Using Generative AI in Higher Education: A Guide for Instructors

**Henner Gimpel, Kristina Hall, Stefan Decker, Torsten Eymann, Niklas
Gutheil, Luis Lämmermann, Niklas Braig, Alexander Maedche,
Maximilian Röglinger, Caroline Ruiner, Manfred Schoch, Mareike
Schoop, Nils Urbach, and Steffen Vandirk**

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Henner Gimpel
Digital Management
University of Hohenheim
Stuttgart, Germany
henner.gimpel@uni-hohenheim.de

Kristina Hall
Chair for Business & Information Systems Engineering
University of Bayreuth
Bayreuth, Germany
kristina.hall@uni-bayreuth.de

Stefan Decker
Chair of Information Systems and Databases, Fraunhofer FIT
RWTH Aachen University
Sankt Augustin, Germany
stefan.decker@fit.fraunhofer.de

Torsten Eymann
Niklas Gutheil
Luis Lämmermann
Chair for Business & Information Systems Engineering
University of Bayreuth
Bayreuth, Germany
torsten.eymann@uni-bayreuth.de, niklas.gutheil@uni-bayreuth.de,
luis.laemmermann@uni-bayreuth.de

Niklas Braig
University of Bayreuth
Bayreuth, Germany
niklas.braig@uni-bayreuth.de

Alexander Maedche
Institute for Information Systems
Karlsruhe Institute of Technology
Karlsruhe, Germany
alexander.maedche@kit.edu

Maximilian Röglinger
FIM Research Center for Information Management, Fraunhofer FIT
University of Bayreuth
Bayreuth, Germany
maximilian.roeglinger@fim-rc.de

Caroline Ruiner
Department of Sociology
University of Hohenheim
Stuttgart, Germany
caroline.ruiner@uni-hohenheim.de

Manfred Schoch
Faculty of Computer Science and Engineering
University of Applied Sciences Esslingen
Esslingen, Germany
manfred.schoch@hs-esslingen.de

Mareike Schoop
Department of Intelligent Information Systems
University of Hohenheim
Stuttgart, Germany
schoop@uni-hohenheim.de

Nils Urbach
Research Lab for Digital Innovation & Transformation
Frankfurt University of Applied Sciences
Frankfurt, Germany
nils.urbach@fb3.fra-uas.de

Steffen Vandirk
University of Bayreuth
Bayreuth, Germany
steffen.vandirk@uni-bayreuth.de

ABSTRACT

The rapid advancement of generative AI (GenAI) systems such as ChatGPT raises questions about their potential impact on higher education. This article provides a comprehensive overview of the opportunities, limits, and risks of using GenAI in higher education. Drawing on our experience in information systems, computer science, management, and sociology, we examine the concrete application possibilities of ChatGPT and other GenAIs in the daily activities of higher education, such as teaching courses, learning for an exam, writing seminar papers and theses, and assessing students' learning outcomes and performance. By offering clear guidelines and actionable recommendations, this article serves as a practical guide for instructors, helping them to use GenAI efficiently and responsibly in their teaching practices. To further highlight the practical relevance of our recommendations, we evaluate their applicability from the perspective of instructors. Finally, we stress the need for further interdisciplinary research and collaboration to gain a deeper understanding of these technologies' transformative potential in education.

Keywords: Artificial intelligence, Generative AI, Generative AI in teaching, Generative language models, Higher education

1. INTRODUCTION

"Would ChatGPT get a Wharton MBA?" This headline circulated in the media in early 2023, raising concerns about academic integrity in higher education worldwide. The launch of ChatGPT in November 2022, its performance increase with the introduction of GPT-4 in March 2023, and the further performance increase and multimodal capabilities of GPT-4o released in May 2024 shook up the world of higher education. ChatGPT and the large language models (LLMs) of OpenAI are examples of a broader development in which numerous generative artificial intelligence (GenAI) models and applications based on them have emerged in recent years. These are now routinely used by many students and instructors. However, the question of how instructors should deal with this development is open.

Even before the release of ChatGPT, higher education has been an emerging application area for the deployment of conversational agents (Al Muid et al., 2021) since they can provide the advantages of being permanently available, scalable, and location-independently accessible, levering the potentials to address multiple learners' concerns simultaneously while adapting to their individual needs (Elshan & Ebel, 2020; Hobert, 2019). However, in late 2022 and early 2023, the release of ChatGPT (initially based on GPT-3.5) disrupted the higher education field and many other domains in a matter of just weeks. Higher education mostly encompasses teaching and learning how to apply state-of-the-art knowledge and create meaningful, valuable new knowledge (Díaz-García et al., 2022). Both the application and the creation of knowledge often manifest in text, images, or other representations that can be easily communicated, stored, processed, and the like. Since GenAI systems can generate text, images, or other representations with relatively little human input, it is unsurprising that their advent fundamentally challenges accepted knowledge, assumptions, and behaviors in higher education while maintaining or even strengthening the focus on good scientific practice.

Building on that, opinions from the context of higher education demonstrate a sharp divide between those who are enthusiastic about the technology and those who are extremely concerned. Schmid (2023) from the University of Bamberg pointed out that the GPT-3 model has a deeper problem: its inability to trace the sources of each statement and the process used to create them. Schiller (2023) from the Free University of Berlin further highlighted that the program sometimes produces nonsensical output. Decker (2022) suggested: "If people using the generated material are not careful and responsible (and let us be honest, not everyone is), we may be flooded with a barrage of half-truths, misrepresentations, and simply falsehoods, all of which seem plausible and are written using perfect language."

Despite these concerns, there is a broad consensus that GenAI tools such as ChatGPT can potentially transform learning and teaching, as they can be utilized for various applications, including writing, translation, professional communication, and personalized learning (Atlas, 2023). However, without the enablement of potential users, GenAI tools cannot have their desired outcomes and will not lead to the expected increases in the productivity of instructors and students. We propose guidelines to help instructors to successfully use GenAI in higher education. Using these guidelines, skeptical instructors can be convinced that these tools can, in fact, contribute to higher education.

This article reflects on the tremendous opportunities of GenAI tools in higher education and the potentially harmful effects of their increasing use. Doing so can guide instructors and students to reflect on their teaching and learning to make sense of the GenAI disruption in higher education. To this end, we focus on the *teaching-learning trifecta* between instructors, students, and technological tools.

2. OVERVIEW OVER (GENERATIVE) AI, LLMS, AND CHATGPT

AI represents a significant milestone in technological progress and marks the interface between human cognitive abilities and machine computation. It has far-reaching implications, driving change across all industries, altering social norms, and pushing the boundaries of what can be achieved using machines.

