Introduction and Welcome

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Background:
Blended and Personalized Learning,
Teacher Preparation,
Open Education

Technology Use

Before the Printing Press (1233)

After the Printing Press (2016)

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In-Person Learning at Worst

- Technology has drastically changed the educational landscape over the last 25 years.
- Digital tools, online resources, and devices have become prevalent in the classroom.

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In-Person Learning at Best

- Technology has drastically changed the educational landscape over the last 25 years.
- Digital tools, online resources, and devices have become prevalent in the classroom.

The Middle Ground

Blended Learning
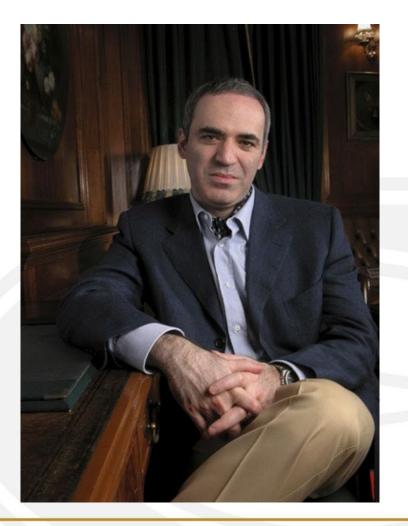
Transformative Instructional Technology – 21st Century

1. Internet and Web-Based Learning
2. Learning Management Systems (LMS)
3. Open Educational Resources (OER)
4. Mobile Learning
5. Massive Open Online Courses (MOOCs)
6. Blended Learning
7. Adaptive Learning Systems
8. Virtual Reality (VR) and Augmented Reality (AR)
9. Cloud-Based Storage and Streaming
10. Video Conferencing

Human Effort Versus Technological Effort (1985)

Technology Wins - 1997

NATURAL 'PROZAC': DOES IT REALLY WORK?

Newsweek

Man vs. Machine: The Rematch

What Computers Will Do Next

The Brain's Last Stand

Swift and Slashing, Computer Topples Kasparov

It's Kasparov Who's Blue After Defeat

■ **Chess:** World champion accuses IBM of targeting him after he loses $1.1-million match to computer.

By JACK PETERS
SPECIAL TO THE TIMES

In a shockingly sudden conclusion to their much-hyped battle, the IBM supercomputer Deep Blue took barely an hour Sunday to defeat world chess champion Garry Kasparov, clinching a $1.1-million duel between brain power and processing speed.

Kasparov resigned after the computer's 19th move in game six. Visibly upset, he stormed from the table, shrugging his shoulders. The final score was 3½-2½ in Deep Blue's favor.

At a news conference later, he lashed out at IBM for programming the computer specifically to beat him.

"It was nothing to do about science. . . . It was zeal to beat Garry Kasparov," he said. "And when a big corporation with unlimited resources would like to do so, there are many ways to achieve the result. And the result was achieved.

"I feel confident that the machine hasn't proved anything yet," Kasparov added. "It's not yet ready, in

Please see CHESS, A13

Garry Kasparov as seen on monitor during Game 6.

Did Technology Win?

"And in 1997, I was still the world champion when chess computers finally came of age. I was Mt. Everest, and Deep Blue reached the summit. I should say of course, not that Deep Blue did it, but its human creators -- Anantharaman, Campbell, Hoane, Hsu. Hats off to them. As always, machine's triumph was a human triumph, something we tend to forget when humans are surpassed by our own creations."

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Human Effort WITH Technological Effort

"We will need the help of the **new, intelligent machines** to turn our **grandest dreams into reality.**"

Garry Kasparov
Grandmaster, author, and analyst
TED2017

What is Artificial Intelligence?

- Let's demystify AI

    - AI, in simple terms, is an innovative technology that emulates human intelligence, paving the way for groundbreaking advancement in various domains.

    - AI systems can learn, reason, problem-solve, and interact with humans in the way we'd expect other humans to be capable of.

