Addressing the Dark Sides of AI for Teaching Critical Thinking Skills to Undergraduate Students

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Talk at the 19th Innovation in Language Learning (ILL)
International Conference, Florence, Italy
11–13 November 2026

Overview

- Introduction
- Selected literature on AI risks
- Motivation for teaching critical thinking
- Discussion activities
- TED talks
- A note of caution for students
- Discussion and recommendations
- Conclusions
- References



Figure 1: University building, 27 June 2011

1. Introduction to the university

- One of the largest universities of applied sciences in Austria
- Teaching university with research
- 3 sites, main campus Graz
- 5 700 students
- 24 700 graduates
- 800 employees

- Programs
  - Bachelor's degree
  - Master's degree
- Career fields
  - Information technology
  - Building, environment, & society
  - Engineering
  - Health sciences
  - Business & management
  - Media & design

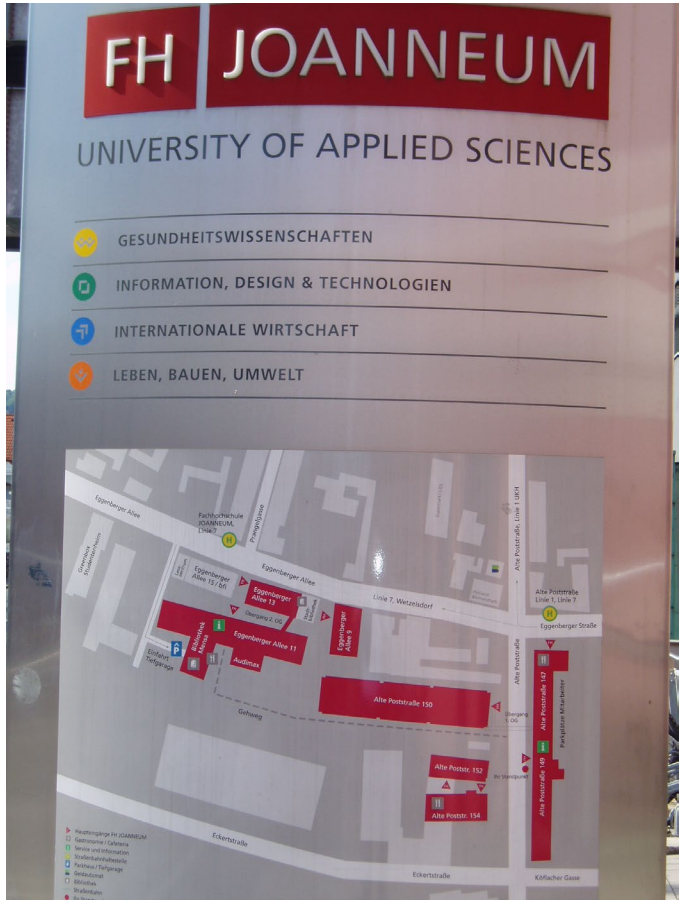


Figure 2: Graz campus map, 27 June 2011

1. Introduction to the Institute of Aviation



Figure 3: Aft-fuselage section of a Dornier 728, aviation laboratory, 27 June 2011

- BSc in Engineering (3 years)
  - 39 places/year, full-time
  - Aeronautical engineering
  - Instruction in German
- MSc in Engineering (2 years)
  - 25 places/year, full-time
  - Aeronautical engineering
  - Instruction in English (EMI)
- Aviation laboratory

2. Selected literature on AI risks

Major concerns of AI practitioners interviewed [1]:

- Harmful recommendations
- Distorted reality (from deep fakes & misinformation)
- Widespread job loss

2. Selected literature on AI risks

- Organisations burden employees with task of applying AI responsibly
- Systemic risks in “complexity and poorly understood system interactions between humans, machine, and ecology” [2, p. 8]
- Dilemma of collecting race and ethnicity information in medical contexts for reducing bias in data on which AI relies but at the same time risking the abuse of such personal data to further marginalise already disadvantaged groups in healthcare systems [3, p. e292]

2. Selected literature on AI risks

Increasing number of fake papers and paper mills, endangering the integrity and reputation of journals, editors, reviewers, and authors [4]

Retractions based on the misuse of AI are likely to multiply

Recent example of a retraction notice published by the Editors-in-Chief [5] of the *Journal of English for Academic Purposes*

2. Selected literature on AI risks

In educational policy, Wang [6] warns of confusing AI-generated recommendations with decisions and calls for transparency and the need to employ AI merely to support human decision-making

Gross [7] underscores the tremendous energy consumption and carbon emissions caused by AI use

3. Motivation and purpose

- Addressing the negative impact of AI
- Critical thinking as goal of higher education
- Assessing consequences of new technology
- Dismantling AI myths

4. Teaching critical thinking skills

Undergraduate engineering program

English for Specific Purposes (ESP)

Teaching stream

Discussion activities

TED talks

4.1. Discussion activities

- Short quotations on AI and automation from Acemoglu and Johnson [8]
- Between two and six AI discussions over a whole semester per course
- Group size varies from three to four participants
- Instructions: *Reflect on the quotation below in small groups. Discuss current and potential future dark sides of AI. Exchange critical views from the media and personal experience with AI use*.

4.1. Discussion activities

- Quotations function as discussion triggers
- Students respond to quotations
- Students exchange their own experiences with AI
- Each extract as a starting point for critical thinking
- Quotations may raise interest in independent reading

4.1. Skills practised in discussion activities

Critical thinking
Communicative interaction
Argumentation
Oral fluency
Technology assessment

4.1. Example of quotation for discussion

AI for surveillance and control of citizens

Under the leadership of Xi Jinping, the government increased its demand for surveillance and related AI technologies first in Xinjiang and then throughout China. In 2017 it issued the “New Generation AI Development Plan,” with a goal of global leadership in AI and a clear focus on the use of AI for surveillance. Since 2014, China’s spending on surveillance software and cameras and its share of global investment in AI have increased rapidly every year, now making up about 20 percent of worldwide AI spending. Researchers located in China now account for more AI-related patents than any other country. [9, pp. 345–346]

4.1. Example of quotation for discussion

AI is amplifying antidemocratic forces

The AI illusion thus favors an antidemocratic impulse, even as many of its executives view themselves to be on the center-left and supporters of democratic institutions and even the Democratic Party. Their support is often rooted in cultural issues and conveniently bypasses the vital building block of democracy: people's active participation in politics. Such participation is especially discouraged when it comes to AI because most entrepreneurs and venture capitalists believe that people do not understand the technology and unnecessarily worry about its intrusive effects. [10, pp. 372–373]

4.2. TED talks

Kelly [11] on AI in 2016

Early AI proponent

AI as industrial revolution

Pariser [12] on algorithms in 2011

Early critic of filters

Algorithmic bias

5. A note of caution for students

In course materials

AI as massive data collection tool

Warning of AI risks

Guidance on AI use

Digital safety

Digital security

6. Discussion

Hamed et al. [13] call for technological support for ensuring ethical AI use

- Computational fact-checking
- Transparency of algorithms
- Comprehensive resources
- Result verification

7. Recommendations

- Teaching stream for replication
- Further development possible
- Use in parts or as whole
- Tailored to local contexts



Figure 4: Graz International Airport, 31 May 2006

8. Conclusions

- AI is unreliable and intrusive
- AI increases workload (checking)
- Awareness of AI risks for students
- Critical thinking
- Assess impact of technology
- Transferability to other disciplines



Figure 5: Directions at Graz International Airport, 12 March 2009

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