While there are several standard definitions in research and practice, we define AI as a broad field that encompasses various techniques and approaches to creating intelligent machines that perceive their environment and take actions (Gimpel et al., 2023b). While the hype around AI has only been prevalent in recent years, AI research has been going on for more than 70 years. One of the most important milestones in this research is the Turing test from 1950, in which Alan Turing investigated machines' abilities to conduct human-like conversations. This test helped to measure the progress of AI research and led to researchers around the world working to make machines ever more human-like and intelligent. The first neural network was developed in 1957 by Frank Rosenblatt, followed by the invention of the Backpropagation algorithm in 1986, which has led to significant advances in image and speech recognition through a multilayered approach. More than 30 years later, Vaswani et al. (2017) introduced the Transformer architecture, which is considered a breakthrough in the development of language models; it is the basis for the so-called Generative Pre-trained Transformer (GPT) models, representing many of the currently available language models. While the milestones are examples of different forms of AI, they can be summarized under the definition of simulating human intelligence in systems.

As we delve into the mechanics of AI, we encounter the field of machine learning (ML), a subset of AI (see Figure 1) that provides systems with the ability to learn from and improve upon experience without explicit programming (Kühl et al., 2022). The best-known current example of ML is GenAI, which refers to algorithms that generate new content, from poetry and lyrics, and software code, to complex theories, audio files, images, videos, digital models of chemical molecules, processes, and blueprints. By transforming raw data into structured results, GenAI can mimic human creativity (Russell & Norvig, 2016). Its importance in society stems from its technological functioning and ease-of-use through interfaces such as ChatGPT or Copilots.

LLMs are critical for GenAI's progress. These are highly developed models that have been trained on various text corpora and can predict and generate human-like texts based on the learned patterns (Gimpel et al., 2024). LLMs, such as GPT-4, represent a new peak of this progression due to their size and profound ability to handle language nuances and contexts. Conversational agents or chatbots are applications that can use

such LLMs. They are designed to simulate a human conversation. They use the underlying model's ability to process and generate speech to interact with users in an informative and engaging way. ChatGPT, which currently builds on the GPT-3.5 and GPT-4 models, is one such agent that has attracted attention for its ease-of-use and its ability to have complex conversations in various domains. In this article, we often refer to ChatGPT, focusing on this specific system from OpenAI and as a representative of other LLM-based systems, such as Microsoft's Copilot or Google's Gemini. Although the points concern a broader class of systems, we use ChatGPT as an example because, first, this is the system that dominates the discussion and, second, it makes the text simpler.
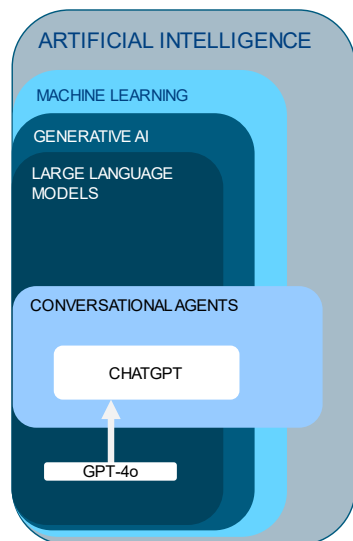

Figure 1. AI and Its Subdomains (Gimpel et al., 2024)

The potential applications of ChatGPT and other GenAI-based systems are extensive. Particularly in higher education, their capabilities to comprehend and react naturally to language input render them valuable for various tasks. ChatGPT can be helpful for students in various tasks, such as writing assignments, summarizing, paraphrasing text, making grammar corrections in text, and translating text. ChatGPT can help instructors to collaborate on written work, engage in intellectually stimulating conversations, conduct research, and assist with administrative tasks such as report writing (Atlas, 2023).

There are various factors to consider when incorporating ChatGPT into higher education, including productivity and efficiency benefits, learning objectives, didactics, ethical considerations, and concerns about the impacts on human job roles and intellectual property. It is crucial to approach the integration of ChatGPT with thoughtful consideration and a holistic perspective, considering all the relevant factors. In this sense, it is crucial to consider the limitations and risks of using ChatGPT in higher education, such as data biases, plagiarism, or the quality of the produced text. In the following sections, we will guide the effective use of ChatGPT and identify areas for innovation in education.

3. METHOD

We followed a combination of multiple approaches to develop this guidance for instructors. First, we built an initial draft by reflecting on and integrating the 14 authors' knowledge and experience in their roles as instructors, degree program managers, faculty, and university management members, students, and AI researchers at five universities (Gehlert et al., 2009).

Second, using the initial draft, we entered into active discourse with instructors and students via social media, e-mail newsletters, and personal communication via e-mail and in-person discussions.

Third, we conducted workshops at the authors' universities and in cross-university networks in which experts discussed the digitalization of higher education. Here, we engaged with more than 50 instructors, degree program managers, and deans of studies. We reflected on the workshop participants' feedback, shared ideas, and updated the guidance accordingly.

Fourth, we introduced the ideas into the committee processes at several of the authors' universities. Some were turned into official aids or guidelines by faculties or universities following consultation in the relevant committees (and, where necessary, further development).

Fifth, we applied the guidelines in our teaching contexts. We have reached hundreds of students, noticed what works and where we need to make adjustments, and have received feedback from students that has helped us to further develop the guidelines.

Finally, we conducted a formal evaluation to assess our recommendations' effectiveness and practical applicability. We gathered qualitative and quantitative feedback from 19 independent information systems instructors from three German universities, who participated in two 30-minute working sessions, as described in section 6.

4. GUIDANCE FOR INSTRUCTORS

The emergence of new educational technologies often arouses strong emotions, from doomsday predictions to endless euphoria (Rudolph et al., 2023). In the case of ChatGPT, experts also speak of an "instructor's dilemma" between banning these technologies or promoting their use (Teubner et al., 2023). Although there are various uses of conversational agents, particularly in higher education, we will first examine two primary areas of application for instructors in some detail: (1) the teaching process, and (2) the assessment process. In the subsequent section, we will then discuss how instructors can guide students.

4.1 Teaching
There are numerous potentials on the teaching side across all teaching-related activities, from planning, to implementation, to evaluation. The following section encompasses different recommendations on how GenAI systems, especially ChatGPT, can support instructors' teaching activities. We illustrate this with six recommendations for instructors regarding teaching, as summarized in Table 1.

Recommendations for Instructors Regarding Teaching	
1	Reflect on how ChatGPT can be used to achieve your course's learning goals.
2	Use ChatGPT to create learning materials.
3	Create quizzes for your students with the help of ChatGPT.
4	Create new learning opportunities with ChatGPT.
5	Encourage students to use ChatGPT.
6	Teach the students how to properly use ChatGPT

Table 1. Summary of Recommendations for Instructors Regarding Teaching

4.1.1 Recommendation 1: Reflect on How ChatGPT Can Be Used to Achieve Your Course's Learning Goals. Before considering how to use ChatGPT to support your teaching, it is essential to determine the *de facto* learning objectives of your course, which may vary depending on the field of study and the subject matter. Considering using AI tools per the rules of good scientific practice, instructors can also revisit these rules and discuss their application. While critical thinking and structured thinking are considered essential goals in higher education, instructors can utilize ChatGPT to develop these skills in their students by utilizing GenAI's limitations, such as its potential to provide false information or the potential to receive a low-quality text. By reflecting on the outputs generated by AI tools and providing ChatGPT with purposeful prompts and sufficient information, students can practice structuring their arguments logically, a key component of structured thinking. This interaction with GenAI can effectively develop students' critical reflection and structured thinking skills iteratively. Today, generating high-quality output with ChatGPT depends on creating the correct prompts. The ability to create and refine prompts that are tailored to specific tasks or goals can be crucial in achieving the desired outcome. This makes domain-specific prompt engineering expertise a valuable skill for the future.