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What is Generative Artificial Intelligence?

- Generative AI refers to AI systems that can generate content such as text, images, audio, or video.

- Such systems use deep learning techniques, often based on neural networks, to create contextually relevant and coherent content.

- Generative is the "G" in ChatGPT.

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What About the "PT"

- ChatGPT stands for Chat Generative Pre-Trained Transformer.

  - Pre-Trained: Before the model is fine-tuned for a specific task or application, it undergoes "training." This training exposes the model to a vast amount of text data from the Internet. The system then learns human language.

  - Transformer: This is a deep learning architecture that can capture long-range dependencies in data. They are the foundation for Natural Language Processing models of AI.

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Characteristics of AI

- Learning – Can adapt and change based on inputs
- Reasoning – Can create logical assumptions and analysis
- Problem-Solving – Can use logic models to solve problems
- Interaction – Can interact with humans to share and create

- Non-Education Examples: Self-driving Cars, Virtual Assistants, and Recommendation Systems

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AI vs. Traditional Educational Technology

- Traditional Educational Technology is algorithm-based or based on teacher use of the tech.

- AI is much more dynamic.

  - Students and teachers can use the technology to create dynamic learning experiences.

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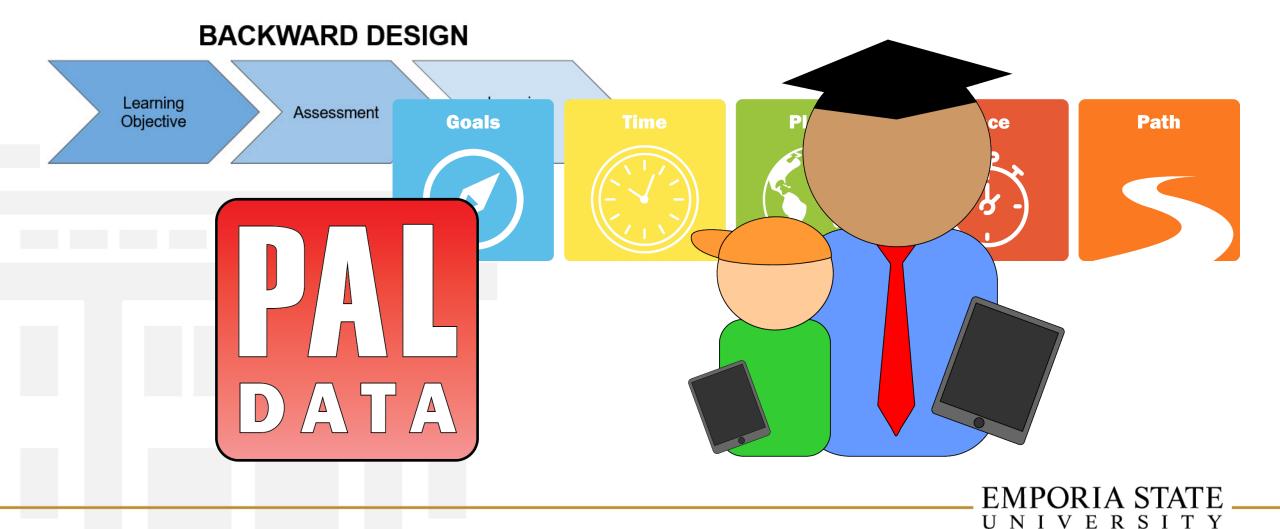
Traditional v. AI-Enhanced Learning

