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Adnan Qayyum

Associate Editor, Athabasca University

Bicycles of the Mind: Technologies for Empowering People

Steve Jobs used to call the personal computer “a bicycle of the mind.” Humans, on their own, are quite inefficient at moving when measured by distance travelled per unit of energy spent. But a person on a bike can move more efficiently than any bird, animal, or fish. This machine combined with human brains and power vastly enhanced human abilities. Jobs’ hope was that a computer would have the same transformative effect for humans. In automation theory, a person on a bike is a *centaur*: a person who controls a technology to enhance their abilities. There are many everyday examples of centaurs, including spell check in word processors or auto-brakes in cars. But there is also a *reverse centaur*: the technology directs the person, making the person an appendage to the machine. An Uber driver with a checklist of pickup locations on their Uber app is a reverse centaur. They are physical operators that have to surrender navigation decisions to the machine (which are just manifestations of employer policies).

Cory Doctorow underscores this difference between a centaur and reverse centaur to argue that we should not focus just on what a technology does, but who it does it for and who it does it to. The central question should be: how does the technology affect people, and their agency? It can be easy to lose perspective on how to analyze any technologies in education and other fields, especially amid the tsunami of opinions and research on artificial intelligence and the breakneck pace of change of new frontier AI models. But coming back to focus on people, how they are affected, their agency and opportunities, that is what matters.

The AI Discussion

In this issue, we have two research articles and three special reports that discuss AI. In “Artificial intelligence in online learning: Using BERTopic to track research topics and their evolutions,” **Chen et al.** used a topic modelling technique to analyze over 1000 publications on AI in online learning. They identified the major research topics in the field of AI in online learning, and the evolution of this research. Early research on AI in online learning focused on topics such as AI-automated grading, AI-generated feedback, and adaptive testing. More recent research is on machine learning methods and deep learning approaches that can act as platforms for applications to understand learner behaviours, forecast outcomes, and improve educational decision-making. They propose a conceptual model to guide AI research and practice in online learning, by integrating four components: data, AI processing, adaptive learning, and learner development.

In “The 20-year evolution of distance education: A bibliometric and LDA-based topic model analysis,” **Yavuz, Balat, Kayali, and Gulen** studied research trends in distance education. They used a machine learning method, Latent Dirichlet Allocation (LDA), to do a bibliometric analysis over 54,000 distance

education articles. They found DE grew substantially, post-pandemic, in the fields of health, management, and education. Among 19 topics of research, the most prominent were digitalization, artificial intelligence, Web-based learning, and social interaction and collaboration. As anticipated, AI and emergency distance education have been more popular topics in recent years. Notably, there has been less interest in program design.

In the first of three reports on AI and scholarship, **O’Driscoll** and **McGreal** ask who is responsible for the content of academic work when AI is used. They identify three distinct roles in the scholarship process: the animator, author/designer, and principal, based on Goffman’s idea of production format. They analyze two major issues about AI-assisted scholarship: the accountability of publishers and platforms, and the apparent displacement of the authorial role by GenAI. Their work is important because it addresses a key concern with the use of AI in education and other fields: accountability.

Bozkurt focuses on how AI affects quality control within academic publishing. He highlights the tension between efficiency gains and the preservation of integrity. AI can reduce publication delays and reviewer burnout. However, concerns continue over confidentiality, accountability, algorithmic bias, and the erosion of expert judgment. Bozkurt argues that AI should serve as an augmentative rather than substitutive technology in peer review.

Downes provides a survey of AI in scholarly publishing. He identifies six ways AI can benefit research functions including: idea development and research design; literature review and synthesis; content development and structuring; data management and analysis; editing, review, and publishing support; and communication, outreach, and ethical compliance. He also identifies important challenges of using AI for research, including: accuracy, research integrity, authorship and ownership, bias, privacy, and consent. Importantly, he discusses that AI may not be technologically ready for the complex tasks involved in academic publishing.

Research Articles

The field of open and distributed learning is about more than AI. It is foremost about access and openness in education. In “Building a framework to guide the design and development of open educational practices for the digital training of university professors,” **Esteve-Mon et al.** are interested in enhancing teacher digital competence, including competence in developing open educational resources. They create a theoretical framework to guide the design of OER-based training to integrate an open educational practice for faculty development. The framework they create focuses on reflection within the teacher’s professional development and practice.

Sing and colleagues also research open educational resources (OER), exploring how students could improve their understanding of OER by creating them. In “From consumers to creators: How student participation in OER development transforms understanding of open licensing and improves digital literacy,” they survey 57 students. They found significant improvements in how students understood open licensing, particularly Creative Commons licenses, their perceptions of how credible OER were, and their behaviour accessing different types of OER materials. By creating OER, students had more favourable attitudes and a deeper understanding of OER.

In “Between obligation and aspiration: Motivation, emotions, and systemic barriers in online professional development for rural teachers,” **Hua, Yang, and Chan** interviewed 30 rural primary and secondary school teachers in China to understand how they experience online professional development. The teachers had a positive attitude toward online professional development, but they had unsatisfying learning experiences, despite their initial optimism. The researchers found a mismatch between teachers' favorable attitudes and unsatisfying learning encounters. This may have been due to required participation, lack of internal agency in developing learning goals that informed the training design. The researchers propose three conceptual constructs to explain the complex interplay between emotional readiness and systemic limitations.

