Generative AI and statistics anxiety: Are students using GenAI for learning statistics, and is this linked to student anxiety and confidence while studying statistics?

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Rethinking Teaching and Learning in The Mathematical Sciences in Times of Generative AI

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University policies on GenAI

We are shifting away from prohibitive GenAI policies.

Then:

- ⛔😠🚫

Now:

- Does the relevant programme / module permit GenAI usage?
- Have accuracy, credibility, and copyright-related issues been considered?
- 🤔

Educators' stance on GenAI

To support…
or not?

Why this study?

The human side of GenAI in higher education

- Potential gaps between how educators and students view GenAI.

- Are university policies and guidance connecting with the actual student experience?

- We need to move beyond assumptions and ask directly:
  - What do students really think and feel about using these new tools?
  - Are they confident and supported, or anxious and confused?

Our project: a UK & Australia snapshot

Who: Statistics educators from eight universities in the UK and Australia.

What: To investigate students' **perceptions**, **usage**, and **training** needs related to GenAI for learning statistics, along with links with **anxiety** and **confidence** while learning statistics.

How: Online survey of over 900 higher education students in 2024 and 2025.

This talk: a focus on student **awareness**, **perceptions** and **usage** of GenAI, and how these may link with **anxiety** and **confidence**

Statistics Anxiety

- "...characterised by extensive worry, intrusive thoughts, mental disorganisation, tension and physiological arousal" (Zeidner, 1991, p. 319) when encountering statistical situations
- Thought to affect 70-90% of students (Zeidner, 1991; Marshall et al, 2021) studying statistics as part of their course (or degree)
- Shown to be negatively associated with student performance (Macher et al., 2012; Paechter et al., 2017), particularly anxiety about asking for help (Shaker et al., 2021)

❓ Can using GenAI assist anxious students, particularly those with high levels of anxiety about asking for help?

Who did we survey?

Participants by country, institutional affiliation, level of study, age, and gender

| Country | Institution | N | Level of study | | Age (years) | | Gender (%) | | |
			UG (%)	PG (%)	Mean	SD	Man	Woman	Other
Australia	La Trobe	48	100.0	0.0	26.2	11.34	18.8	79.2	2.1
	Macquarie	63	71.4	28.6	22.7	5.65	47.6	50.8	1.6
	Total	111	83.5	16.5	24.2	8.72	35.1	63.1	1.8
UK	Coventry	65	37.5	62.5	26.2	8.72	60.0	40.0	0.0
	Open University	161	98.1	1.9	39.3	13.44	64.6	33.5	1.9
	UCL	89	23.6	76.4	23.0	3.08	44.9	55.1	0.0
	UWE Bristol	185	54.1	45.9	24.8	7.20	57.3	38.9	3.8
	Total	500	60.2	39.8	29.3	11.69	57.8	40.2	2.0
Overall	Total	611	64.5	35.5	28.4	11.38	53.7	44.4	2.0

Note: these results are based on an interim data download taken on 26th March 2025

Results

❓ How much are students using GenAI?

❓ What is the perceived impact of using GenAI on student anxiety and confidence?

❓ How do students perceive GenAI?

❓ How do student perceptions relate to usage, ability, anxiety and confidence?

❓ Are there any associations between usage, ability, anxiety and confidence?

❓ How do age, perceived ability, anxiety and confidence differ between usage groups?

How much are students using GenAI? [for specified stats tasks]

Stats GenAI user	Unaware		Unaware / other non-specified use		No-low usage		Medium-high usage		Overall	
	N	%	N	%	N	%	N	%	N	%
Undergraduate	35	8.8%	31	7.8%	251	**63.2%**	80	**20.2%**	397	100.00%
Postgraduate	4	1.9%	10	4.7%	93	**43.5%**	107	**50.0%**	214	100.00%
Total	39	6.4%	41	6.7%	344	**56.3%**	187	**30.6%**	611	100.00%

Perceived impact on anxiety and confidence
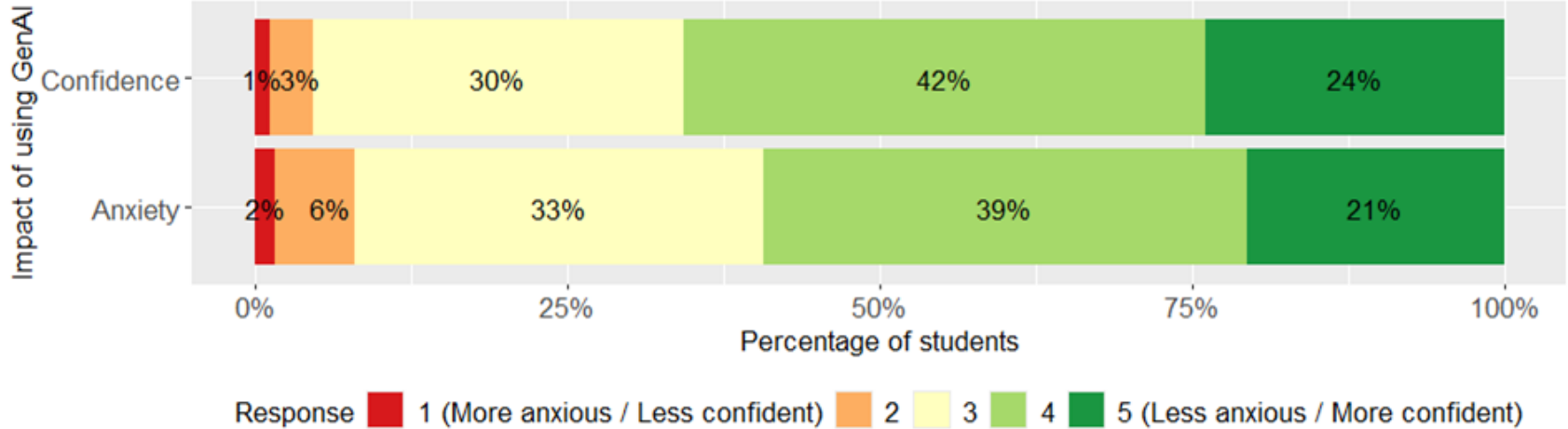
- The majority of students feel that using GenAI reduced anxiety (59.3%) and increased confidence (66%)

Perceptions - what do students think about…

➔ GenAI guidance and policy?