4.1.2 Recommendation 2: Use ChatGPT to Create Learning Materials. ChatGPT can be a valuable tool for personalized learning in higher education. Besides supporting instructors with various classroom tasks, ChatGPT can create custom exercises, offer feedback, and generate tailored educational materials that align with a student's learning style and progress. ChatGPT can also assist in developing lecture ideas, drafting seminar plans and module descriptions, and crafting announcement texts. Another possible application of ChatGPT is to assess students' prior knowledge using AI.

4.1.3 Recommendation 3: Create Quizzes for Your Students With the Help of ChatGPT. Quizzes on a course's contents can support students and assess their learning level. ChatGPT prompts can help instructors create quizzes. Figure 2 presents an example of a suitable prompt with the ChatGPT answer.

To stay close to a lecture's content, instructors can provide transcripts to ChatGPT and then use prompts such as "Please generate a single choice exam question about this content with four potential answers, exactly one of them being correct."

Such prompts can and likely will also generate exam questions. While this may be an exciting feature to spur ideas for exam questions, instructors cannot assume that the questions and suggested answers are in fact correct. Therefore, they

should do more than simply accept and use them. This is true for all uses of ChatGPT, but it is essential regarding exams.
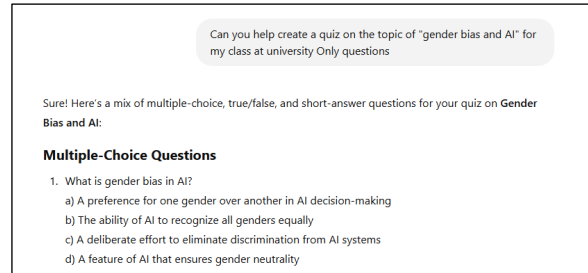

Figure 2. A Prompt to ChatGPT: Quiz (A Screenshot)

Further, as emphasized in Recommendation 4.1.1, quizzes and generated learning materials should be carefully aligned to specific learning objectives and the context of the subject matter. For instance, the use of ChatGPT to create quizzes may vary considerably across disciplines. In the humanities, where interpretative and analytical skills are central, prompts may focus on fostering critical thinking, while in STEM subjects, they must prioritize precision and technical accuracy to ensure alignment with the required competencies.

4.1.4 Recommendation 4: Create New Learning Opportunities With ChatGPT. ChatGPT can help instructors to design course materials and can boost learning by overcoming three challenges that are typically hard to address in classrooms: helping students apply their knowledge to new situations, showing students that they may not know as much as they think they do, and teaching them how to think critically about information (Mollick & Mollick, 2022). One way to overcome these challenges is to incorporate ChatGPT as a learning tool. This approach allows one to utilize AI's strengths and weaknesses to enhance learning experiences. Table 2, building on Mollick and Mollick (2022), shows three ways to integrate ChatGPT into the curriculum.

4.1.5 Recommendation 5: Encourage Students to Use ChatGPT. Teaching in higher education should adapt to technological developments and their various possibilities. In this sense, ChatGPT should be seen as a support rather than a threat. Nonetheless, higher education is also about being aware of the rules of good scientific practice and being able to apply them. In this context, the use of AI represents an interesting field of application for which students need to gain the necessary and relevant knowledge. Instructors should encourage students to use ChatGPT creatively and critically to improve, expand, or vary their own texts, but not to replace or plagiarize them. By teaching students how to effectively use these tools, instructors can equip them with important skills for their future careers while emphasizing the importance of academic integrity and originality.

Learning Objectives	ChatGPT Tasks	Student Tasks
Train transfer with ChatGPT.	ChatGPT can be used to demonstrate and clarify concepts and to transfer them to a different context. However, AI is limited in understanding complex relationships and combining information from different sources.	The students must evaluate the AI's response as it transfers a concept to a different context. Further, students should apply strategies to improve AI's output.
Train evaluation with ChatGPT.	ChatGPT can be used to write essays about a particular topic. Although AI is good at simplifying text, it has weaknesses in providing insightful analysis.	The students must continually improve the AI-created essay by providing further prompts to the AI, adding new information, or clarifying points.
Help students to identify and close gaps in their knowledge with ChatGPT.	ChatGPT can be used to outline the steps involved in a specific process. However, the AI-generated process may not be complete.	The students must evaluate and improve the AI's output by adding information from different sources.

Table 2. How to Boost Learning With ChatGPT

4.1.6 Recommendation 6: Teach Students How to Properly Use ChatGPT. Incorporating AI tools such as ChatGPT in higher education is not merely a threat to conventional assessment methods but can also enhance students' academic performance. Not all learners possess strong writing skills, or they may encounter linguistic obstacles. Utilizing LLMs such as ChatGPT can promote equity and fairness in an educational setting. By providing learners with a tool to generate well-composed texts, instructors help students to demonstrate their knowledge and comprehension of a subject matter, rather than being handicapped by writing deficiencies or language barriers. For instance, instructors could assign tasks where students use ChatGPT to help organize and refine their ideas while being responsible for content creation and critical analysis. This allows students to focus on their knowledge and ideas while the tool helps them to improve clarity and structure. Students can also use ChatGPT to receive feedback on their drafts, enhancing their writing and self-editing skills. Thus, ChatGPT can be pivotal in promoting inclusivity and excellence in higher education.

Although AI can assist in creating substantial and insightful content, this is not a simple task and demands student proficiency in technical skills and knowledge of ethical considerations. Students need to be made aware of, for instance, stereotypical ChatGPT answers. As ChatGPT is trained on a large dataset of text, the data used to train ChatGPT likely contains societal biases (Dahmen et al., 2023). Thus, the model will reflect these biases in the output data, reinforcing existing

societal issues and discrimination (Atlas, 2023). Therefore, when using ChatGPT in higher education, students should be aware of such potential biases and should critically reflect on each statement created by ChatGPT.

Further issues of copyright and intellectual property need to be discussed with students. The media have recently reported that leading AI developers such as Microsoft, OpenAI, StabilityAI, and Midjourney increasingly face lawsuits over alleged copyright infringement in their programs' outputs and the data they are trained on (Wiggers, 2023).

Furthermore, instructors should encourage students to be aware of the risks associated with using free GenAI tools, especially those who may ingest all their prompts for further training, highlighting the potential privacy concerns and data security implications of using such tools.