- Traditional learning is often static and takes a one-size-fits-all (or most) approach.
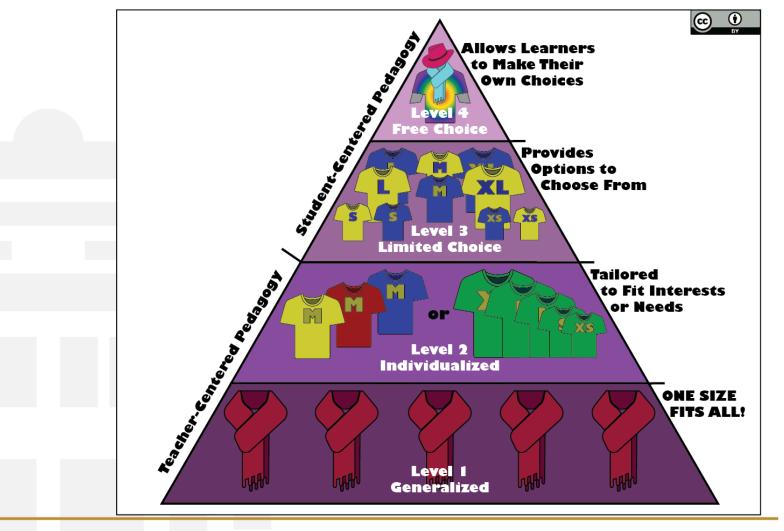
- AI can create opportunities for blended learning environments that personalize learning, are data driven, and adaptive to individual needs.

Personalized Learning (Next Week)

Personalized Learning Goal

Types of AI in Education

- Machine Learning: Algorithms analyze data and make predictions (Learning Engineering)

- Natural Language Processing (NLP): Machines understand and generate human language

- Computer Vision: Machines interpret visual data

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Machine Learning in Education

- Machine Learning

  - A subset of AI that uses data to make predictions.

  - Useful for Learning Management Systems and Applications

- Applications can include adaptive learning systems that use predictive analysis to guide student learning and success

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Personalized Learning (Next Week)

BACKWARD DESIGN

Learning Objective | Assessment | Goals | Time | Pl... | ...ce | Path

PAL DATA

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Personalized Learning Goal

Example of Machine Learning in Education

- Adaptive Learning: Khan Academy, Canvas and/other LMS

- Plagiarism Detection: TurnItIn, VERY difficult for AI-created text – but more on that later

- Predictive Analysis Alerts: Can identify students who are struggling academically, and alert educators

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Natural Language Processing (NLP)

- NLP enables machines to understand and generate human language – but not JUST human language – can also be used for coding applications, webpages, and software!

- Applications include: Chatbots, Language Tutors, and Essay Scoring Systems

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NLP in Education

- Language Learning Apps: Virtual language tutors can assist with pronunciation and vocabulary

- Automated Essay Grading: Speeds up grading and provides quick and consistent (less biased?) feedback

- Virtual Language Assistants: Enhance language learning through conversational practice with speaking and writing

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NLP Examples

- Chat GPT
- Bing Chatbot
- Snap Chatbot

- More and more everyday

Computer Vision (CV)

- Computer Vision allows machines to interpret visual data such as images and videos.

  - New to Chat GPT in September 2023! But in search engines previously, using algorithms.
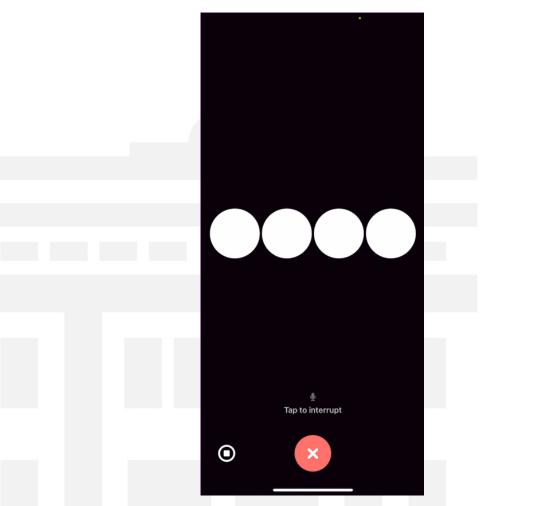
  - The Difference is that AI can go beyond image deconstruction and searching, it can intelligently respond to the image.
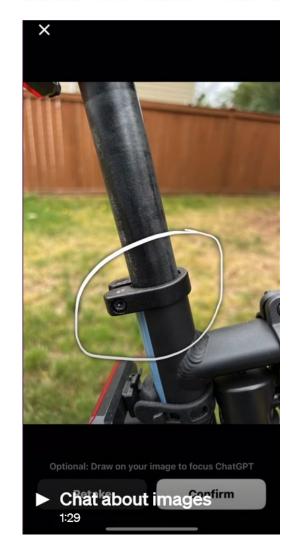
Real-World Computer Vision

