Research from the Office of RIDIL

Artificial Intelligence in Higher Education

This white paper provides a summary of the work from:

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Overview

There has been a rise in the capabilities and the use of artificial intelligence (AI) in higher education since 2016. AI is being used to conduct tasks and provide new types of information for higher education instructors, students and administrators.

Purpose of the Research

The purpose of this research is to conduct a systematic review to examine extant publications of how AI has been used in higher education teaching and learning from 2016-2022.

The initial questions provide context on the research examined, such as the countries, researcher affiliations, and years of publications. The main question of this study, shared in this white paper is: *What are the applications of AI in higher education?*

Method

A PRISMA systematic review methodology was used to determine the articles that would be included in this systematic review. Then, a grounded coding approach revealed the trends in answering this research question.
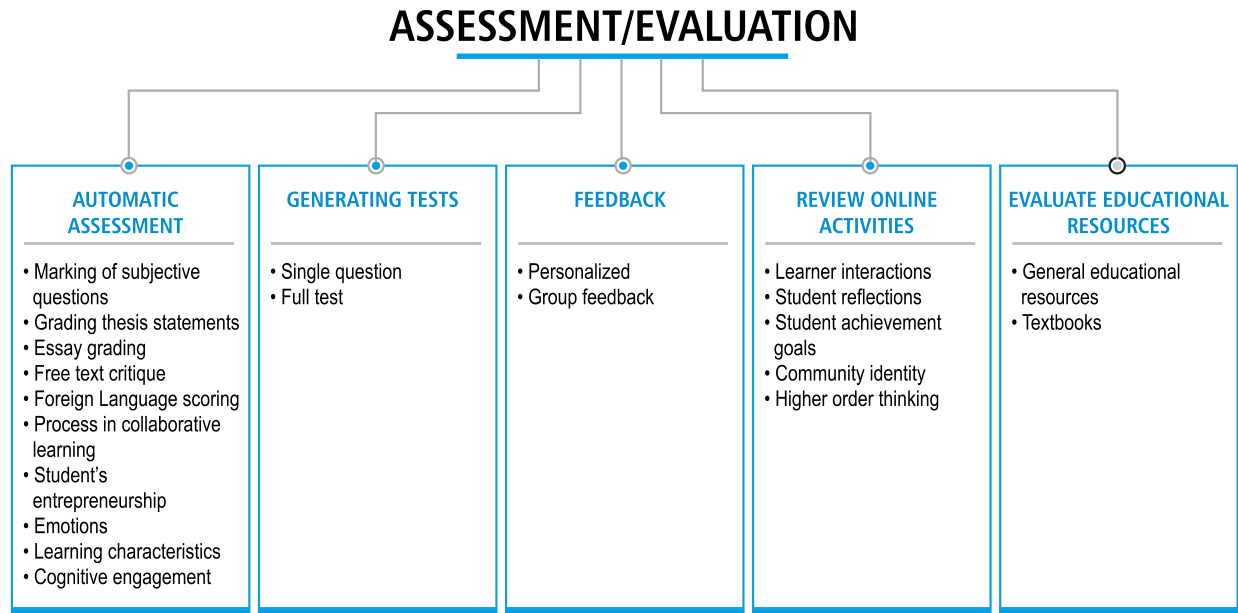
Findings and conclusions

The findings revealed five specific areas where AI is used in higher education: (1) Assessment/Evaluation, (2) Predicting, (3) AI Assistant, (4) Intelligent Tutoring System (ITS), and (5) Managing Student Learning. The research provided further details on AI use for each of these areas and these are provided in the following figures and descriptions:

Assessment and Evaluation

Of the uses of AI in HE, assessment and evaluation were the most common. Figure 1 shows the five trends in assessment/evaluation.

Figure 1. Five Trends in AI Assessment and Evaluation

ASSESSMENT/EVALUATION

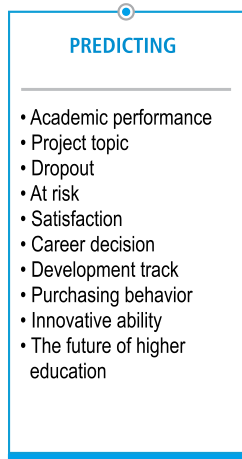| AUTOMATIC ASSESSMENT	GENERATING TESTS	FEEDBACK	REVIEW ONLINE ACTIVITIES	EVALUATE EDUCATIONAL RESOURCES
• Marking of subjective questions • Grading thesis statements • Essay grading • Free text critique • Foreign Language scoring • Process in collaborative learning • Student's entrepreneurship • Emotions • Learning characteristics • Cognitive engagement	• Single question • Full test	• Personalized • Group feedback	• Learner interactions • Student reflections • Student achievement goals • Community identity • Higher order thinking	• General educational resources • Textbooks

AI automated assessments supported a variety of learners with diverse needs as well as reducing the time it takes for instructors to grade. AI is a powerful tool in assessment with the ability to analyze multiple data sets. AI also supports instructors in generating questions and creating multiple question tests Researchers found that AI technologies can generate realistic short-answer questions. The ability for AI to develop multiple questions is a highly valuable affordance in saving time while producing quality questions. The study was across all higher education modalities. Nonetheless, a trend revealed the benefits of AI in online assessment and evaluation, specifically highlighting student's reflections, achievement goals, community identity, and higher order thinking.

