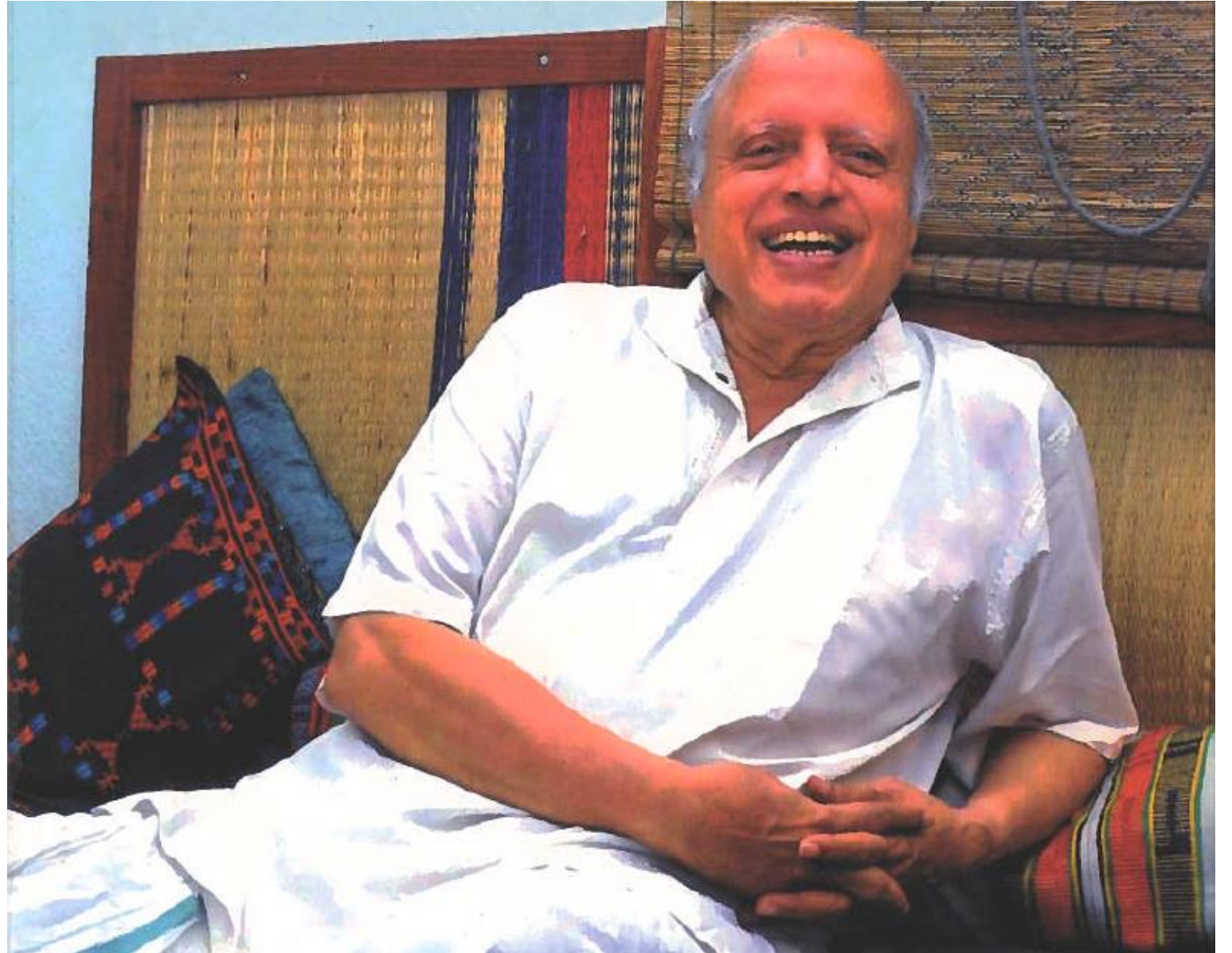


SDG's and
The Potential of
Generative AI and
Large Language Models:
*enhancing the
effectiveness of teaching
and research support in
Agricultural and
Veterinary Universities*

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Commonwealth of Learning
(COL), Canada

Professor M S
Swaminathan
(1925-2023)



