Empowering Learners.AI

2022 GLOBAL ONLINE CONFERENCE | EMPOWERING LEARNERS FOR THE AGE OF AI

Foundations of AI to empower learners: Theory, models, and impact

AI and Learning Research: State of the Field

Dr. Melissa Bond, University of South Australia (Australia), University College London (UK)

Dr. Helen Crompton, Old Dominion University (USA)

Dr. John Y. H. Bai, University of Oldenburg (Germany)

Prof. Sdenka Zobeida Salas-Pilco, Central China Normal University (China)

Prof. Olga Viberg, KTH Royal Institute of Technology (Sweden)





David R Horton (creator), © AIATSIS, 1996.

Acknowledgement of Country

We would like to acknowledge the Traditional Custodians of the land on which this conference is being hosted and from which some of us are presenting, Kaurna country, and pay our respects to Elders past, present and emerging.

We respectfully acknowledge the Kaurna, Boandik and Barngarla First Nations Peoples and their Elders past and present, who are the First Nations' Traditional Owners of the lands that are now home to the University of South Australia's campuses in Adelaide, Mount Gambier and Whyalla. We are honoured to recognise our connection to the Kaurna, the Boandik and the Barngarla lands, and their history, culture and spirituality through these locations. We also acknowledge the other First Nations of lands across Australia, their Elders, ancestors, cultures and heritage.

UniSA | CENTRE FOR CHANGE AND COMPLEXITY IN LEARNING | Education Futures

Panel Objectives

- What kind of research is being conducted in AIEd?
- What can it tell us about the affordances and challenges of using AI in various educational contexts?
- What opportunities for future research have been identified?
- What considerations are needed when undertaking robust studies in AIEd?

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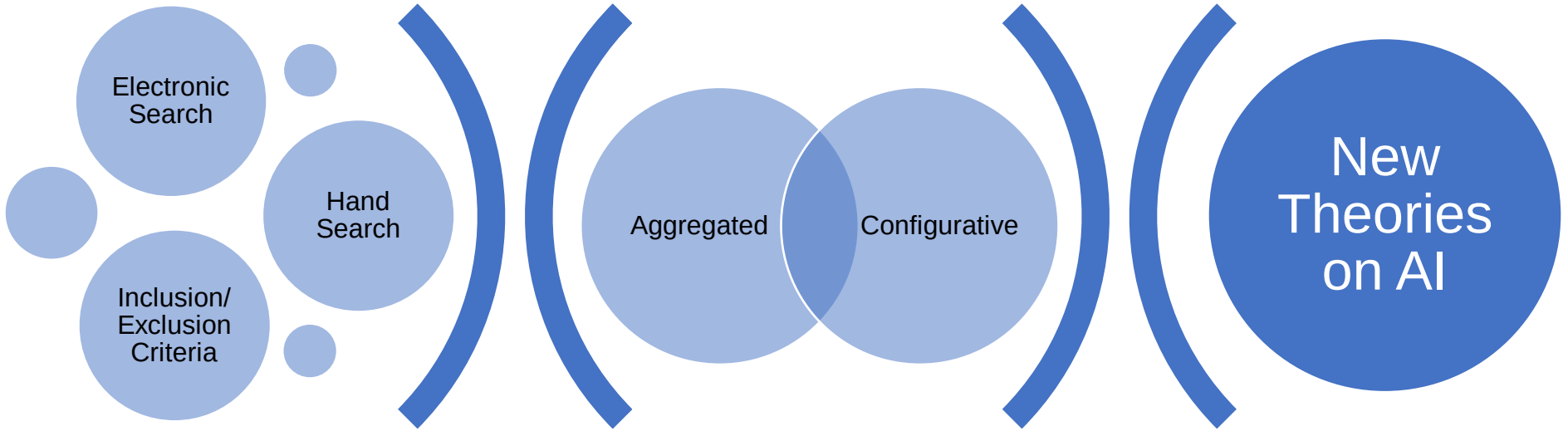
AIEd Research: State of the Field