Predicting

Ten types of predictions were revealed from the data, and these are found in Figure 2. Prediction was also a trending use of AI in other systematic reviews (e.g., Chu et al., 2022; Hinojo-Lucena et al., 2019; Ouyang et al., 2022; Zawacki-Richter et al., 2019). Note that many of these are outside the classroom with student management.
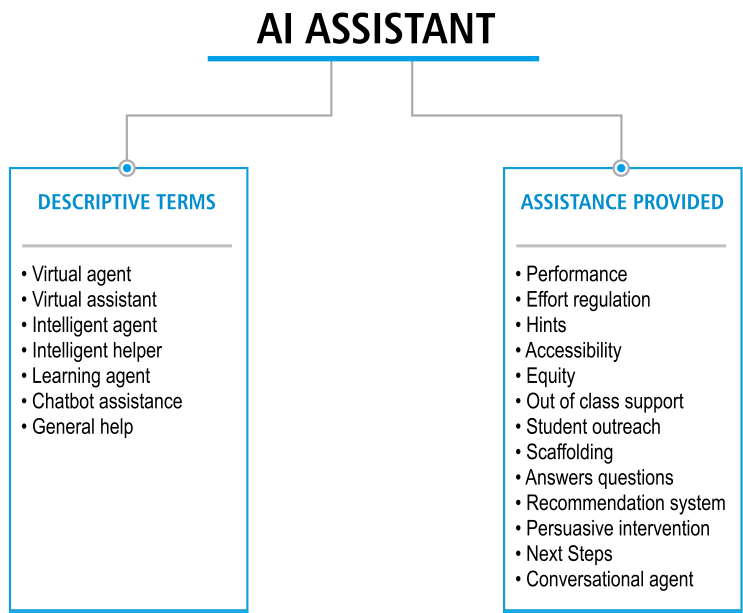
Figure 2. AI Predicting

PREDICTING

- Academic performance
- Project topic
- Dropout
- At risk
- Satisfaction
- Career decision
- Development track
- Purchasing behavior
- Innovative ability
- The future of higher education

AI Assistant

AI assistants provide a variety of services for students. Various terms are used in the literature to describe AI tools that provide assistance. These terms can be found in the left column of Figure 3. In the right column, the different types of assistance are listed.

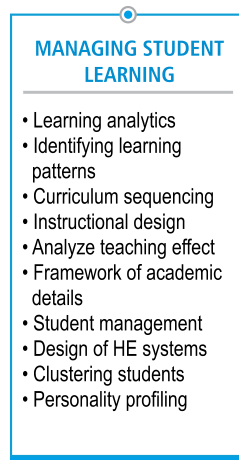Figure 3. Terms and Assistance Provided by AI

AI ASSISTANT

DESCRIPTIVE TERMS

- Virtual agent
- Virtual assistant
- Intelligent agent
- Intelligent helper
- Learning agent
- Chatbot assistance
- General help

ASSISTANCE PROVIDED

- Performance
- Effort regulation
- Hints
- Accessibility
- Equity
- Out of class support
- Student outreach
- Scaffolding
- Answers questions
- Recommendation system
- Persuasive intervention
- Next Steps
- Conversational agent

Intelligent Tutoring System

ITS systems are adaptive instructional systems that involve the use of AI techniques and educational methods. An ITS system customizes educational activities and strategies based on a student's characteristics and needs (Mousavinasab et al., 2021). This trend in the literature does not have a figure breaking the ITS into further parts as an ITS naturally has multiple parts in its system.

Managing Student Learning

This trend highlighted the use of AI in managing student learning. Again, those affordances of being about to look across large amounts of data from different sources is especially valuable in this area. The ten areas revealed in this study, see Figure 4, connect directly to students, but also shows how it is being used in learning design.

Figure 4. AI Use in Managing Student Learning

MANAGING STUDENT LEARNING

- Learning analytics
- Identifying learning patterns
- Curriculum sequencing
- Instructional design
- Analyze teaching effect
- Framework of academic details
- Student management
- Design of HE systems
- Clustering students
- Personality profiling

Conclusion

This study examined the use of AI up to 2022. Recent advancements in AI have put Generative AI at center stage. This study reveals all the other types of AI and the variety of uses available and examined through the literature. Trends in the us of SI in higher education were found in five main areas: (1) Assessment/Evaluation, (2) Predicting, (3) AI Assistant, (4) Intelligent Tutoring System (ITS), and (5) Managing Student Learning. This white paper provides a brief snapshot of the research taken from the main published manuscript. Examples of these trends can be found in the main paper with further detailed descriptions of each of the five areas.

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