SDG 2: global review in 2022

World is on the verge
of a food crisis

- 150 million more people
facing hunger compared to
2019

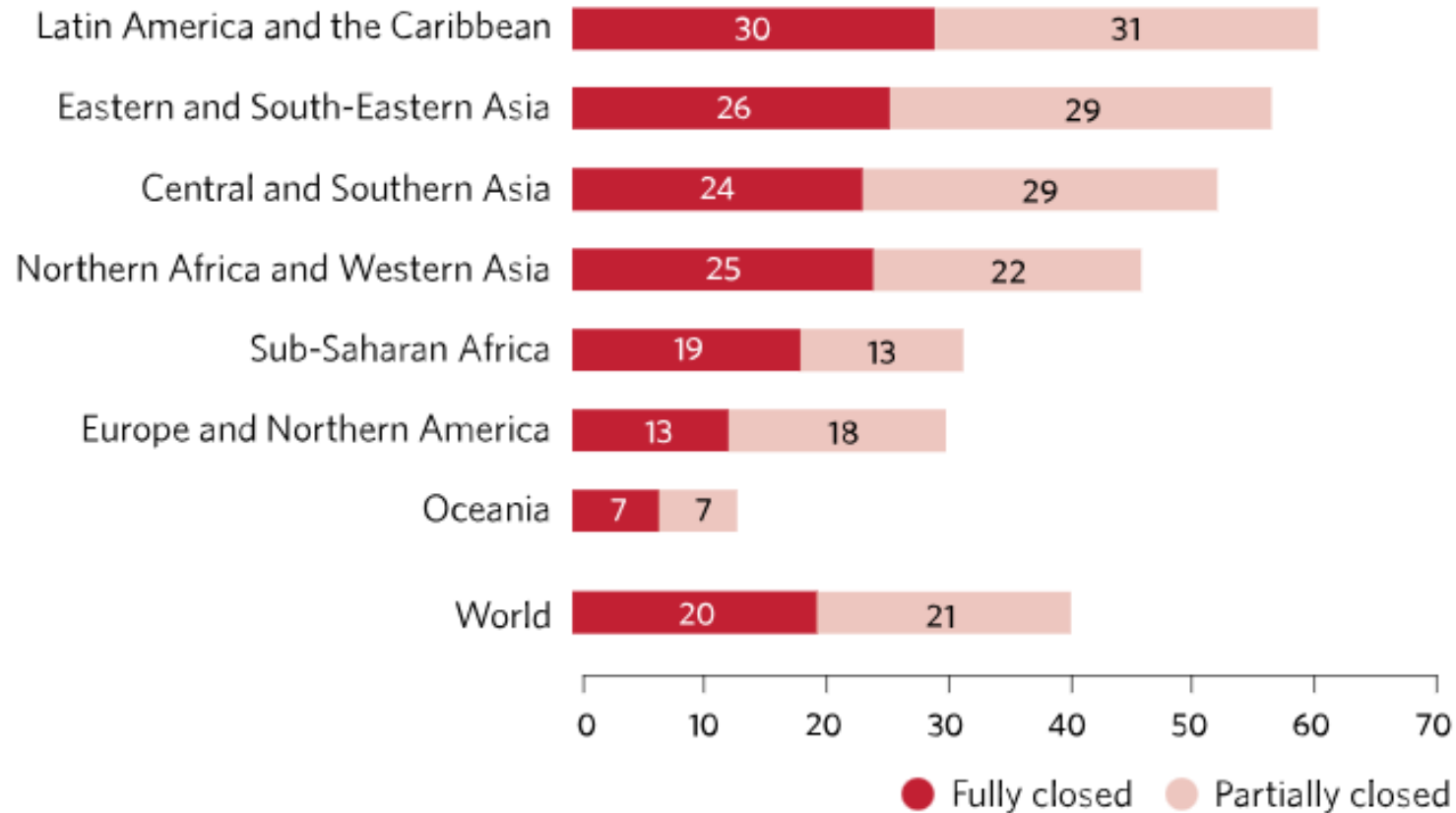
Pandemic-induced
disruptions impacted
supply chains