Dr. Helen Crompton

Old Dominion University

Research on AIEd

Systematic Research on AI

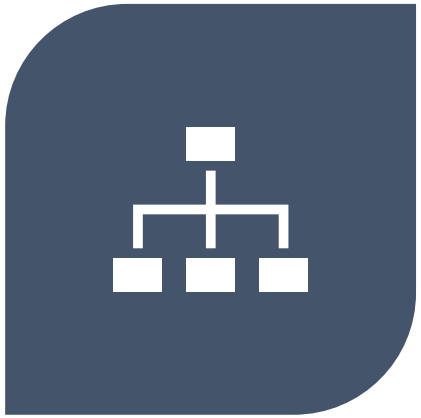



Educational Disciplines
Educational Levels
Research Purposes
Methodologies
Volume of Publications
Geographical Locations

Affordances

PEDAGOGY

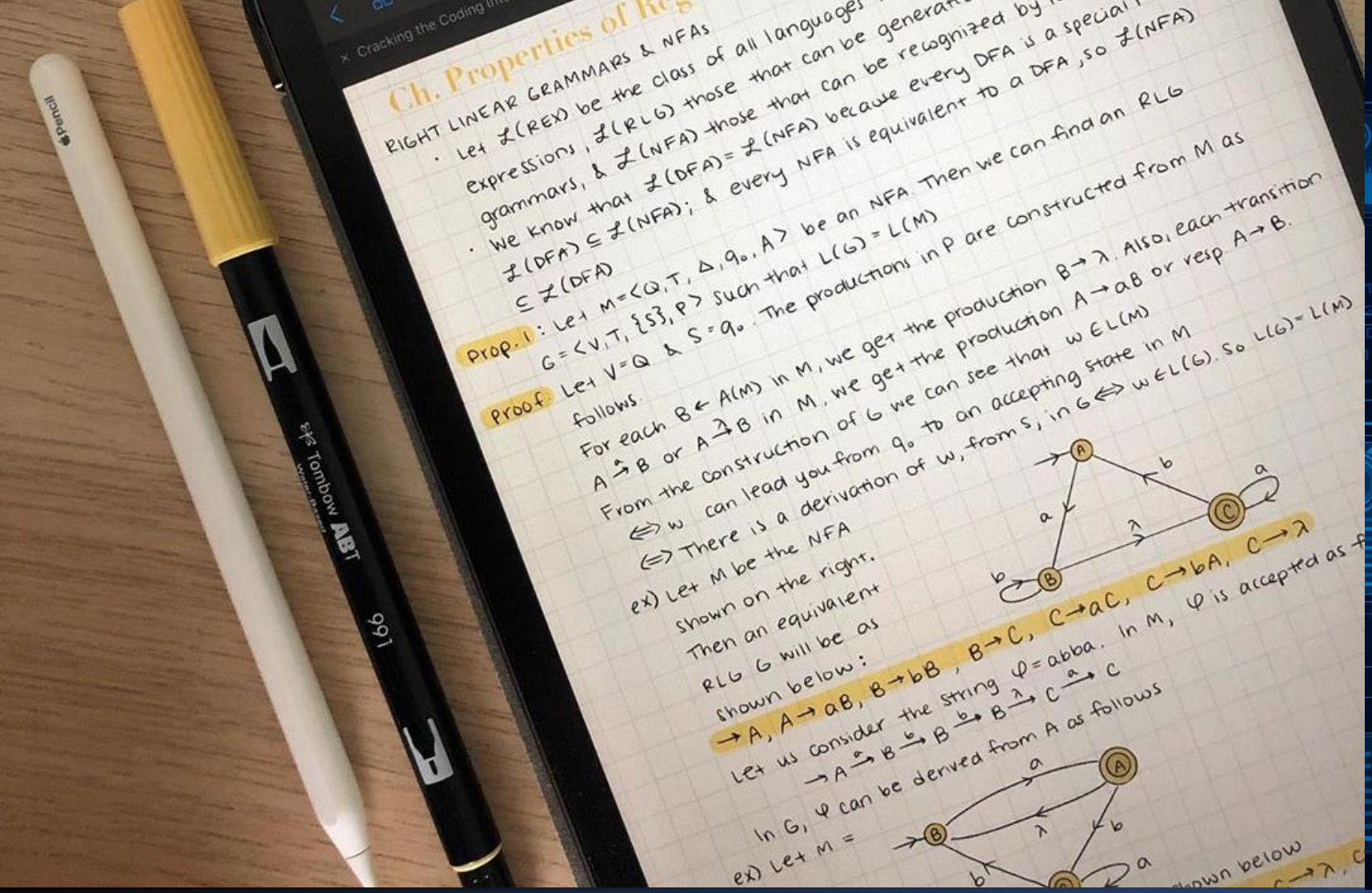
SUBJECT CONTENT



ADMINISTRATION

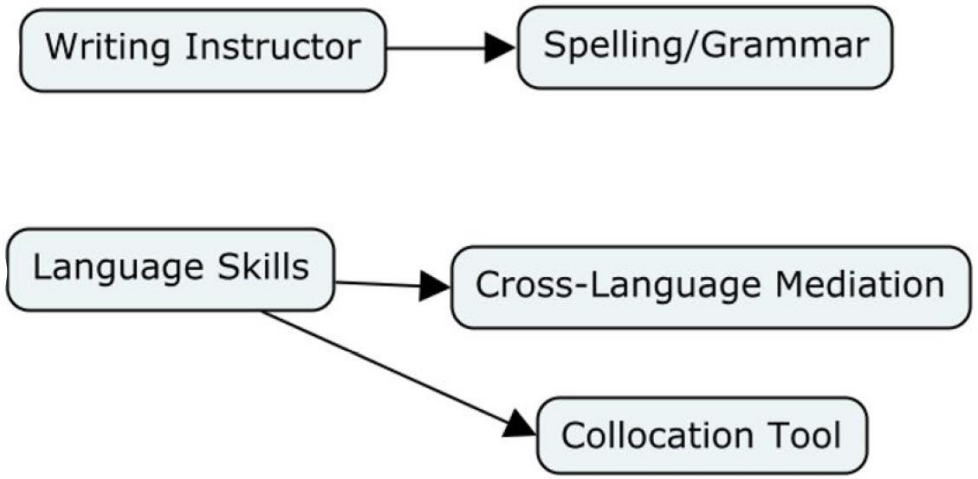
Pedagogy

- Gaming
- Lecture notes
- Modeling
- Collaboration
- Intelligent tutor
- Personalized learning
- Visualization
- Active learning
- Teachable agent



Familiar to New Pedagogies

Subject Content



Our team has less projects this quarter.

GRAMMAR

~~less~~ → fewer

It appears that the quantifier ***less*** does not fit with the countable noun ***projects***. Consider changing the quantifier or the noun.

Administration

STUDENT TRACKING

PREDICTION

DIAGNOSTIC TOOLS

ASSESSMENT

Gaps in the Research

- Teacher PD
- Across Subjects
- Administration Tools
- Qualitative Studies

AIEd References

- Crompton, H., & Burke, D., (near completion). Artificial Intelligence in Higher Education.
- Crompton, H., Jones, M., & Burke, D., (2022). Affordances and challenges of artificial intelligence in K-12 education: A systematic review. *Journal of Research on Technology in Education.* https://doi.org/10.1080/15391523.2022.2121344
- Crompton, H., & Burke, D. (2022). Artificial intelligence in K-12 education. *SN Social Sciences 2*(113).https://doi.org/10.1007/s43545-022-00425-5
- Crompton, H., & Song, D. (2021). The potential of artificial intelligence in higher education [Editorial]. *Revista Virtual Universidad Católica del Norte,* 62, 1-4. https://www.doi.org/10.35575/rvucn.n62a1

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Foundations of AI to empower learners: Theory, models, and impact

An updated systematic review of artificial intelligence research in higher education

John Y. H. Bai[1], Melissa Bond[2], & Olaf Zawacki-Richter[1]

[1]Carl von Ossietzky University of Oldenburg, Germany

[2]University of South Australia, Australia / University College London, UK

Carl von Ossietzky Universität Oldenburg

COER Center for Open Education Research

Artificial intelligence in education (AIEd)

- Artificial intelligence encompasses a wide range of different techniques and algorithms
- Systematic reviews – a replicable method for capturing snapshots of the literature


REVIEW ARTICLE Open Access

Systematic review of research on artificial intelligence applications in higher education – where are the educators?

