying and their use of AI for integrating pharmacological concepts. Descriptive statistics were computed to summarize the responses. A network analysis using the Girvan–Newman algorithm was conducted to detect community structures within the dataset. Three AI language models—ChatGPT (GPT-4), Claude, and Gemini—were employed to assist with thematic coding, sentiment analysis, and interpretation of the identified communities.

**Results:** The Girvan–Newman analysis revealed several distinct clusters of student behavior related to AI usage. The AI models demonstrated consistency in thematic labeling and provided complementary insights. Claude’s analysis emphasized empathetic and ethical dimensions, highlighting student uncertainty and the need for institutional support structures. GPT-4 offered strategic, curriculum-oriented interpretations, identifying actionable recommendations for educators based on student readiness and engagement. Gemini focused on network structure and bridging roles, providing observational insights with less depth in thematic interpretation.

**Discussion:** The integration of AI tools in both student learning and research methodologies presents a dual opportunity: enhancing educational practices and advancing analytical capabilities. The Girvan–Newman algorithm proved effective in revealing nuanced behavioral clusters, while AI models facilitated rapid, scalable interpretation of qualitative data. Triangulating insights across different AI platforms enriched the understanding of student sentiment and behavior, supporting the development of inclusive and adaptive instructional strategies. However, the use of AI in educational research also raises important considerations regarding bias, transparency, and the evolving role of educators in guiding responsible and ethical AI engagement.