To help students master AI usage, instructors can redefine their curricula and explicitly teach AI usage. This may include:

- Including subject-specific reflection on the impacts of AI in the curriculum.
- Reflecting on the rules for good scientific practice when using AI.
- Developing study programs focused on AI in science, the ethical implications of AI use, and knowledge creation through AI systems.
- Offering online tutorials or webinars on data privacy, safe uses of AI tools, and ethical considerations to prepare students for independent and thoughtful usage.
- Redefining core competencies in classes and reflecting on what should be tested in each subject.

4.2 Assessments (Exams, Seminar Papers, Theses, and the Like)
One of the most common concerns regarding ChatGPT use is the fear that essays will become increasingly obsolete as an assessment method in higher education.

For instance, the University of Economics Prague's Faculty of Business Administration has decided to drop the Bachelor thesis in favor of Bachelor projects (Friedmannová, 2023). Some instructors are concerned that written assignments are being outsourced to ChatGPT without subsequently being detected by plagiarism detectors. Further, instructors see the challenge of reading generated text naturally. While traditional plagiarism detection tools can identify copied and pasted text from scientific sources, they cannot identify text generated by GenAI tools such as ChatGPT (Khalil & Er, 2023). Tools such as the OpenAI Text Classifier, which have been developed to address the issue of false claims that a human wrote AI-generated text, are currently improving. However, these tools' accuracy at categorizing texts as human-generated or LLM-generated is low and is expected to remain low (Wiggers, 2023).

The second fear relates to ChatGPT's inability to truly understand a context and interpret text (Arif et al., 2023). As a result, institutions concerned about AI's outputs could construe this as providing legitimacy for implementing policies that prohibit the use of AI for quality reasons. Given the rapid technological development of AI applications and their prospects, it quickly becomes apparent that there is no alternative to using AI applications in the university context. Universities and instructors should therefore focus on ensuring responsible usage by addressing potential challenges related to ChatGPT, rather than implementing policies that restrict use

(Brown et al., 2020; Vogelgesang et al., 2023). We will now present several ways in which instructors can turn the challenges associated with ChatGPT, as well as assessment formats, into opportunities to adapt to emerging changes in higher education. Specifically, we have seven assessment recommendations for instructors, as summarized in Table 3 and discussed below.

	Recommendations for Instructors Regarding Assessing Students
1	Adapt your exam design to the current technological possibilities.
2	Require that students declare specifically how they have used ChatGPT and other GenAI tools.
3	Rethink your assessment formats.
4	Focus on the supervision process for assignments.
5	Innovate the evaluation criteria for assignments.
6	Implement guidelines for avoiding plagiarism and copyright infringements.
7	Implement *rules for tools.*

Table 3. Summary of Recommendations for Instructors Regarding Assessing Students

4.2.1 Recommendation 1: Adapt Your Exam Design to the Current Technological Possibilities. Closed-book exams, where students write by hand, using only pen and paper, or using a computer in a controlled environment, and a kiosk mode without Internet access, may be the easiest way to test knowledge in the future. ChatGPT is no more of a threat to the assessment process in such a setting than traditional paper-based cheat sheets. However, such an assessment approach may be antiquated, because students acquire much knowledge shortly before an exam that is subsequently forgotten.

Thus, we notice a trend in higher education, not least driven by the COVID-19 pandemic, from pen-and-paper-only exams to open exams or take-at-home exams. When creating open exams where technical aids are also allowed, care should be taken to test the exam questions in advance with ChatGPT. The following are additional items to consider when administering exams that can help prevent student misconduct (Koenders & Prins, 2023).

- Ask for personal reflection in your exam.
- Focus your exam questions on very recent events that were not included in the training data of ChatGPT or other GenAI models.
- State exactly which tools are allowed (e.g., Stata) and which not (e.g., ChatGPT).

All these suggestions have limitations. Assessing the correctness or quality of personal reflections takes much work and is only possible to a certain extent. Further, retrieval augmented generation (RAG) allows for the combination of LLMs' linguistic abilities with knowledge from documents (such as a course's learning materials), databases, or Internet searches. Despite these limitations, the general recommendation to critically rethink exams in light of GenAI remains.

4.2.2 Recommendation 2: Require That Students Declare How ChatGPT and Other GenAI Tools Were Used. It is impossible to monitor which tools were used in a take-at-home exam, and not all students may be truthful. However, explicit declarations about whether or not special tools were used increase the binding nature and the consequences in case of misconduct, as is also standard practice in declarations of independence in, for instance, theses and the rules of good scientific practice.

Various scientific publishers and institutions have already developed guidelines that require authors to disclose their use of AI-based tools, such as when writing articles. One significant advantage is that such guidelines can protect authors who wish to utilize AI-based tools such as ChatGPT, encouraging them to do so (Cambridge, 2023). Thus, universities should develop declarations that explicitly address the use GenAI tools to provide students with legal certainty and conformity. At best, such declarations are not binary regarding using tools such as ChatGPT (e.g., "I used ChatGPT") but are differentiated, just like author contribution statements in some academic journals. The statements should include confirmation of responsible tool use, including being informed about the capabilities and limitations of the GenAI tools used, verifying the results' accuracy, and acknowledging responsibility for the content. Accordingly, such declarations should include a statement of student responsibility regarding potential errors, copyright violations, and plagiarism inserted in their work by technical tools. Furthermore, students should report the tools' activities, including the tool's name, the usage type (e.g., developing an outline or proofreading), and affected sections of the paper/thesis.

Instructors may also require students to provide a list of the prompts they used. They may require students to provide a full transcript of the conversations with ChatGPT that informed that student's work. However, instructors should carefully weigh the pros and cons of requiring students to report the tool usage at a prompt level, as it may place a significant burden on the students, particularly when using various AI-based tools with different input and output data formats, as well as interaction types. For instance, it would be unreasonable to report the single words and phrases of a text that were adapted using an AI-based grammar tool (e.g., Grammarly).

In sum, the level of detail for reporting the uses of AI tools should align with the overall reporting purposes, which are to estimate the work's originality, including a student's achievement of learning objectives, as well as to promote a student's critical reflection on their tool usage. Scientific work is about showing that you know and can apply the rules of good scientific practice. It requires careful planning, accuracy, objectivity, and critical thinking. It is based on traceability and transparency to ensure that the results are reproducible and drive scientific progress. Based on these reporting rationales, we developed a reporting framework that includes constructs that guide the declaration of GenAI tool uses in higher education tests. As we will illustrate, our declaration of GenAI tool usage includes two sections. In part 1, the students are asked to confirm the responsible use of GenAI tools. Thereby, they confirm that they are aware of the limitations of the AI tools they used, they confirm that their results are accurate and reliable, and they confirm that they bear full responsibility for the authorship of the paper. Part 2 of our checklist requires students to provide a detailed account of which tools they have used for their research project and to specify for which activities and to what extent they were used. Our checklist is based on

relevant activities for which AI tools can be used in a student's research project. The first activity on our checklist, ideation and conceptualization, serves as an example to illustrate possible usage: The activity section of the checklist contains the name of each activity of a student's project. The description provides a more detailed list of the activities for which students might have used AI tools. In the reporting tab, students are asked, for each activity, to list the tools they have used and to include a detailed description of how the tool was used, i.e., reporting the usage type. For the ideation and conceptualization section, this could include activities such as describing which tools they used for generating ideas and how, research goals or questions, as well as how these tools supported the student to identify and define relevant concepts. The other sections are: literature search and analysis, methodology, coding, data collection and analysis, interpretation and validation, structuring and planning the text, generating the text, translating text, reviewing and editing the text, presentation, citation management, and further activities in which AI tools supported the independent work but have not been mentioned in the previous activities. Table 4 summarizes the reporting tool for the student declaration of use of ChatGPT and other GenAI tools (Gimpel et al., 2023a).