https://openai.com/blog/chatgpt-can-now-see-hear-and-speak

Computer Vision in Education

- CV can scan, interpret, and provide feedback/grade handwritten assignments – as well as anything that is printed.

- In content areas like science, math, and engineering, CV can understand and analyze data and charts

CV Grading Example

From Bing Chatbot:

The image is a clear and concise representation of the key concepts related to supporting neurodiverse students in the classroom. It effectively communicates the importance of understanding neurodiversity, creating inclusive environments, and using differentiated instruction. The use of simple and visually appealing graphics makes the information easy to digest for educators, **despite that fact there is so much information and the graphic is very text heavy.**

Bolded Text is text I added.

Benefits of AI in Education

- Improved Engagement
  - Personalized content can keep students engaged

- Accessibility for All Learners
  - Can allow students to learn at their own pace on their own time, by accommodating learners' diversities

- Efficiency for Teachers
  - Automation of administrative tasks and data analysis can free up teachers for more teaching

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Why AI in Education Matters

- AI, much like the internet before it, will offer transformative approaches to education providing dynamic support for learning and instructional design.

- Combined with human teachers, AI will create teaching and learning experiences that are more personalized, have more feedback, and create more gains in learning outcomes.

Challenges in Implementing AI in Education

- Privacy
  - Data security and protection of minors/students will be important when using AI for data analysis.

- Digital Divide
  - Access to technology is necessary for access to AI. We will see similar disparity as we see in blended/online learning.

- Teacher Training
  - Much like the acceptance and implementation of blended/online learning, teachers will need to understand effect practices.

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Basic Ethical Considerations of AI in Education

- The algorithms for AI do have some inherent bias, and may be developing more…

    - Racial

    - Economic Status

- College and Career Goals/Status

Future Trends of AI

- AI-driven Curriculum Design and Development

- Augmented Reality Created by AI

- Assessment of Cognitive and Non-Cognitive Skills and Status

- Practice will continually out pace research

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Preparing for the AI Era

- Institutions and Educators can prepare for AI through:

  - Exploring what is possible
  - Understanding use cases for teachers/students
  - Creating clear policies and expectations around usage
  - Designing and Developing curricula that promote ethical use of AI
  - Understand how AI works and how it affects learning, training, and career outcomes

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Use and Practice of AI in Education

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AI Powered and Enhanced Teaching/Learning

- Lots of options for empowering teaching and learning through the use of AI

- We will look at many of them, but new applications and uses are emerging daily

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Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITS)

- ITS are AI-driven platforms that provide personalized instruction.

  - They differ from former personalized learning apps and software in that they are much more dynamic and "intelligent"

  - They can adapt content, pacing, review questions, format, etc. to individual learner needs.

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How ITS Work

- Measures student current knowledge or ability through some form of assessment.

- Collects students' learning and performance data, including correct and incorrect responses, response times, and identifies where the student is struggling.

- Uses these data to understand a student's baseline knowledge and identify areas needing support.

ITS Content Delivery

- Based on the assessment results, the ITS designs a personalized learning path for the student.

  - Path may include lessons, exercises, and assignments tailored to the student's specific needs.

  - Content can be presented through various formats, such as text, videos, simulations, or interactive exercises.

  - Content is dynamically adjusted to suit the student's pace and learning style.