➔ Relying on GenAI for learning?

Student perceptions of GenAI

Opinion Statements	Overall % agree
I am **encouraged by my lecturers to use GenAI** to help with my studies.	**36%**
I have been **given clear guidance** on the appropriate use of GenAI in my studies.	**68%**
Students **should be encouraged more** by their lecturers to use GenAI to help them with their studies.	43%
Students **should be allowed to use** GenAI when completing assessments.	**37%**
Using GenAI for assessments **undermines** the value of a university **education**.	42%
I **trust** that the answers or responses from **GenAI** are always truthful and **correct**.	**19%**
I am **anxious** about using GenAI for **fear of being accused of academic misconduct**.	**65%**
I am concerned that GenAI might **limit my ability to learn** my subjects.	45%

How do student perceptions relate to usage, ability, anxiety and confidence?

- Students who **use** GenAI more are more likely to agree that:
  - Students should be **encouraged** to use GenAI more (correlation 0.36, p < 0.01)
  - Students should be **allowed** to use GenAI for assessments (0.32, p < 0.01)
  - They are **encouraged** by lecturers to use GenAI (0.3, p < 0.01)
  - They **trust** the responses from GenAI (0.25, p < 0.01)
- Perceived **ability** does not appear to be strongly related to perceptions of GenAI (no strong correlations)
- Students who reported higher reductions in **anxiety** are more likely to agree that:
  - Students should be **encouraged** to use GenAI more (0.29, p < 0.01)
  - Students should be **allowed** to use GenAI for assessments (0.28, p < 0.01)
- Students who reported higher increases in **confidence** are more likely to agree that:
  - Students should be **encouraged** to use GenAI more (0.38, p < 0.01)
  - Students should be **allowed** to use GenAI for assessments (0.27, p < 0.01)

Are there any associations between usage, ability, anxiety and confidence?

- Students who **use** GenAI more are more likely to:
  - Perceive an increase in **confidence** (0.50, $p < 0.01$)
  - Perceive a decrease in **anxiety** (0.43, $p < 0.01$)
- Students with **lower** perceived **ability** are more likely to feel **anxious** towards statistics (-0.36, $p < 0.01$)
- Students who perceive an increase in **confidence** are also likely to perceive a decrease in **anxiety** (0.66, $p < 0.01$)

How do age, perceived ability, anxiety and confidence differ between usage groups?

Variable	Hypothesis test result and effect size	Unaware	Unaware / other non-specified use	No-low usage	Medium-high usage	Overall
Statistics anxiety	$F(3,607)=6.78$, $p<0.001$, $\eta^2=0.032$	3.5	3.4	2.9	3.3	3.1
Age	$F(3,607)=15.02$, $p<0.001$, $\eta^2=0.069$	36	29	30	25	28
% good ability	K-W=15.08, $p=0.002$, $\eta^2=0.020$	28%	20%	41%	47%	40%
% reduced anxiety	K-W=61.9, $p<0.001$, $\eta^2=0.099$	NA	29%	49%	79%	59%
% increased confidence	K-W=86.9, $p<0.001$, $\eta^2=0.140$	NA	25%	56%	87%	66%
% PG	$\chi^2(3)=62.678$, $p<0.001$, V=0.320	10%	24%	27%	57%	35%
Statistics anxiety (after controlling for other factors)	$F(3, 559)=4.76$, $p=0.003$, $\eta_p^2=0.025$	3.5	3.1	2.9	3.3	NA

Statistics anxiety (after controlling for other factors)

- Further analysis showed that after controlling for other factors, **usage** was still significantly associated with **statistics anxiety**, in addition to:
  - Age
  - Institution
  - Study level
  - Perceived ability in statistics
  - Fear of being accused of academic misconduct (perception)
  - Students being allowed to use GenAI in assessments (perception)

Discussion and conclusion

- Reported GenAI usage was modest. However, this may increase over time and may be subject to underreporting
- Even so, findings show that GenAI usage is associated with decreases in anxiety and increases in confidence while studying statistics
- Overall, students who are more anxious tend to use GenAI more
- However, students who were unaware were more anxious compared with those who were aware but chose not to use (or rarely use) GenAI

Discussion and conclusion

- Implication: increasing awareness of GenAI may assist anxious students
- Students have some healthy skepticism around GenAI outputs and its potential to undermine learning
- The results also indicate the potential of GenAI as a useful learning assistant, particularly for those who experience anxiety
- Future work: Given the potential value of GenAI tools in reducing anxiety and supporting student learning of statistics, what could a GenAI-driven pedagogy look like?

This presentation is based on work within an upcoming conference paper.

Shaker, A., Marshall, E., Owen, A., Calvert, C., Sanchez A., L. A., Hoh, T. Y., Larkins, J.-a., Binkowski, K., Dunn, P. K., & Derrick, B. (2025). Investigating links between student awareness and use of Generative AI tools, and student anxiety and confidence when studying statistics [Paper under review]. *2025 IASE Satellite Conference: "Statistics and Data Science Education in STEAM".* Münster.

Questions?

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