Online Appendix of

Generative AI Usage and Academic Performance

Completed Research Paper

Variables	Definition	Rationale	Reference
Exam Score	Continuous measure of student performance in the final exam of the mandatory introductory accounting course indicating the percentage of points a student achieved in the final exam. The minimum is zero and the actual (achievable) maximum is 96.67 (100).	to solve course-relevant problems, therefore approximating student performance. Consistent with related	citation 4, Cheng and Ding (2021), Eskew and Faley (1988), Hu et al. (2023), Lento (2018), Massoudi et
GenAI User	Indicator variable depicting student usage of GenAI applications for studying and crafting work that they intentionally should have written on their own. <i>GenAI User</i> is estimated by ZeroGPT, a GenAI detection system indicating the percentage of text identified as created by GenAI applications. <i>GenAI User</i> equals one if the estimate of ZeroGPT exceeds a threshold of 0.5 and is zero otherwise. In our robustness checks we use alternating thresholds of the ZeroGPT estimation (i.e., 0.4 and 0.6) to distinguish GenAI users from non-users.	effects (e.g., simplification of complex topics and personalized learning) as well as negative effects (e.g., risk of superficial understanding and loss of independent problem-solving) of using GenAI applications in higher education. These factors can either	Fauzi et al. (2023), Gilson et al. (2023), AlAfnan et al. (2023), Pavlik (2023), Engelmann et al. (2023), Calderon et al. (2023), Sallam et al. (2023), Qadir (2023), Lund et al. (2023), Qudir (2023), Lund et al. (2023), Wu et al. (2023), Perkins (2023), Cotton et al. (2023), Ali et al. (2023), Sullivan et al. (2023) Negative effects of GenAI usage: Markauskaite et al. (2022), Eager and Brunton (2023), Jain and Kapoor (2013), Rasul et al. (2023), Crawford et al. (2023a), Sallam et al. (2023), Crawford et al. (2023b), Lund et al. (2023), Milano et al. (2023), Bangert-Drowns et al.

Variables	Definition	Rationale	Reference	
		ZeroGPT is capable if correctly classify texts of German language.	Aremu (2023), Liang et al. (2023), Walters (2023), Weber-Wulff et al. (2023), Yeadon et al. (2024)	
A-Level Grade	Continuous measure school performance prior to entering university, ranging from 4.0 (best grade) to 1.0 (worst grade).	<i>A-Level Grade</i> is used as proxy for general academic aptitude in this study. Related studies consistently document A-level grades to be predictive for exam performance.	performance: Azzali et al. (2023), Eskew and Faley (1988), Lento	
Attempt	Continuous measure equals the number of times a student has registered for the final exam with a maximum value of five, as student must pass the examination within five semesters (i.e. five attempts) according to the regular examination regulations.	the number of attempts) affect performance. We include <i>Attempt</i> into our analyses to control for prior	performance: author self-citation 2, Dowling et al. (2003), Perera	
Attendance	Continuous measure indicating the number of tutorials a given student attended scaled by the total number of tutorials offered to the students. Information on students' attendance was collected by conducting short in-class quizzes on the LMS comprising three questions regarding the specific tutorial contents in each tutorial. To participate in the quizzes, the students had to sign in to the LMS utilizing a QR-code presented to them in the corresponding tutorial.	association between student behavior (e.g., attendance) and their exam performance. The students' attendance reflects their effort and motivation they spend on the given course Byrne and Flood (2008). We therefore include <i>Attendance</i> into our	performance: author self-citation 2, Aldamen et al. (2015), Cheng and Ding (2021), Massoudi et al.	
Vocational Training	Indicator variable equal to one if a given student completed vocational training before entering university, and zero otherwise.		performance: author self-citation 1, Guney (2009), Hartnett et al.	
Voluntary Service	Indicator variable equal to one if a student completed a voluntary service or spent a gap year prior to entering university, and zero otherwise.		performance: author self-citation	

Variables	Definition	Rationale	Reference
		for students. Voluntary Service reflects higher self-organization skills, supporting students to structure university life and thus improve exam performance. We include Voluntary Service to control for this potential impact.	(2004)
Female	Indicator variable equal to one if a student is female, and zero otherwise.	Related studies provide evidence for students' gender affecting their exam performance. The results of these studies are versatile, indicating a positive, negative, or no effect of gender on performance. We control for a potential influence by integrating <i>Female</i> into our analyses.	performance: author self-citation 3, Aldamen et al. (2015), Gammie et al. (2003), Gracia and Jenkins (2003), Mutchier et al. (1987), Premuroso et al. (2011), Tan and
			Negative effect on exam performance: Johansson et al. (2022), Koh and Koh (1999), Massoudi et al. (2017), Tan and Laswad (2008)
			No significant effect on exam performance: Azzali et al. (2023), Byrne and Flood (2008), Hu et al. (2023), Papageorgiou and Halabi (2014)
LinkedIn User	Indicator variable equal to one if a student has a LinkedIn profile, and zero otherwise.	impacts exam performance and is therefore included in our analyses.	exam performance: Paul et al. (2012)
		Related studies document LinkedIn usage being correlated with exam performance. Moreover, (new) social media usage (e.g., LinkedIn usage) can be utilized as operationalization for personal innovativeness, which in turn affects GenAI acceptance among students.	Study documenting an effect on personal innovativeness: Strzelecki (2023) Studies documenting an effect on social media usage: Aldahdouh et al. (2020), Wijesundara and Sun (2018)
Course of Study	Categorial variable equal to one if a given student is registered for business studies, two for economics, three for economics in complementary subject, four for engineering and management - production	considerably across different courses of study as each attract certain	