Olaf Zawacki-Richter*, Victoria I. Marín, Melissa Bond and Franziska Gouverneur

Check for updates

Zawacki-Richter et al. (2019) - method

- Ran search string through three databases:
  - EBSCO Education Source
  - Web of Science
  - Scopus
- Explicit inclusion and exclusion criteria
  - Primary-research articles in peer-reviewed journals
- Synthesis corpus = 146 papers

Table 1 Initial search string

Topic	Search terms
Artificial intelligence	"artificial intelligence" OR "machine intelligence" OR "intelligent support" OR "intelligent virtual reality" OR "chat bot*" OR "machine learning" OR "automated tutor" OR "personal tutor*" OR "intelligent agent*" OR "expert system" OR "neural network" OR "natural language processing"
AND	
Education level	"higher education" OR college* OR undergrad* OR graduate OR postgrad* OR "K-12" OR kindergarten* OR "corporate training*" OR "professional training*" OR "primary school*" OR "middle school*" OR "high school*" OR "elementary school*" OR "vocational education" OR "adult education"
AND	
Learning setting	learn* OR student*

Table 2 Final inclusion and exclusion criteria

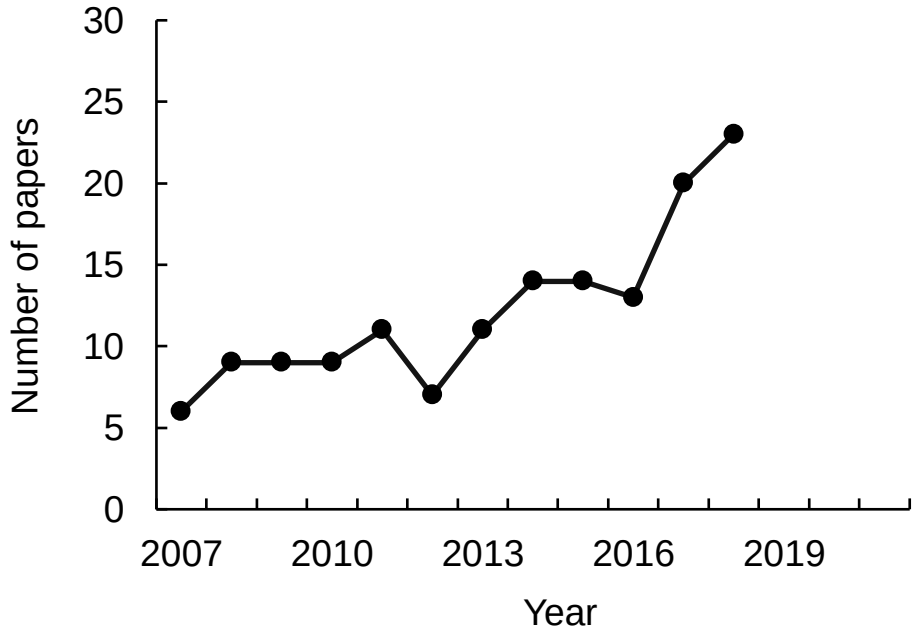
Inclusion Criteria	Exclusion Criteria
Published 2007 – Nov 2018	Published before 2007
English or Spanish language	Not in English or Spanish
Higher education	Not higher education
Empirical, primary research	Not primary research (e.g., review)
Indexed in Web of Science, Scopus or EBSCO Education Source	Not a journal article
	No artificial intelligence
Artificial intelligence use in education	No learning setting

Zawacki-Richter et al. (2019) - results

- Generally increasing trend in number of publications across successive years
- Country of first author:

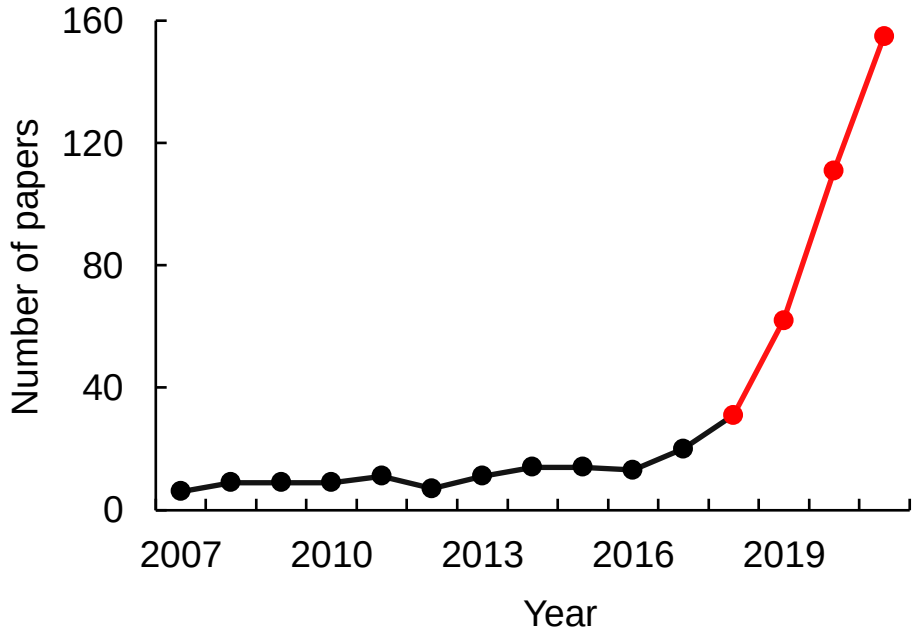
2019 Review (n = 146)			
Rank	Country	Count	Percentage
1	USA	43	29.5
2	China	11	7.5
3	Taiwan	10	6.8
4	Turkey	9	6.2
5	UK	7	4.8

- Noted few papers discussed ethical issues or were lead by educators



Updated review

- Replicated the methodology of Zawacki-Richter et al. (2019) in October 2021
- Same search string and inclusion/exclusion criteria
  - Except range from Nov. 2018 – Oct. 2021
- Synthesis corpus = 336 papers on AIEd in higher education



Comparison of review corpora

- The 2019 review covered ~11 years, vs. ~3 years in the 2021 update
- Increased rate of output from all counties in top 10
  - Especially pronounced for China and India
- Relatively more papers lead by first author from education
  - 8.9% (13/146) vs. 17.6% (59/336)

2019 Review (n = 146)			
Rank	Country	Count	Percentage
1	USA	43	29.5
2	China	11	7.5
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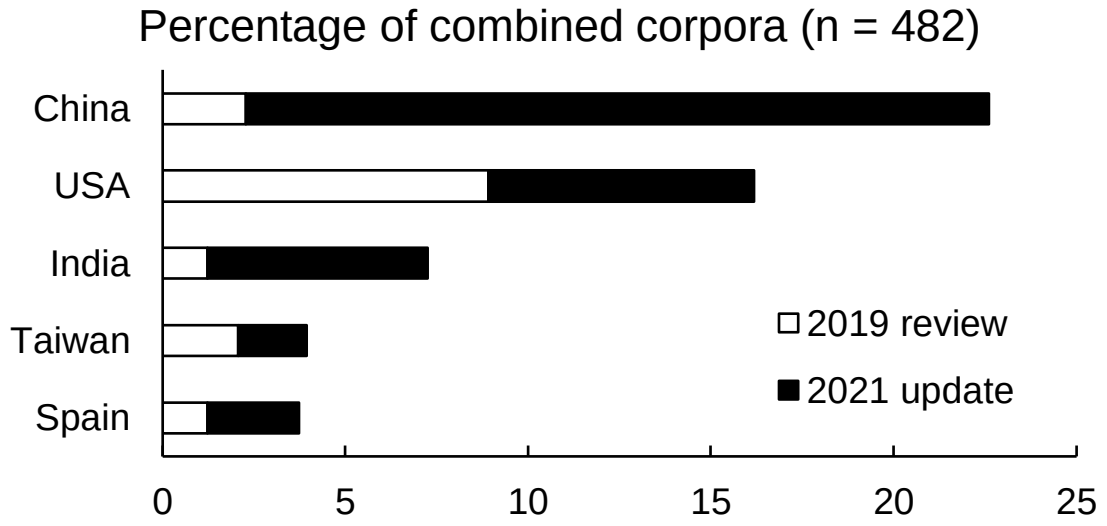
4	Turkey	9	6.2
5	UK	7	4.8

