Everyone Talks Everything With ChatGPT:
Students' Uses of ChatGPT and Their Impact on Learning Performance

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ABSTRACT

Research suggests that ChatGPT offers numerous affordances for students, who use it for various purposes, yet the field lacks quantitative studies that offer insight into a variety of students' actual uses of ChatGPT and their impact on academic performance. The main aims of this paper were (a) to introduce and validate a typology of students' ChatGPT uses, (b) to identify clusters of students with similar patterns of ChatGPT uses, and (c) to investigate the impact of ChatGPT uses on academic performance. An online survey research was conducted, which resulted in a typology of 10 distinct uses of ChatGPT and four distinct clusters of students. The strongest predictor of academic performance is information searching and explanation. Problematic use of ChatGPT, while resulting in improved grades, is found to be detrimental to competencies. Although the study might not fully represent the diversity of students' experiences across academic institutions, the typology offers a baseline for nuanced research and interventions pertaining to particular ChatGPT uses among students.

KEYWORDS

ChatGPT, Clustering, Factor Analysis, Large Language Models, Learning Performance, Motives, Problematic Use, Regression Analysis, Students, Typology, Uses and Gratifications

ChatGPT, an application with unprecedented adoption rates (Moon, 2023; "ChatGPT Sprints," 2023), has been hailed as a groundbreaking innovation in the field of generative artificial intelligence (GAI) (AlAfnan et al., 2023; Mhlanga, 2023). Although the adoption of artificial intelligence (AI), specifically GAI, has been steadily increasing, the introduction of ChatGPT has sent a resonating wave across media, business, politics, education, and society as a whole, becoming one of the most discussed technologies over the last few years (Dwivedi et al., 2023; Sullivan et al., 2023). Especially in the field of education, ChatGPT and similar GAI tools based on large-language models (LLMs) have sparked immense amounts of research articles, preprints, conference papers, and presentations highlighting the numerous opportunities and challenges for educators and learners (Allam et al., 2023; Bahrini et al., 2023; Kocon et al., 2023; Ray, 2023; Tlili et al., 2023; Vargas-Murillo et al., 2023; Zhang & Tur, 2023). For students, who were among the early adopters integrating ChatGPT and related applications[1] into their studies ("One-Third of College Students," 2023), the tool offers numerous features for enhancing learning efficiency by explaining complex concepts, providing feedback, writing computer code, summarizing text, or adjusting texts to students' different perspectives, needs, and preferences (Baidoo-Anu et al., 2023; Meyer et al., 2023; Ray, 2023; Qureshi, 2023; Zhang & Tur, 2023). However, ChatGPT's capabilities of writing whole essays or successfully completing exams

in different fields (Allam et al., 2023) were quickly recognized as a means of facilitating academic dishonesty and AI-assisted cheating (Bin-Nashwan et al., 2023; Cotton et al., 2024; Kocon et al., 2023; Oravec, 2023; Tlili et al., 2023). As a result, many universities have adopted rules and guidelines regarding the use of ChatGPT and GAI in general.

The question of how GAI should be incorporated and regulated in the educational field has been identified as a key priority in AI research in general (Van Dis et al., 2023). An important baseline for making meaningful and efficient decisions, rules, and guidelines is to obtain objective insight into the reality of how a certain application is used (Pfeffer & Sutton, 2006). The main research problem of this paper thus pertained to the ways in which students use ChatGPT and related applications and how these uses influence academic performance. This research should present an important baseline for further studies and the development of regulations regarding the use of ChatGPT in educational settings. Despite the abundance of research revealing the many possible affordances and perceptions of ChatGPT, it has been argued that more empirical research is needed to provide a better understanding of the patterns of the actual uses of ChatGPT and their effects on students (Allam et al., 2023; Kocon et al., 2023). Recently, studies have emerged that go beyond the identification of affordances to offer insights into students' motives for using ChatGPT and their experiences and satisfaction with it (Jishnu et al., 2023; Lee & Park, 2023; Soufan, 2023). The main findings of these studies reveal that students have very diverse perceptions of this technology and are, to some extent, aware of the issues with biases and academic integrity (Shoufan, 2023), while the main motives for use are found to be information acquisition, entertainment, academic content creation, novelty, and convenience (Jishnu et al., 2023; Lee & Park, 2023).

However, these studies have not provided direct answers to questions about what students actually do with ChatGPT, what uses emerge, and to what extent they are present in reality. For example, to what extent do students use the tool to enhance their learning, and to what extent do they engage in problematic uses, such as plagiarism? How do such different uses impact their academic success and competencies? Are there distinct groups of students who use ChatGPT only for information seeking and never for plagiarism? Establishing a typology of actual ChatGPT uses is a necessary step in answering such questions, as typologies of uses in general reduce complexities and help gain objective insights into regularities regarding the uses of a particular new information and communications technology (ICT) (Brandtzaeg, 2010; Eynon & Malmberg, 2011). Thus, the main aim of this research was threefold: (a) establish a typology of students' uses of ChatGPT and discover which uses are most and which are least present, (b) identify clusters of students with similar patterns of use, and (c) investigate the impact of different uses on academic performance.

In addition to identifying the variety of ways in which students use ChatGPT, the original value of this study lay in identifying distinct user groups and examining the role of ChatGPT in student performance, which is a crucial research question regarding GAI in general (Dwivedi et al., 2023). Numerous studies and analyses have implied that it can be an effective tool not only for enhanced learning but also for writing whole essays and cheating on assignments (Cotton et al., 2024; Kocon et al., 2023; Tlili et al., 2023). A recent report suggested that students openly embraced GAI in their studies and commonly used it unethically ("One-Third of College Students," 2023). It was thus crucial to investigate how (different) uses of ChatGPT impact students' academic performance in terms of both grades and competencies.

To answer these research questions, a theoretical background is first presented, followed by a presentation of the survey-based quantitative study, empirical verification of the measurement instrument for the proposed typology of ChatGPT uses, identification of the clusters of similar users, and investigation of the effects of various ChatGPT uses on academic performance.

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