4.2.3 Recommendation 3: Rethink Your Assessment Formats. There are many concerns about ChatGPT's potential to undermine the effectiveness of assignments as an assessment method. This concern has been present since the early days of its implementation. ChatGPT has the potential to be a significant innovation in higher education by enabling instructors to use assessment as a teaching tool. However, few instructors currently possess the necessary skills, making AI a potential educational milestone to take the assessment as a learning (Earl, 2012). One possibility for innovative assessment formats arises from the fact that ChatGPT has a restricted capacity for creativity. ChatGPT is trained on specific patterns and existing text, limiting its ability to generate original content or ideas. As a result, ChatGPT can only replicate what it has been trained on and what already exists, and needs to be more capable of thinking creatively (Susnjak, 2022). Thus, there is potential for instructors to explore innovative assessment formats that demand thinking beyond traditional boundaries that could lead to new outcomes through students' creative linking of topics.

We therefore recommend steering clear of standardized assessments that can be quickly completed by a computer, as suggested by Herman (2022); instead, we recommend design assessments that promote students' abilities to think creatively and critically, as advocated by Brookfield et al. (2019). Examples of innovative assessment formats include:

- Administer specific assessments only during a class (Rudolph et al., 2023).
- Encourage oral presentations to assess students' public speaking skills as well as their understanding of the material (McCormack, 2023).
- Encourage collaborative group projects where students work in small teams to complete a specific task or project (McCormack, 2023).
- Promote critical thinking by requiring students to reflect on their learning through written or oral reflection.
- Let students prepare other types of material—for instance, web pages, videos, and animations—that express critical thinking (McCormack, 2023).

None of these formats is a silver bullet. In one form or another, they favor students being able to participate in person in the classroom, deal well with high time pressure, or have good oral communication skills. Assessing individual contributions in group work is challenging, as is evaluating individual reflections. Further, ChatGPT and other AI tools can also help one create web pages, videos, and animations. Nonetheless, instructors should consider innovating their assessment formats in light of students' ability to use GenAI tools and in light of the potential changes in learning goals to account for the diffusion of GenAI tools. In changing the assessment formats, instructors must consider the time required for the assessments. Potentially, staffing needs to be increased to allow for meaningful assessments.

4.2.4 Recommendation 4: Focus on the Supervision Process for Assignments. Since ChatGPT is particularly good at formulating text, it is almost impossible to detect whether AI or students wrote specific text passages of assignments. Thus, instructors should emphasize the supervision process more than written assignments. Building on that, they can better evaluate how an assignment was done and whether students acquire specific expertise in the process. This aligns with Frölich-Steffen (2023), who proposed the following steps:

- No assignments without a supervision process.
- Require information on the work steps during the process.
- Emphasize the study design and the careful execution of the study in empirical work.
- Require the use of ChatGPT as a work step, including a clear indication of what ChatGPT was used for.
- If possible, add a presentation and an oral defense of the results, as these show the extent to which a student has mastered the contents.

As with recommendation 3 above, improving the supervision process may require additional time and, therefore, staffing.

4.2.5 Recommendation 5: Innovate the Evaluation Criteria for Assignments. Given AI tools' exceptional ability to generate and compose text, higher education institutions must establish novel assessment criteria that surpass the mere formulation of text for evaluating assignments. Although ChatGPT occasionally makes mistakes in its content, its writing is often convincing. Students can therefore assess the text's content while placing less emphasis on the structure and writing style, which are areas where language models tend to excel somewhat. The following evaluation criteria should therefore be seriously considered in cases where ChatGPT is not explicitly forbidden (Frölich-Steffen, 2023):

- The quality and the individuality of the research question and its fit with the assigned topic.
- The quality of the theoretical background, including proper references.
- The coherence of the presentation.

Statements on Responsible Tool Usage		
Activity	Description	Reporting Type
1. Responsible uses of the GenAI tools		
I/we are informed about the capabilities and limitations of the GenAI tools I/we have used.		Confirmatory (i.e., check box)
I/we verified that the results provided by the tools are accurate, or that I/we corrected them.		Confirmatory (i.e., check box)
I/we acknowledge that the responsibility for the paper/thesis lies with the author(s), not the tools or anyone else.		Confirmatory (i.e., check box)
2. Detailed activities for which the tools were used		
Ideation and conceptualization	• Generating ideas, research goals, aims, and questions • Identifying and defining relevant concepts	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Literature search and analysis	• Searching for relevant literature • Reviewing potentially relevant literature • Summaries of relevant literature	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Methodology	• Searching for (an) appropriate methodology/ies • Designing and tailoring the methodology/ies to the research question(s)	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Coding	• Creating and documenting the code, algorithms, and software • Testing and debugging the existing code, algorithms, and software • Understanding the existing code, algorithms, and software	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Data collection and analysis	• Collection of primary or secondary data • Qualitative data analysis (including summarizing and coding) • Quantitative data analysis (including statistics) • Mathematical, computational, or other formal techniques for modeling, simulation, and analytics	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Interpretation and validation	• Interpretation of results • Derivation of implications for research and practice • Verification of the overall reproducibility of results and other research outputs	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Structuring and planning the text	• Outlining the paper/thesis • Outlining sections of the paper/thesis (e.g., bulleted lists per section)	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Generating the text	• Generating text on various topics in different sections of the paper (including the title and the abstract)	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Translating text	• Translating text written by the authors • Translating text written by others	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Reviewing and editing the text	• Critical review, feedback, or revision of content, organization, or grammar of the paper • Proofreading • Rephrasing or paraphrasing text • Shortening or extending text	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Presentation	• Structuring a presentation on the paper • Filling a presentation with content on the paper	A list of the tool(s) used and a detailed description (e.g., the usage type/s, the affected sections of the thesis/test)
Citation management	• Creating a references list • Formatting of the references	A list of the tool(s) used and a detailed description of the tool uses (e.g., free-form text)
Further activities	• Further activities that would highlight or limit your independent, definable performance in crafting this paper/thesis/test regarding the uses of AI-based tools	A list of the tool(s) used and a detailed description of the tool uses (e.g., free-form text)

Table 4. Recommended Constructs for Student Reporting on GenAI Tools

- The alignment of the research question, the theories used, the methods used, and the results.
- Unique (theoretical, empirical, and technical) contributions beyond summarizing the literature.
- The inclusion of personal reflections, such as a learning log or personal statement.