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ITS Feedback and Interaction

- Provides immediate and continuous feedback to the learner through correct/incorrect answers, explanations, hints, and suggestions for improvement.

- The ITS will encourage interaction through questions, prompts, and discussions, creating an engaging learning experience.

ITS Adaptation of Instruction

- The ITS constantly uses various interactions to monitor student learning and can slow down or speed up instruction accordingly.

- The system "learns" about the student and can create personalized learning across all dimensions of personalization and all areas of instruction (objectives, assessments, and activities).

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AI & Administrative Tasks

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AI Automation of Administrative Tasks - Scheduling

- AI can handle scheduling tasks to free up the educator to focus on instructional tasks.

  - Course Scheduling
  - Teacher/Staff/Student Meeting Scheduling
  - Resource/Space Allocation
  - Exam Scheduling

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AI Automation of Administrative Tasks – Data Management

- AI can handle data tasks to free up the educator to focus on instructional tasks.

  - Student Data Tracking – demographics, goals, records, grades, activity – all PAL Data

- AI can then analyze and report on trends, suggest next steps for progress, manage documentation of learning.

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AI Automation of Administrative Tasks – Communications

- AI can handle communication tasks to free up the educator to focus on instructional tasks.

  - Email management
  - Automated notifications
  - Language translation
  - Speech recognition
  - Automated surveys and feedback for data

AI for Lesson Planning

AI-Based Curriculum and Design

- AI can analyze curriculum data, learning objectives, and student performance to create, modify and optimize curriculum content.

- This automates the process of aligning lesson plans with educational standards and objectives.

- Ex: Searching a syllabus for topics related to the Science of Reading

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Curriculum Generation

- AI tools can automatically create entire curriculum units based on educational standards and learning objectives.

  - AI can generate lesson plans for a month, complete with assignments, activities, and resources.

  - AI can create content such as presentations, documents, worksheets, quizzes, and activities tailored to the abilities of individual students. No more One-Size-Fits-All!

Tools for Creating Curriculum Plans

- Chatbots can handle lesson planning aligned to learning outcomes quite well, providing a range of backward design optimization.

  - State/National Standards
  - Content Objectives
  - Individual Goals

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Tools for Creating Curriculum Resources

- Many AI tools can create presentations or documents to use for instructor-led instruction, or to streamline reading of content.

  - Gamma
  - Chatbots

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Image Generation via AI

- AI can create images to be used for writing prompts, to assist with reading, or for assessment of learning.

  - Stable Diffusion (DreamStudio)
  - DALLE-3
  - Midjourney
  - Firefly (Photoshop)
  - Craiyon
  - Generative AI by Getty Images
  - Bing's Image Creator
  - Canva's AI Image Generating Tool
  - Recraft

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Video Generation via AI

- AI can create videos to be used for delivering content, interactions, or as assessments of learning.

  - Wondershare
  - Colossyan
  - Synthesia
  - Pictory
  - Elai.io
  - GliaCloud
  - Lumen 5
  - FlexClip

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Presentation Generation via AI

- AI can create presentations (slides, documents, websites) to be used for delivering content.
  - Gamma
  - Beautiful.ai
  - Simplified
  - Slidebean
  - Designs.ai
  - Pitch
  - Presentations.ai
  - Kroma.ai
  - Tome
  - DeckRobot (PowerPoint plug-in)

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AI for Assessment

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AI for Providing Curated Feedback

- AI can provide formative feedback on students' work.

- AI can provide broad feedback for teachers to use in praising and evaluating student work.

- AI can recommend (mostly?) unbiased grading and scoring on students' assignments.

AI-Assisted Grading and Assessment

- AI can automate grading of assignments and assessments.

- AI can provide feedback that is personalized, complete, growth-oriented, and feels human.

- AI feedback can be more consistent than feedback from humans who have innate biases and irregularities.

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Feedback Recommendations Pt. 1

- Set up the context for your grading and feedback.