Variables	Definition	Rationale	Reference
	engineering, five for electrical engineering with management, six for information systems and management, and seven for others, respectively. We integrate Course of Study as fixed effects in our analyses.	influences students' exam performance and therefore include	Laswad (2008), Tan and Laswad (2015)
German Detector	Indicator variable alternatively deployed as <i>GenAI User</i> estimated by the detection system developed at the University of Applied Sciences Wedel. <i>German Detector</i> equals one if the estimate of Originality.AI exceeds a threshold of 0.1 and is zero otherwise.	estimate <i>GenAI User</i> are characterized by the morphological	Tlok et al. (2023)
Originality.AI	Indicator variable alternatively deployed as <i>GenAI User</i> estimated by the detection system Originality.AI. <i>Originality.AI</i> equals one if the estimate of Originality.AI exceeds a threshold of 0.5 and is zero otherwise.	findings by using alternative detection tools. We utilize	Walters (2023)
Manual Computation	Continuous measure indicating GenAI application usage for text generation. <i>Manual Computation</i> is extracted from principal component analysis comprising <i>Adjectives</i> , <i>Fog Index</i> , and <i>Herdan's C</i> . We use this GenAI detection as an alternative estimation of <i>GenAI User</i> in our robustness checks.	an alternative measure to estimate <i>GenAI User</i> to test the robustness of our main analysis. Systems detecting	Markowitz et al. (2023), Martínez et al. (2024), Muñoz-Ortiz et al. (2023), Shah et al. (2023), Deveci et al. (2023), Pehlivanoğlu et al.

Variables	Definition	Rationale	Reference
Adjectives	Continuous measure indicating the number of adjectives scaled by the total number of words of a text.		
Fog Index	Gunning (1952) readability index, calculated as: $\left(\frac{Total Words}{Total Sentences} + 100 * \frac{n_{WSY^{\geq 3}}}{Total Words}\right) * 0.4$ where $n_{WSY} \ge 3$ is the number of words with three syllables or more. A higher (lower) <i>Fog Index</i> indicates an easier (a more difficult) read.	We include <i>Fog Index</i> into the principal component analysis to extract <i>Manual Computation</i> . Related studies have shown that GenAI texts are less readable. <i>Fog Index</i> is commonly used by numerous studies to approximate text readability.	Gunning (1952)
Herdan's C	Herdan (1960) lexical richness index, calculated as: log (Total Unique Terms) log (Total Words)	<i>Herdan's C</i> is included into the principal component analysis to extract Detection Factor. Related studies provide evidence on lexical richness to be predictive for the use of GenAI applications to generate texts. We deploy <i>Herdan's C</i> to approximate lexical diversity and richness.	Herdan (1960)

Appendix A. Variable Definitions.

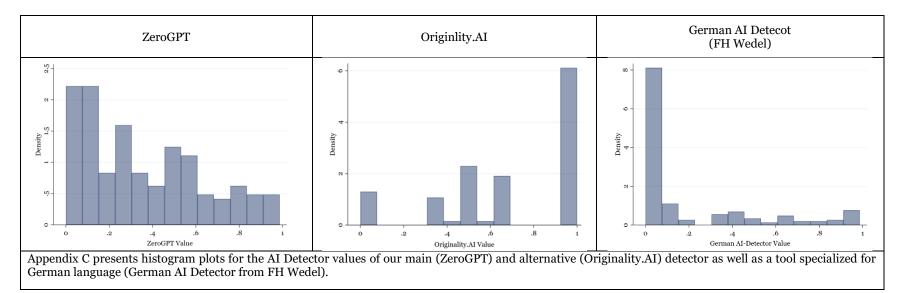
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) GenAI User	1.000							
(2) A-Level Grade	-0.116 *	1.000						
(3) Attempt	0.184 **	-0.152 **	1.000					
(4) Attendance	-0.072	0.214 ***	-0.331 ***	1.000				
(5) Vocational Training	-0.097	0.014	-0.100	0.049	1.000			
(6) Voluntary Service	-0.056	0.057	-0.051	-0.066	-0.298 ***	1.000		
(7) Female	-0.109	0.041	0.003	-0.001	-0.038	0.173 **	1.000	
(8) LinkedIn User	0.048	0.106	0.057	-0.059	-0.038	0.071	0.067	1.000

Appendix B presents the pairwise pearson correlations of the variable of interest *GenAI User* and the control variables. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively. All variables are defined in Appendix A.

Appendix B. Pearson Correlations.

0	8 (0.267)	22 (0.734)
0	9 (0.300)	21 (0.700)

Appendix C. Survey Results.



Appendix D. Distribution of AI Detector

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