4.2.6 Recommendation 6: Implement Guidelines for Avoiding Plagiarism and Copyright Infringements. One of the most significant challenges in higher education is plagiarism detection. In 2000, *The Guardian* warned of a "plagiarism epidemic" and raised concerns that Google, Wikipedia, and their ilk will make students "stupid." More than 20 years later, it is well known that none of these technology-driven developments have made students stupid; instead, they have brought innovations to higher education's teaching and learning processes. However, with easy access to electronic texts on a massive scale, plagiarism has become easier (e.g., copy and paste). It is therefore crucial to revisit and consolidate the rules of good scientific practice. Many universities use plagiarism detection software that compares a submitted text against previously known texts to detect and combat this. This is good for detecting blunt, direct plagiarism.

Recent advancements in automatic translations and LLMs ease wrongdoers' tasks and complicate plagiarism detection. Automated translations (e.g., using tools such as DeepL or Google Translate) of preexisting texts into an assignment's language evades direct text comparison. For years, some students have used translation chains to paraphrase text. For instance, you take an English text from the literature and auto-translate it to German, then to Spanish, then to Russian, and back to English. Even within a single service, the resulting text paraphrases the original. The discrepancy between the original text and the paraphrased text likely increases when switching between translation services. This task could be more convenient for students. Unfortunately, LLMs ease this task. Students may for instance prompt ChatGPT as follows: "Please paraphrase the following text: '…'." Even if not direct, but paraphrased—if the source is not credited, this is plagiarism. However, it is harder to detect.

A more fundamental concern regarding plagiarism is whether ChatGPT can do it without disclosing it, or whether the user notices it. ChatGPT was trained on pre-existing texts and learned typical flows of text. Text generated by ChatGPT can quickly become identical to pre-existing text in parts. With human writers, it can happen, by chance, that one writer produces a short piece of text fully independent of the other. However, as language models are trained on text and then reproduce parts of that text, this is not a "random occurrence" but potentially plagiarism. Likely, this will not recreate large portions of a single text, but may lead to what is known as *patchwork plagiarism* or *mosaic plagiarism*, where multiple different sources are interwoven without adequately referencing them.

Further, ChatGPT has been accused of copyright infringement. Thus, copying text generated by ChatGPT into a document draft puts one at risk of plagiarism and copyright infringement. Responsibility for such violations of laws and good scientific practice lies with a work's human author(s) (arXiv Moderation, 2023). Even if one argues that this is accidental plagiarism from the user's perspective, users of tools such as ChatGPT should be aware of the risks and should not

be neglected. A new legal framework called learningright is already being discussed as an alternative to copyright (Malone, 2023). This legal concept balances the need to protect creators' intellectual property rights while allowing AI systems to learn from and build on existing knowledge. This responsibility on human users relates not only to plagiarism and copyright infringement, but also to "biased content, errors, mistakes, incorrect references, or misleading content" (arXiv Moderation, 2023).

Instructors should inform their students about the risks and their responsibility for the texts they submit under their names. Further, to prevent plagiarism, instructors can implement guidelines to encourage students to deal responsibly with literature sources, for instance, by requiring them to provide detailed notes or screenshots/photos of the literature base (Frölich-Steffen, 2023). In sum, the handling of plagiarism should be consistent with the university's policy and its guidelines.

Finally, some consider the use of text generated by ChatGPT to be plagiarism, as the text was not developed by the student, but by someone else, namely ChatGPT. Instead, we take the perspective that using ChatGPT and other tools is not a problem per se. However, using advanced tools such as ChatGPT requires transparency concerning tool use. Various ChatGPT content detectors or AI content detectors are already available to distinguish between human-written and machine-written text. Like plagiarism detection software, they analyze text, highlight dubious sections (in this case, likely computer-generated), and typically provide a percentage value on how much of a text was computer-generated or the likelihood that it was computer-generated. Currently, these detectors are far from perfect. They will improve in the future, just like other systems try to avoid correct classifications. These imperfect content detector tools may be used to check the plausibility of a student's disclosure.

4.2.7 Recommendation 7: Implement *Rules for Tools*. AI tools such as ChatGPT have immense potentials for uncovering novel pedagogical approaches. Nonetheless, while it can proficiently generate plausible information, AI risks disseminating false data, fabricated quotes, inaccurate information, plagiarism, etc. A reflection on the rules of good scientific practice is therefore also warranted in this context. Learners must possess adequate knowledge of a subject at hand if they are to achieve satisfactory outcomes. Establishing a transparent policy that governs AI implementation in higher education is a crucial step towards fostering a learning setting in which AI is embraced with accountability and candor. Therefore, rules for tools can help to build an AI policy (Spannagel, 2023).

Based on Spannagel (2023), and in line with other parts of this article, rules for tools may include:

- In general, students may use all types of media and tools, with the use of said tools subject to the course requirements.
- Students are accountable for their achievements, as AI tools such as ChatGPT, while capable of generating well-composed texts, can still contain mistakes, and can violate regulations or norms.
- It is mandatory for students to report the aids used during a course, for instance, being required to list the tools and their application fields, and recording, for

instance, the prompts when using AI tools such as ChatGPT.

- Exceptions can be made to the outlined rules, such as prohibiting tools in specific learning or assessment situations; these must be communicated to students in advance.

5. INSTRUCTORS' GUIDANCE TO STUDENTS

Conversational agents are valuable tools for university students, aiding with academic work, saving time, offering accessibility, improving critical thinking, and improving language skills (Atlas, 2023). This section critically reflects on how instructors can engage students in using ChatGPT to maximize its potential benefits and to avoid the risks. This includes highlighting the limitations and dangers of ChatGPT, and leads to the nine recommendations summarized in Table 5.

	Instructors' Recommendations for Students
1	Familiarize the students with the exam regulations.
2	Teach them how ChatGPT can support the learning goals.
3	Teach them how to use ChatGPT as a writing partner.
4	Teach them how to use ChatGPT as a learning partner.
5	Teach them how to best converse with ChatGPT.
6	Teach them how to use ChatGPT to summarize the learning material.
7	Teach them how to speed up coding with ChatGPT.
8	Inform them of the risks of using ChatGPT.
9	Present this checklist before the students use ChatGPT in their courses.

Table 5. Summary of Instructors' Recommendations for Students

5.1 Recommendation 1: Familiarize the Students With the Exam Regulations

Before discussing the possibilities of working efficiently with ChatGPT or other AI-based tools, it is crucial to highlight the need to respect the relevant national and regional laws and the individual examination regulations of each university, school, and study course. The students must comply with these and must observe any instructions in the exam regulations on using AI-based tools. The students must also follow the rules regarding quotations and good scientific practice. Eventually, they need to indicate whether a text is created by AI or even what information was given to the AI.