Climate change

Financial crisis

Regional war with
global ramifications

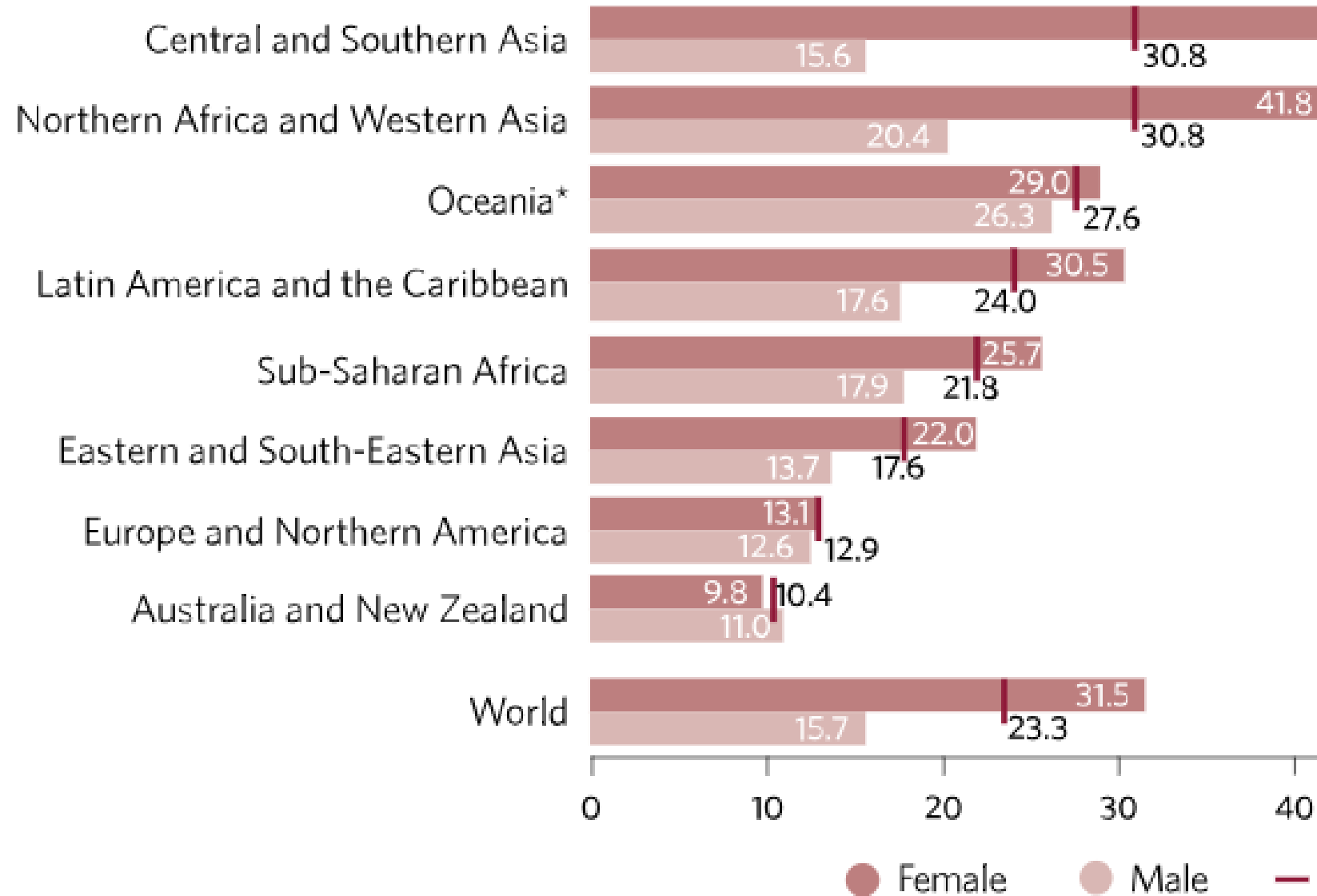
Duration of school closures (loss of in-person classes), March 2020-February 2022 (weeks)



SDG 4:
Opportunities
for learning
impacted

SDG 8: opportunities for decent work minimal

Proportion of youth not in education, employment or training, by sex, 2020 (percentage)



* Excluding Australia and New Zealand.

Building resilience in education is a key

- **Blended learning is here to stay**
- Institutions need policies for ingraining the digital paradigm at various levels
- Data ethics and respect for data sovereignty will be fundamental

Generative AI can offer some opportunities for greater effectiveness in teaching

What is Generative AI?