  - "You are a grade 11 English teacher analyzing students' persuasive essays."

- Provide measurement parameters for the assignment(s).

  - "Each essay should include: X, Y, and Z."

Feedback Recommendations Pt. 2

- Describe the feedback you want students to receive.

  - "Feedback should focus on what students did well to meet the requirements of the assignment, and ways in which students could continue to improve their work."

- Humanize the response.

  - "Thank students for their efforts and encourage them to keep up their studies."

Feedback Recommendations Pt. 3

- Iterate your instructions for feedback until the output matches your expectations.

- You can choose to include scoring, and even experiment with giving the Chatbot a rubric to follow for scoring.

- Copy and past the response into the Chatbot, don't worry about formatting. Remove students' identifying information.

Other Uses of AI in Education

- The University of San Diego came up with 43 examples of AI in Education, though some are really narrow.

- https://onlinedegrees.sandiego.edu/artificial-intelligence-education/

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DEMONSTRATION

5 MINUTE BREAK & QUESTIONS

Predictions for Research on AI in Education

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General Overview of AI Research

- As happened (and still happens) with other technologies that transform the landscape of education, practice and implementation are FAR out-pacing research.

- AI is moving so fast that some theoretical frameworks for using AI quickly become outdated before such frameworks can go through publication processes.

AI Dispositional Research Topics

- Dispositions concerning:

  - AI & Teacher Use
  - AI & Student Use
  - AI Affordances
  - AI Constraints

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AI Ethics and Standards

- Research will focus on whether AI use is ethical:

    - AI bias
    - AI and professionalism
    - AI as weakening the profession

AI as a Research Tool

- Research and publishers will start to focus on how AI can amplify research practices.

  - Data Analysis
  - Qualitative Analysis
  - Interpretation/Manipulation of Data
  - Replacement/Enhancement for Reviewers of Research

AI Impact on Learning Outcomes

- Studies will use various metrics, including academic performance, student engagement, retention rates, and standardized test scores to evaluation AI's impact on learning outcomes.

- Comparisons of students who use AI tools for assessments and learning and those students who do not.

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Data-Driven Decision Making in Education via AI

- Explorations of how data analytics and AI can inform decisions related to curriculum design, resource allocation, student support, and policy development.

- Use of data to identify at-risk students, improve course design, or optimize resource access and distribution.

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Challenges and Opportunities Provided by AI

- Exploration of teachers' roles changing as AI takes on more administrative and instructional tasks.

- Equity and Safety around AI use of data, teacher/learner access to AI, bias in AI algorithms, and AI validity/reliability.

Research on Emerging Trends in AI Practice

- Reviews of emerging trends such as the application of AI in assessing non-cognitive skills, AI-driven curriculum design, and the use of AI for evaluating learners, courses, and policies.

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Privacy and Data Security

- Even though AI feels like personal 1-on-1 communication, we should be careful to safeguard personal information.

- Data breaches or other leaks of data could reveal institutional secrets/IP or reveal student's private information.

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Data Security Measures

- First and foremost, if it isn't something you would openly share on the web – a blog post, social media, etc. – then don't share it with AI.

- Information protected by FERPA, GDPR, of PIPL should not be included when requesting assistance from AI.

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Data Encryption and Access Control

- Currently, tools like ChatGPT do not provide encryption services. I expect to see these in the future as business recognize the economic impact using chatbots could serve.

- Access control has also been something discussed in using AI. Maybe banning it will stop employees from leaking data – this is unlikely.

  - AI is just too useful.

AI Bias and Fairness

- AI algorithms are not immune to bias and that understanding and addressing bias is crucial in education.

- Algorithmic bias is the presence of unfair or discriminatory outcomes in AI systems. These biases can lead to unequal treatment based on factors like race, gender, or socioeconomic status.

Inherited Biases

- AI systems can inherit biases from the data they are trained on.