In addition to the advantages of utilizing ChatGPT for creating scientific texts, users should be aware of potential sources of error and misconduct. Thus, although we recommend using AI-based tools such as ChatGPT to create scientific text (if there is no explicit prohibition by the exam regulations or the university), students should reflect on each AI-generated outcome. This applies not only to text but also to code generated by ChatGPT.

5.2 Recommendation 2: Teach the Students How ChatGPT Can Support the Learning Goals

Higher education is about more than acquiring domain-specific competencies. It also includes cultivating and enhancing basic competencies such as critical and structured thinking. Eloundou

et al. (2023) provided compelling evidence for the shifting relevance of basic competencies. According to their study, the importance of critical thinking, active learning, mathematics, and learning strategies will increase owing to the advent of GenAI, while programming, writing, reading comprehension, or active listening will decrease in importance. In the same direction, Lanzl et al. (2024) reported the results of a Delphi study on how AI changes the relevance of various basic competencies: competencies for critical and analytical thinking, decision-making, using digital tools, and engaging in ethical and intercultural discourse is suggested to increase, while the relevance of competency regarding foreign languages is suggested to decrease.

With the advent of GenAI, critical thinking, structured thinking, the evaluation of text and other media, and prompt engineering have gained importance, while the initial creation of text and other media is becoming less important. By reflecting on the desired learning outcomes, students can, in the next step, determine how to best integrate ChatGPT into their education and how to use it to supplement and enhance their learning experiences. Further, their learning goals and the offerings of different courses should guide their selection of specific courses (Eloundou et al., 2023).

5.3 Recommendation 3: Teach the Students How to Use ChatGPT as a Writing Partner

As noted, today, ChatGPT cannot replace critical thinking and creativity, which are essential components of writing assignments. Thus, students in higher education should use ChatGPT only as a supplementary tool, as with Wikipedia, Google, or translation programs such as DeepL (Spannagel, 2023). Therefore, ChatGPT is not the author of any work, and the responsibility for written content lies with the human author—in this case, the student.

Susarla et al. (2023) note that ChatGPT can be particularly useful for reviewing and refining a researcher's text drafts. It can provide feedback on the quality of writing and the logical structuring of arguments and paragraphs, or can produce further advice on improving the text's style or clarity. As an easy-to-access tool, it can support students by pointing out grammar or punctuation mistakes (Susarla et al., 2023). Nonetheless, by uploading data and files, individuals agree to their further use. This situation may be undesirable for some, or they may be unable to make this decision owing to copyright restrictions.

Also, GenAI tools can offer a helping hand throughout the writing process of a research project, for instance, by iteratively generating research questions or suggesting new hypotheses for the student's typed prompts. ChatGPT can also be used to identify and suggest journal articles that may suit the research at hand (Susarla et al., 2023).

Weßels (2022) emphasizes that ChatGPT may only be a good writing partner. This means that, although ChatGPT may provide some topics and perspectives on a given topic, the user is still required to add further knowledge and creativity—a large part of creating essays or dissertations.

Also of concern is that, while a text generated by ChatGPT may sound plausible, it may also contain hallucinations, false information, or meaningless information. ChatGPT can also generate sources that seem very realistic in appearance and syntax but are entirely fabricated. This can be dangerous for students who rely on it for literature research. Although GPT-4 can now generate sources with an attached Digital Object

Identifier (DOI), there is still plenty of room for erroneous outputs. For instance, some DOIs are completely fabricated, while others do exist but refer to a different paper than the one intended by ChatGPT's text output.

Instructors should therefore teach their students to verify any information obtained from AI-generated content. Otherwise, there may be the risk that students use incorrect information or false citations to create user-generated content. Further, an AI model could be trained on false information, and could recreate a spiral of misinformation on these platforms (Gimpel et al., 2023c).

Table 6 presents example usage cases, following Atlas (2023), where ChatGPT can act as a "co-partner" for formulating text at a high linguistic level.

Activity to be Supported	Example Prompts
Generate a headline for an essay	"Generate five headlines for an essay about [paste your text here]"
Summarizing	"Summarize the following text in two sentences: [paste your text here]"
Paraphrasing	"Paraphrase this sentence: [paste your text here]"
Correction	"Act as a professional spelling and grammar corrector and improver" Wait for response [Paste your text here]"
Proofreading and editing	"Please revise the following sentence to make it clearer and more concise: [Paste your text here]"

Table 6. Example Prompts on the Writing of Text

5.4 Recommendation 4: Teach the Students How to Use ChatGPT as a Learning Partner

Another useful application of ChatGPT is as a learning partner for students. Since prominent conversational agents such as ChatGPT are accessible 24/7, they provide students with numerous opportunities to help them acquire new knowledge or test existing knowledge. Since many best practices are already circulating on the Internet, we compiled and tested what we consider to be the most helpful ones in Table 7. Students should ensure that they have the copyright to upload data and files to the AI tool.

5.5 Recommendation 5: Teach the Students How to Best Converse With ChatGPT

It is sometimes unclear how to effectively use ChatGPT. Providing ChatGPT with accurate and specific information is crucial to obtaining the desired text and information. Since ChatGPT relies solely on prompts and words, it is crucial to provide additional information and context, including the intended purpose, and information on the target audience, unique position, and intended tone. If a text or a result is unsatisfactory, users can request more information and can provide detailed feedback to improve the model's response and generate a better match for their requirements (Atlas, 2023).

Possible prompts from Atlas (2023) that are consistent with these principles include:

- "Summarize this text and highlight why [X] has a relevant role"

- "Write a text on the topic [A] from the perspective of [B] with the target audience [C] in a [D] tone"
- "Rewrite the text to make it sound more like [A] and highlight the benefits of [B] more"
- One can also manually adapt the prompt or continue conversations with prompts such as:
  - "Please shorten the summary to 150 words"
  - "Please elaborate on the second point"
  - "Tell me more about the last argument in your previous answer"

Activity to be Supported	Example Prompts
Generation of pattern solutions from old exam tasks	"Please generate a pattern solution for the following task: [paste your task here]"
Create a mind map to get a quick overview over a new topic	[paste your topic here] "Create a mind map on the topic above, and list the central idea, main branches, and sub-branches"
Explanation of concepts (e.g., mathematical equations)	"I want you to act as a math instructor. I will provide some mathematical equations or concepts, and it will be your job to explain them in easy-to-understand terms. My first question is: I need help to understand how [paste your concept here] works"
Vocabulary acquisition	"Please provide me with terms related to [paste your text here]"
Create flashcards	"Topic: [paste your topic here] Please help me create a two-column spreadsheet with questions and corresponding answers on the topic above"
Self-testing of specific knowledge	"Topic: [paste your topic here] Please ask me five questions on the topic above. I will then respond to it. After my response, please tell me if my answer was right or wrong and please provide an explanation"

Table 7. Example Prompts for Learning With ChatGPT

Gimpel et al. (2023c) provide a step-by-step tutorial for students to use ChatGPT for drafting a text. They provide detailed prompt examples—many of them helpful, but some also deliberately misleading in order to get the user to experience the limits of ChatGPT. Instructors can ask their students to follow this tutorial and then reflect, in class with the students, on ChatGPT's strengths and weaknesses as a writing partner.