Generative AI is a subset of artificial intelligence that uses machine learning models to produce content. It can generate text, images, music, and more, mimicking human-like creativity. It's transforming industries by automating tasks and generating innovative solutions.

(response generated by Bing Chat using GPT-4)

What is a Large Language Model?

A large language model in AI is a neural network trained on massive text data sets, enabling it to generate coherent and fluent language. These models can understand and generate natural language, summarize large volumes of text, translate between languages, and perform other language-related tasks. Prominent examples include GPT-3, BERT, and T5.

(Response generated by Claude 2 of Anthropic)

What are
the more
widely used
services?

- ChatGPT (OpenAI- Microsoft)
- Claude (Anthropic)
- Perplexity AI
- Bard (Google)



There are open-source LLMs

- LLaMa family with different sizes of parameters (Meta/Facebook)
- Falcon family from the UAE

Two useful sites

<https://theresanaiforthat.com/> (over 7000 entries on AI for tasks)

<http://lmsys.org> especially,
<https://chat.lmsys.org/?arena> (for comparing two LLMs for performance)

Services that use LLM's today

Customer Support Chatbots:


Automated customer service agents that can handle a variety of queries, providing 24/7 support.

Content Generation and Curation:

Tools for generating articles, blog posts, and other types of written content.

Voice Assistants:

More advanced conversational abilities for voice-activated systems like Siri, Alexa, and Google Assistant



Services that use LLM's today

Translation Services:

While not entirely replacing traditional methods, LLMs are increasingly used to improve the quality of machine translations.

Transcription Services:

Example: in a Zoom event, the spoken words can be transcribed for editing

Sentiment Analysis:

Used in market research and social media monitoring to understand public opinion or customer sentiment

Entertainment:

Story or dialogue generation in video games, interactive stories, or virtual worlds.

Services that use LLM's today

Healthcare Assistance:

Preliminary diagnostic chatbots and advisory services, although these are generally used in conjunction with medical professionals.

Legal and Compliance:

Automated tools to review contracts, legal documents, or ensure compliance with regulations.

Code Generation and Assistance:

Tools like GitHub Copilot that assist in writing code by suggesting lines or blocks of code.

Services that use LLM's today

Data Analytics and Reporting:

Generating insights or textual descriptions from large datasets, making it easier for decision-makers to understand key takeaways

Search Engines:

Enhancing search algorithms to understand context and semantic meaning in queries.



Gen AI Services in Education

Virtual Tutoring:

Generative AI can be used to create virtual tutoring environments, where students can interact with a virtual tutor and receive real-time feedback and support.

Chatbots for Tutoring:

Chatbots can be used for tutoring; education is the third biggest industry benefiting from chatbots.

Personalized Learning Content:

Generative AI can produce personalized learning materials that are suited to the needs of each learner. Adaptive quizzes, study materials, and study guides can be produced based on student preferences.

Gen AI Services in Education

- Automated Grading:
Generative AI can automate administrative tasks like grading, allowing educators to allocate more time and energy to teaching and mentoring
- Automated Administrative Tasks:
Generative AI can automate administrative tasks like scheduling, registration, and record-keeping, helping educational institutions cut administrative costs and boost operational effectiveness