Rural education is also the focus of **Mulyani's** research, “Enrollment decline and the digital divide in rural elementary schools: Implications for equity in basic education.” He interviewed principals, teachers, parents and community leaders and observed classrooms and analyze documents to determine why there has been declining enrollments. He found several important reasons, including declining birth rates, outward migration, structural disadvantages such as remote locations and limited infrastructure, and parental preferences for private or religious schools. The decline is not just demographic but also due to systemic digital inequity.

In “Structure and content of interactions: Social presence in asynchronous online whole-class vs. small-group discussions,” **Willet, Baik, Hur and Akcaoglu** investigated how the format of online class discussions affected the structure and content of student interactions. Online classes with the whole class had greater variability in response rates, were more formal, and the communication was more analytical. The small group discussions were more supportive, and students had more social and emotional engagement. The research suggests that online discussion formats should be designed to foster specific learning objectives.

Tomak and Virvan also focused on student experiences in their research on “Blended learning in a post-pandemic context: A cross-sectional study on Turkish EFL learners' perspectives.” They observed classrooms and interviewed 24 students to understand their perspectives of blended learning. Students had ongoing concerns about engagement, socialization, the assessment integrity of online education. Students were more accepting of blended learning since their pandemic experiences. For speaking English and group work, students still preferred in-person instruction.

In “Does interaction quality enhance motivation among online postsecondary students? Exploring the mediating role of anxiety,” **Barri** studies how anxiety affects interaction and motivation among online students. While interaction and motivation are well-studied, there is less research about how anxiety affects each. Barri uses structural equation modelling to analyze a survey of 140 students. The findings showed that anxiety fully mediated the relationships between student-content and student-instructor interactions and motivation, and partially mediated the relationship between student-student interaction and motivation. The results indicate that reducing anxiety and supporting motivation are important to consider for online instructors.

In “An exploratory factor analysis of the online information literacy self-efficacy (OILS) instrument,” **Zarkhov, Traynor, and Maybee** create a self-efficacy instrument for online information literacy. They

analyze a 30-item survey of 259 students. Using EFA, they found four factors that explain substantial variance in the response patterns about online information literacy self-efficacy: scoping research topics, obtaining information, evaluating information quality and producing research documents, and crediting sources. The instrument measures students' confidence in applying information literacy skills in online settings.

Avci and **Güven**, in “Systemic vulnerabilities in online education: Diagnosing and meeting K–12 teacher preparation needs,” created and evaluated a 5-week in service teacher training program that enhanced teacher's online education competencies. They did a needs assessment of 21 teachers, as well as learning analytics and pre/post test assessments. The results suggest that teachers benefit from being online students before they become effective online instructors.

In “*Predicting student outcomes in open high schools using educational data mining*,” **Polat** and **Horzum** used data mining to analyze the academic trajectory of 484,000 students enrolled in open high schools. They found that academic and administrative features of open high schools, particularly total credits accumulated and initial enrollment type, are more important predictors of completion or dropout than demographic variables. This suggests that retention policies should identify at-risk students using predictors such as low-credit accumulation rates and high-risk enrollment types.

Book Notes and Literature Reviews

In our book notes, **Xiao** reviews Mark Nichols open access book on *Mega-Universities and Opening Education*. The book is meant to be a revisit of John Daniel's 1996 book *Mega-Universities and Knowledge Media*, and includes a foreword by Daniel. Xiao identifies that the 14-chapter book explores four facets of openness in higher education: availability, inclusiveness (from the students' perspective), scalability, and sustainability. Xiao notes that interesting case studies in the book include the Open University of China and Southern New Hampshire University in the United States. Nichols provides five strategic considerations for mega-universities and those seeking mega-university status. Xiao found the book is optimistic about using digital technologies, including Gen AI, to expand higher education at scale. He finds the book to be an inspiring and valuable reference.

We have two literature reviews, one on clinical learning technologies and the other on the community of inquiry framework. In “Novel technologies in nurse practitioner education: An integrative review,” **Girard** and her colleagues conducted a literature review about the use of these clinical learning technologies in nurse practitioner education. These technologies include high-fidelity simulation, immersive virtual reality, augmented reality, and holographic simulations to support learning and improve retention. From the 11 studies that met the inclusion and exclusion criteria, five primary themes emerged: student uptake, student learning, change management, accessibility, and confidence. From their research, they suggest that integrating advanced clinical learning technologies into nurse practitioner programs should be a priority.

In “A systematic review of using social and epistemic network analysis methods in community of inquiry research,” **Don**, **Lowell**, and **Hsieh** synthesize findings from 43 empirical studies that focus on applying social and epistemic network analysis methods within Community of Inquiry research. Focusing on these two methods, they found them to be valuable for investigating interaction patterns, refining CoI theory,

examining community formation and evolution, analyzing discourse and knowledge construction, and tracing the development of CoI presences. The study will be of interest to CoI researchers and designers of online learning communities.