2021 Update (n = 336)			
Rank	Country	Count	Percentage
1	China	98	29.2
2	USA	35	10.4
3	India	29	8.6
4	Spain	12	3.6
5	Saudi Arabia	10	3.0
	UK	10	3.0



Summary

- Stark increase in rate of AIEd publications in higher education
  - Changing patterns of contributions across countries
  - And relatively more papers led by first authors affiliated with education departments
- Quantity ≠ Quality
  - No indication of the lasting impact of individual papers
  - Academic incentives for number of publications
- More countries represented overall (38 in 2019 review vs. 53 in 2021 update)
  - Opportunities for collaborative, international, and interdisciplinary research

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AI in Latin America and AI in Teacher Education

Prof. Sdenka Zobeida Salas-Pilco

Central China Normal University

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华中师范大学人工智能教育学部
Faculty of Artificial Intelligence in Education,CCNU

Artificial Intelligence (AI) in Latin America and Artificial Intelligence (AI) in Teacher Education

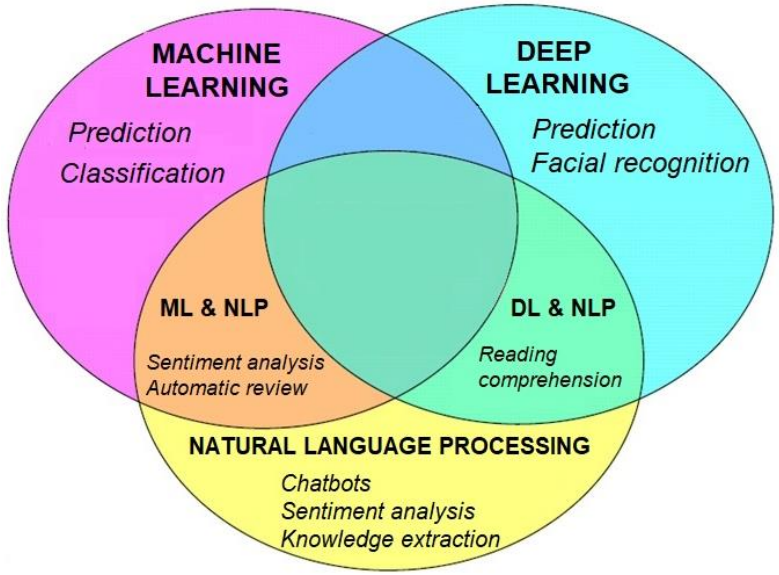
Sdenka Zobeida SALAS-PILCO
Distinguished Associate Professor
Faculty of Artificial Intelligence in Education
Central China Normal University

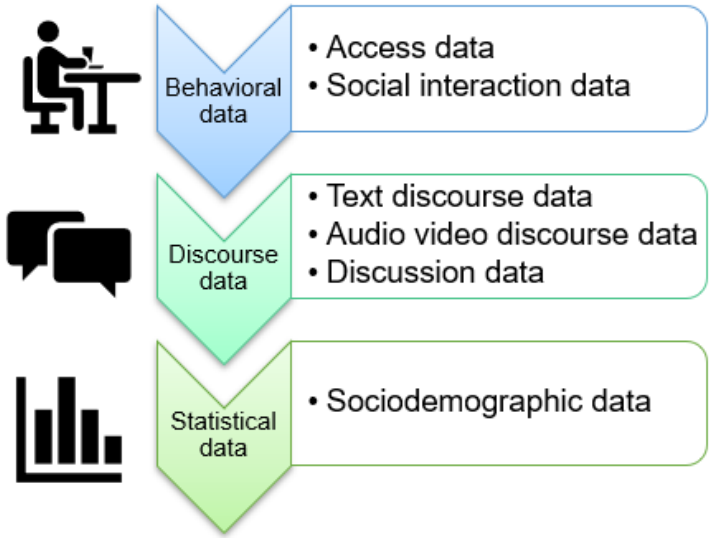
December 2022

What kind of research is being conducted in AIEd?