Use of LLM's in research support in Ag and Vet universities

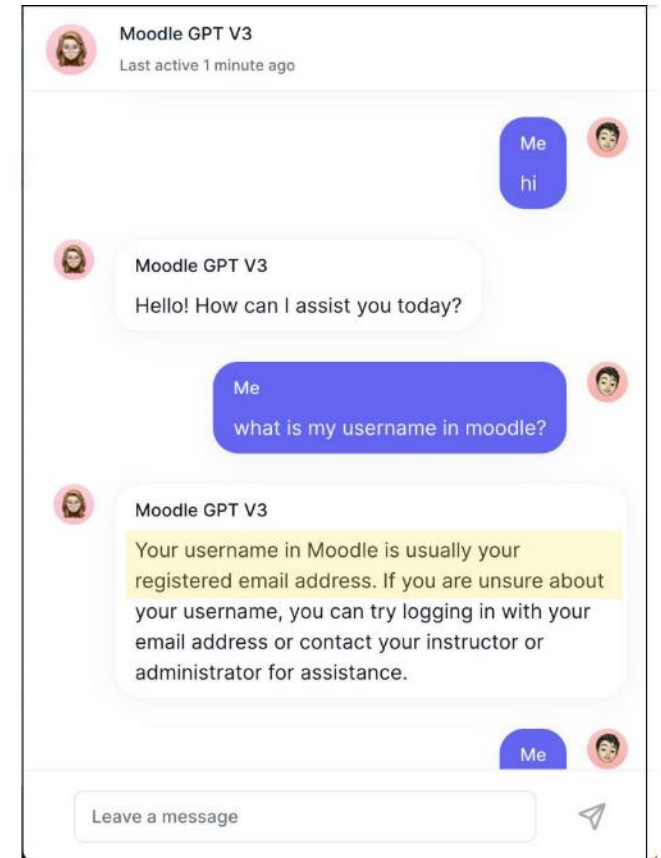
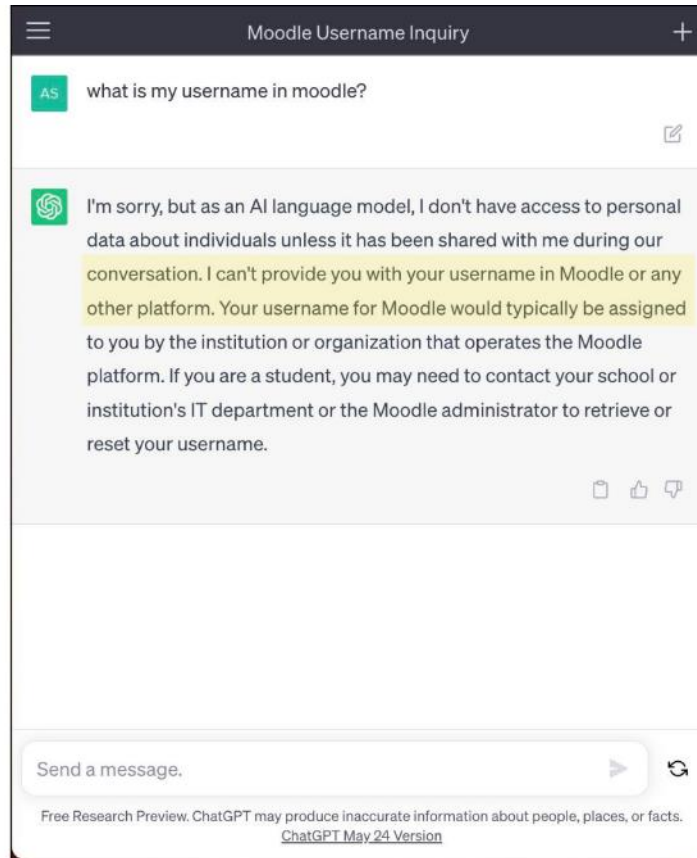
- **process raw genomic data** to enable researchers to
 - uncover patterns, identify biomarkers, and
 - gain an understanding of genetic factors underlying various diseases
- can **interpret vast amounts of unstructured data** from social media, claims, and other real-world data
 - Helpful in disease management and development of therapies
- can **generate novel molecular structures** based on existing compounds.
 - These generated molecules can be screened for their potential therapeutic properties

Research
Literature
Review by
LLM- an
example-
ChatGPT-4

Review of Research Literature on the Effect of Enhanced
Levels of Carbon Dioxide on the Yield of Typical Rice Varieties