- AI learns patterns and associations present in the training data, which may include historical biases and inequalities.

- AI could potentially become either more or less biased over time due to its learning models.

Source of AI Bias

- ## Training Bias
  - Training data can be biased if it reflects historical disparities, stereotypes, or prejudices. For instance, if the data used to train an AI grading system is historically biased in favor of one gender or ethnicity, the algorithm may favor those groups in its assessments.

- ## Algorithmic Bias
  - Algorithms themselves can introduce bias due to the way they process data or make predictions. Algorithms may inadvertently amplify existing biases by referencing or suggesting biased resources.

Generative AI Bias

- Generally, AI is created with some regulations around what it will and will not generate.

- ChatGPT will refuse, for example, to create explicit content.

- It will also refuse to create biased test questions when prompted – though there's a work around.

Bias Implications for Education

- Biased AI algorithms can perpetuate inequalities in academic assessments, grading, and educational opportunities.

- They may disadvantage certain student groups or reinforce stereotypes.

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Testing for Bias

- Rigorous testing and auditing of AI systems should involve assessing the AI's decision-making processes for any signs of bias.

- Tools for identifying bias may include fairness evaluation frameworks, statistical analyses, and fairness-aware machine learning strategies.

Bias Mitigation

- Once bias is identified, AI developers can work on mitigating it through adjustments to the algorithms, changes in data collection, or modifications in model training.

- Transparency and accountability are needed in the testing and mitigation processes. These steps should be well-documented and communicated to stakeholders via research and other forms of dissemination.

Other Ethical Considerations

- It is unclear what works or text AI pulls from to generate content.

- Content created using AI should be carefully vetted to make sure it is not unfairly using others' work.

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The Future of AI in Education

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Emerging Trends

- Students and educators are using AI to help generate assignments and assignment answers.

- We can only know if a student really knows the material if they are doing the work in front of us. Back to paper and pencil testing then!?

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Immediately Emerging AI Practices

- AI-Powered Tutoring in various learning apps, LMS, and systems.

- Use of AI to create more immersive AR and VR simulations for teaching/training.

- AI-Enhanced Assessments are using NLP models and machine learning to provide immediate, detailed, and personalized feedback to learners.

More Practice to Come

- More emphasis on the data analytics that AI can provide.

- More emphasis on AI for use in personalized learning and individualized learning across a variety of modalities.

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Predictions and Possibilities

- AI-Driven Curriculum Design
- Enhanced Accessibility
- Assessing of SEL and Non-Cognitive Skills
- Lifelong Learning through enhanced agency
- Global Collaboration in K-12 through enhanced language translation.

The Next Wave

- Professional Development is here!
- Data Privacy and Security will be increased
- Ethical Guidelines will get published
- Institutions will invest in infrastructure to host their own AI models
- Research and Evaluation will catch up in about 5-10 years.

Conclusion and Takeaways

1. AI IS Transforming Education

- AI is here, and it's not leaving. It will continue to transform and revolutionize the way we teach.

- AI enhances what educators can accomplish through personalized learning, quick and detailed feedback,and dynamic curriculum creation.

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2. There Exists an Abundance of AI Tools

- There are AI tools for everything from image and text generation to video and presentation generation.

- Soon AI will provide widespread development of apps, software, and games.

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3. Ethical Considerations for AI

- AI does not necessarily protect your data.

- AI can be susceptible to leaks, bias, and unfairness.

- We don't know who AI is "taking from" to create its outputs.

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4. Prepare for an AI Future

- Seek out opportunities like this one to learn more about AI.

- Pay attention to the practices that are emerging and the research that struggles to keep pace.

- Think about how AI can impact and support your daily teaching and learning practices.

5. Embrace the AI Revolution

- Much like the Internet 20-25 years ago, it is intimidating to think about what all this AI business can mean. Don't ignore it.

- Stay informed, stay engaged, and contribute to the responsible and ethical use of AI.

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