- **Salas-Pilco, S. Z.** & Yang, Y. (2022). **Artificial Intelligence Applications** in Latin American Higher Education: A Systematic Review. *International Journal of Educational Technology in Higher Education, 19,* 21. https://doi.org/10.1186/s41239-022-00326-w

- **Salas-Pilco, S. Z.**, Xiao, K., Hu, X. (2022). **Artificial Intelligence and Learning Analytics in** teacher education: A systematic review. *Education Sciences, 12,* 569. https://doi.org/10.3390/educsci12080569





What can it tell us about the affordances and challenges of using AI in various educational contexts?

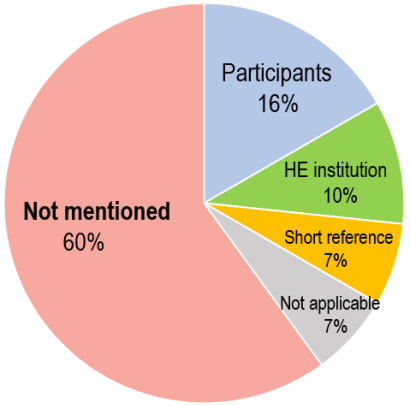
Affordances

- Automated grading, to reduce teachers' workload.
- Predictive analytics, to detect students at risk.
- Adaptive learning, focused learning experiences.
- Chatbots, helpful virtual assistants.

Challenges

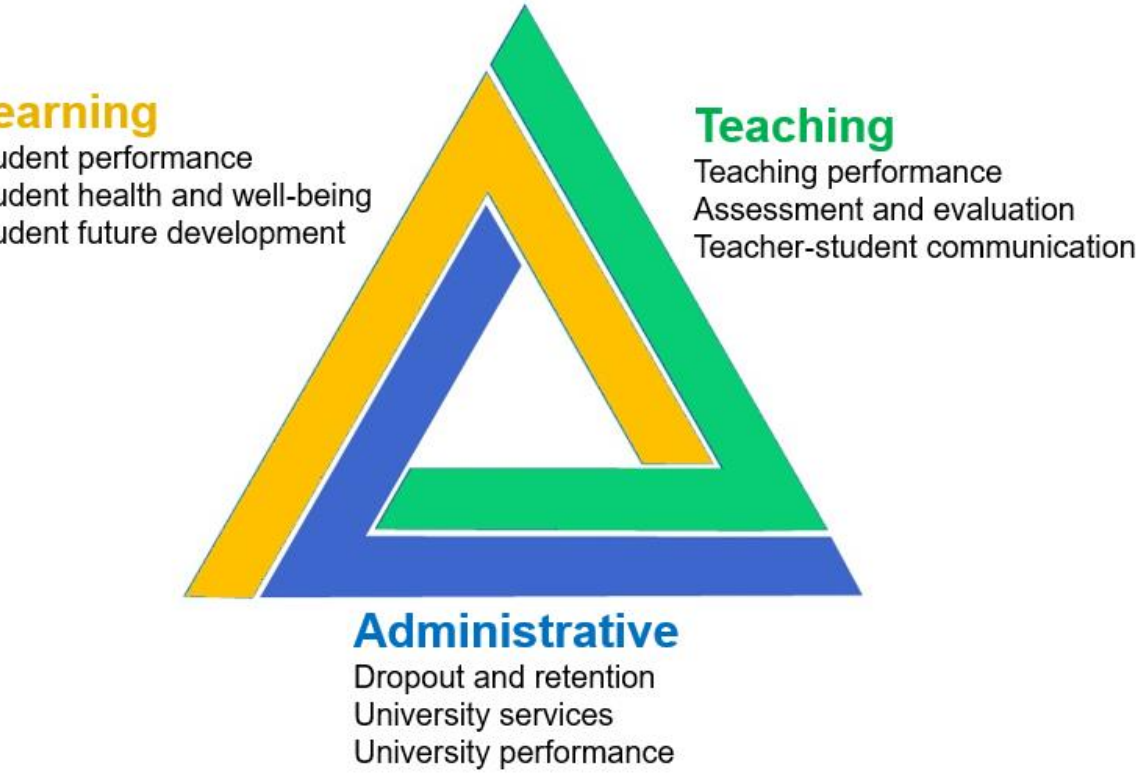
- Bias and discrimination.
- Data privacy, which needs to be regulated.
- Tracking systems (detailed information about actions and preferences)..