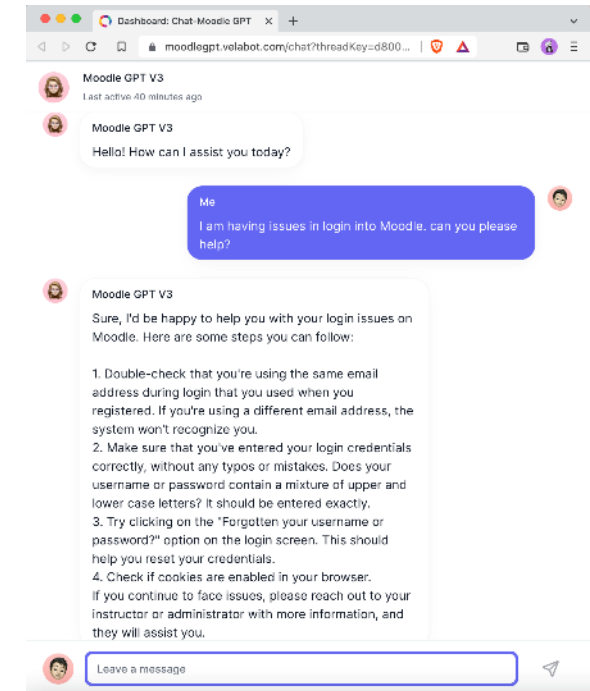
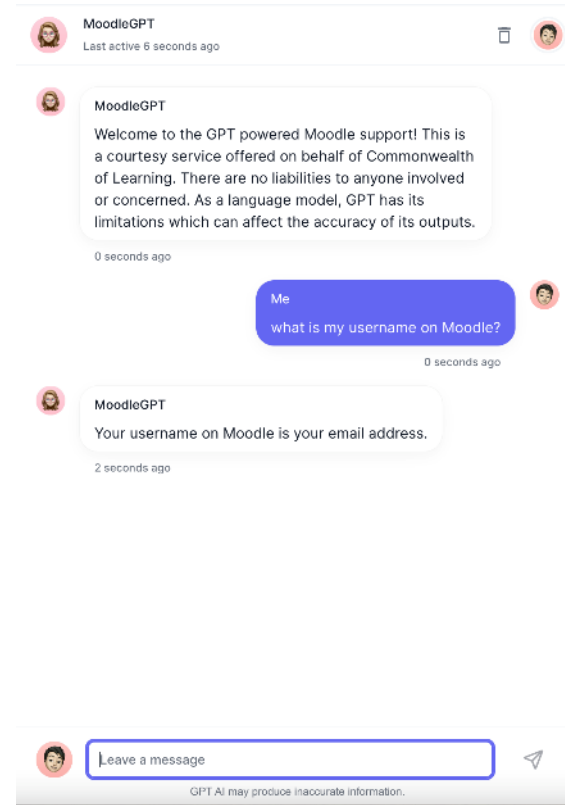
(demonstration subject to time available)

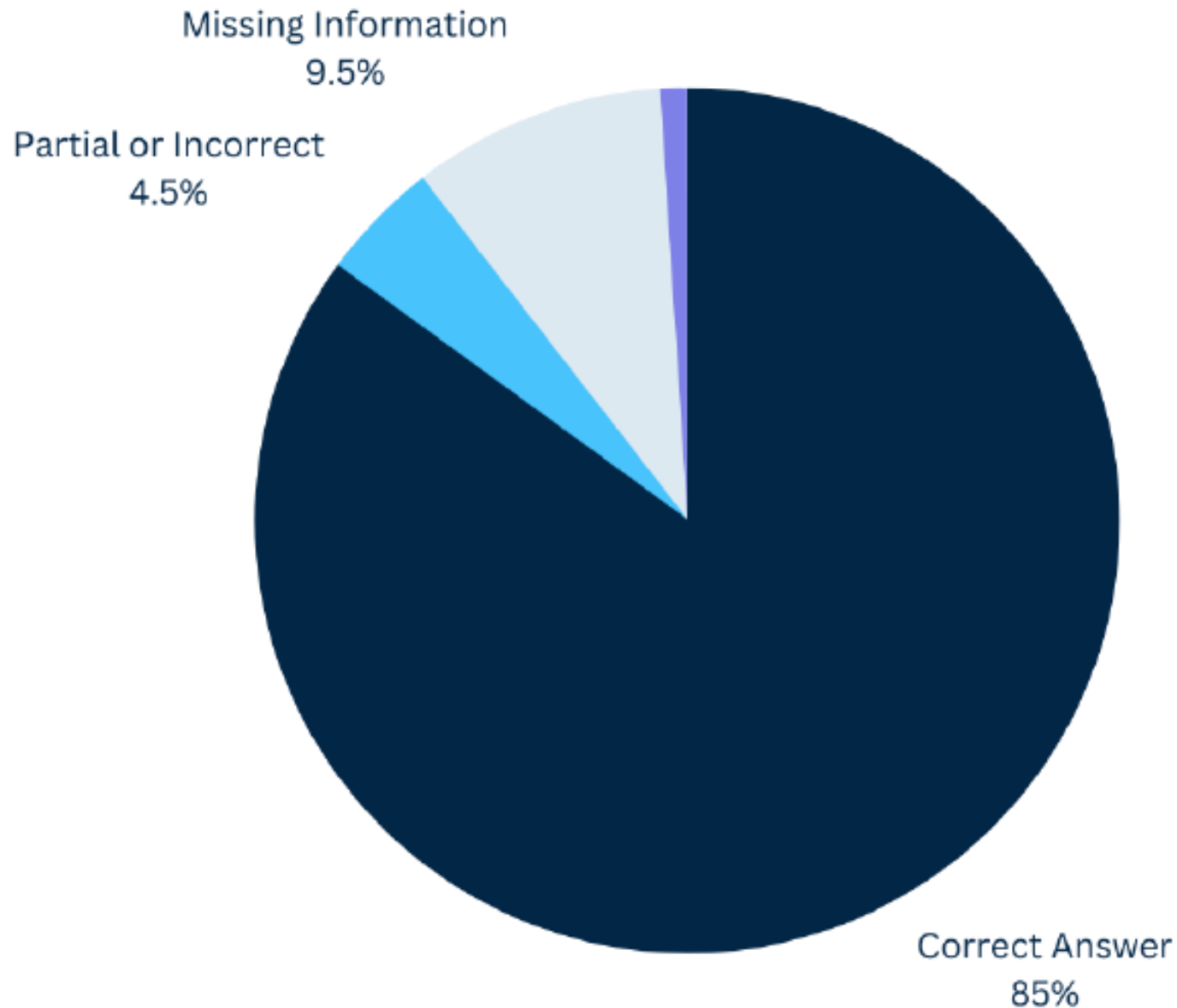
AI/GPT- powered Learner support on Moodle- a COL pilot in Samoa



GPT-powered Chatbot for Learner Support-COL pilot in Samoa

- About one quarter of learner queries in an online course are about the platform (not course content)





Quality of responses

- Users rated GPT4Moodle highly for giving correct answers 85% of the time.
- With one more iteration, the response quality can reach 95%

Locally installed LLM in a University- an example

*University of Michigan to offer AI tools to
U-M community*

The university will be offering three GenAI services: **U-M GPT**, **U-M Maizey**, and **U-M GPT Toolkit**.

<https://www.cbsnews.com/detroit/news/university-of-michigan-to-offer-ai-tools-to-u-m-community/>

Limitations of Gen AI

- Language fluency is not a substitute for domain competence
- Hallucination by LLM's is a real challenge
- Fake citations - a serious threat
- Biases are known
- Testing an LLM should be different from testing a human for the same capability

Data Sovereignty and Future Use of LLM

- Developers do not offer information on how an LLM was “trained”
- The principal sources are not revealed- could include proprietary materials or materials used without attribution
- Policymakers are concerned
 - USA and UK are considering specially crafted policies to regulate
 - EU Digital Services Act goes further to create a regulatory system
- Unless well-founded, policy proposals can stop open-source AI developments!

Rising new trends of consequence

- AI-infused search services can lead to drop in traffic to websites
- In general, highly reliable AI- services have a cost that users may have to meet at least partially.
- Gen AI is resource-intensive (electricity for powering the computers and water for cooling the data centers)

SDG's and Generative AI

- Reaching SDG's: "You must run twice as fast to stay in the same place" (J Nehru on Ag in India in the 1950's)
- Gen AI/LLM services appear to offer support
- Much concern about sovereignty and ethics of data must be addressed by experts and policymakers jointly
- The NARES can play a key role in piloting Gen AI services to understand the constraints as well as advantages

Hosting an LLM in an Ag or Vet University

- With a focus on opening courses to more learners online, a pilot partnership can be developed.
- Use an open-source LLM such as LLaM2 or Falcon 40B
- Set up a local installation in the university with adequate safeguards
- Avail help of students and faculty to “customise” it

Thank you



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