Ethical consent



What opportunities for future research have been identified?

- Future studies could include other AI techniques different from ML, DL and NLP.
- Studies focused on regular in-service teachers who are not enrolled in education programs.
- Studies that include parents and the community.



What considerations are needed when undertaking robust studies in AIEd?

- The use of multiple approaches to address one question (triangulation) and also mixed methods, not only using a quantitative approach but also a qualitative perspective.
- High-quality data, reliable data allows you to draw robust and valid conclusions
- In Latin American education, it is important that more educational stakeholders and decision-makers become involved and understand the potentials and challenges that AI technologies could bring to the education system.

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Responsible AI in Education

Prof. Olga Viberg

KTH Royal Institute of Technology

Why Responsible AI in Education?

What is ‘Responsible’ AI?

- ✓The term “responsibility” has different meanings.
- ✓Hart’s classical account lists 4 senses: 1. **role**-responsibility, 2. **causal** responsibility, 3. **capacity**-responsibility, & 4. **liability**-responsibility (Hart, 1968).
- ✓An etymology of the word ‘responsible’ suggests not only the need to be answerable and accountable, but also to being response-**able** and having an obligation to act (Prinsloo & Slade, 2014).
- ✓The notions of ‘*responsible*’ and ‘*response-**able***’ LA and AI apply to the three levels of regulation in education: *micro* (individual user actions), *meso* (institution-wide application and use) and *macro* level (region/state/national/international), (Prinsloo & Slade, 2018).

Forms of Responsibility in the context of automation and AI

Responsible AI in education must be understood within the context of ecology of responsibilities!

Type of responsibility	Definition	Gaps with AI
Culpability	Blameworthiness for wrongdoing based on intention, knowledge or control	AI making prediction and control more difficult, thereby creating new legitimate reasons/excuses for wrongdoing, e.g. an avoidable road crash involving an automated driving system that nobody could individually predict or prevent
Moral accountability	Duty of human persons to explain one's reasons and actions to others (under some circumstances)	AI making processes unexplainable to the very persons using it, e.g. a doctor not being able to explain the reasons for her diagnosis to a patient
Public accountability	Duty of public agents to explain their actions to a public forum	AI shifting discretionary powers towards IT experts and data analysts (often outsourced to private companies) whose work is harder to publicly scrutinise, e.g. government using (private) AI-systems in support of their decision-making
Active responsibility	Duty to promote and achieve certain societally shared goals and values	Actors involved in the design or use of AI not being sufficiently aware of their own responsibility to prevent harm deriving from AI or not being able or motivated to fulfil this obligation, e.g. engineers or managers only looking at the technical benefits of AI

Santoni de Sio, F., & Mecacci, G. (2021). Four responsibility gaps with artificial intelligence: Why they matter and how to address them. *Philosophy and Technology, 34,* 1057-1084.

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- Hart, H. L. A. (1968). Punishment and responsibility. Oxford University Press

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Future research implications

Dr. Melissa Bond

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EPPI-Centre, University College London, UK

Knowledge Centre for Education, University of Stavanger, Norway (January 2023)

UniSA C3L CENTRE FOR CHANGE AND COMPLEXITY IN LEARNING Education Futures

EPPI Centre Evidence for Policy & Practice

Kunnskapssenter for utdanning Universitetet i Stavanger