5.6 Recommendation 6: Teach the Students to Use ChatGPT to Summarize the Learning Material

Students should use ChatGPT's functionality with videos and texts, such as lengthy notes from a lecture or a paper that is both long and hard to read. This may be a helpful way to skim learning materials and identify important material aspects. In doing so, students should be aware that a summary always

misses details and that these details may be necessary. Thus, this functionality should be used with caution.

5.7 Recommendation 7: Teach the Students to Speed up Coding With ChatGPT

ChatGPT can be used not only as a learning or writing partner but also as a partner to generate or correct code. With the right prompt, ChatGPT can give students suggestions on coding. Figure 3 depicts a potential prompt with code as the response, retrieved and modified from an expert talk at HCUM Munich (Hauck-Thum et al., 2023). These code snippets can then be used as a starting point for a project or task. ChatGPT can be an excellent tool for debugging code. Students can share their code with ChatGPT, and the model can help identify errors and suggest possible solutions. ChatGPT can also assist in optimizing code to make it more efficient by suggesting better data structures and algorithms.
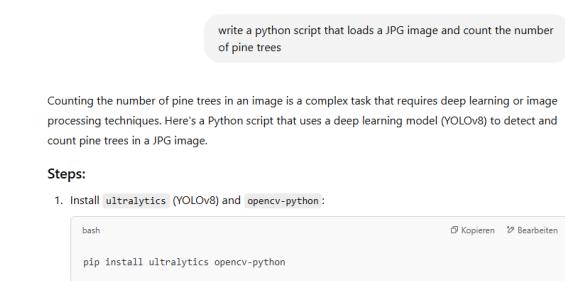

Figure 3. Example Prompt for Code Generation With ChatGPT (A Screenshot)

Table 8 provides examples of prompts that students can use to improve their code. Also, OpenAI has developed a more advanced tool called GitHub Copilot, which can help write code faster and with less effort than ChatGPT. GitHub Copilot is an AI pair programmer that utilizes a generative pre-trained language model created by OpenAI. Analyzing the comments and code instantly suggests individual lines and entire functions to improve the code.

Activity to be Supported	Example Prompts
Help with syntax	"What is the syntax [paste your text here] in Python?"
Coding examples	"Please give me an example of how to use the [paste your function here] in JavaScript?"
Programming tips	"What are some tips for [paste your text here]?"
Debugging help	"How can I fix the ['TypeError: 'int' object is not subscribable' error] in my Python code?"
Explaining codes	"Can you explain the code for me step by step: [paste your code here]?"

Table 8. Example Prompts on Coding With ChatGPT

5.8 Recommendation 8: Inform the Students of the Risks of Using ChatGPT

While ChatGPT can be a powerful tool for students and instructors, instructors should sensitize their students to its limitations. GenAI tools such as ChatGPT excel at deceiving the user into believing that their output is reasonable and legitimate. Despite its ability to generate well-composed answers to all sorts of questions, scholars have pointed out several inherent and usage-related issues regarding ChatGPT, such as misinformation, incomprehensibility, biases, and hallucination, i.e., the fabrication of information that is neither based on scientific facts nor in reality (Bang et al., 2023; Borji, 2023).

Thus, individuals who lack sufficient knowledge in a particular subject matter may rely on the incorrect advice or answers provided by the chatbot. Even Sam Altman, the founder of OpenAI, warned in a Twitter (now X) post that ChatGPT is excellent for creative tasks but should be treated with caution regarding factual queries (Altman, 2022). Since the chatbot understands and generates text based on the statistical structure of language, studies have found various inaccuracies, particularly for tasks that involve reasoning, logic, math, or programming (Borji, 2023). Another major problem when using ChatGPT is its inconsistency: when asked the same question multiple times, its answers usually vary significantly (Krügel et al., 2023; Megahed et al., 2023). Building on this, knowing what types of questions to ask as well as what prompts to use to further explore the generated output may help to reveal and mitigate some of the limitations of LLMs.

For instance, a chatbot user should ensure that the prompt is formulated as clearly as possible, telling it exactly what needs to be done. This includes providing additional information about the background and context, breaking down complex problems into multiple sub-queries, restricting a query to a certain field, and prioritizing relevant information, ideally in an unambiguous way (Nyakundi, 2023; Zheng et al., 2023).

By applying the following strategies, students can enhance their research efficiency and depth, leading to more thorough and more insightful academic work:

- Ask for answers from the perspective of experts in the field or by asking from the view of another third party, for instance, an interviewer or reporter (Cowen & Tabarrok, 2023). Thus, in the economics context, one could ask: "How would Adam Smith describe capitalism?"
- Iterate on your prompts to generate more perspectives and alternatives by using sequential questions, thereby requiring the chatbot to go beyond its current answers. This could also entail asking for more viewpoints or simply generating a new answer (Nyakundi, 2023). ChatGPT recommends asking "Can you explain the reasoning behind your answer?", "Have you considered multiple perspectives or alternative explanations?", or "Are there any potential limitations or biases in the data or algorithms used to generate your answer?"
- Use prompts such as "Let's think step by step" to reveal the chatbot's underlying decision-making process and chain of arguments (Kambhampati, 2022).
- Ask about where you can look up the evidence or the sources that support its answer. Ask if it could provide links for the sources (Cowen & Tabarrok, 2023). For

instance: "Can you cite any sources or evidence to support your answer?"

5.9 Recommendation 9: Present This Checklist Before the Students Use ChatGPT in Their Courses

ChatGPT and other tools based on GenAI are changing how students learn, write exams, and study for tests. We will now summarize example recommendations that should be presented to students working with ChatGPT:

- Review the university's rules and regulations regarding GenAI, LLMs, and ChatGPT (considering policies for usage, acknowledgments, citations, etc.).
- Familiarize yourself with the rules of good scientific practice.
- Understand ChatGPT's capabilities and limitations.
- Check whether it is clever to use ChatGPT, or whether the task requires you to learn basic knowledge.
- Verify that the results provided by ChatGPT are trustworthy and accurate, and that they reflect the findings.
- Consider which topics could be cleverly linked to produce novel insights.

The variety of smart usage cases of ChatGPT is enormous, and with time, there will also be new ways to use it. Students should empower themselves to use ChatGPT responsibly so that the public's first perception is not the likelihood of cheating, but the possibility of learning new things that will lead to mature students being prepared for digital work.

6. EVIDENCE OF INSTRUCTORS' ENGAGEMENT AND SATISFACTION

To evaluate the effectiveness and practical applicability of our recommendations, we gathered qualitative and quantitative feedback from 19 independent instructors from three universities in Germany who had participated in two 30-minute working sessions.

The guidelines were made available to the instructors in advance. and they were already familiar with them. The instructors, who had on average around two years of teaching experience, came from the information systems (IS) field. They rated the recommendations on a five-point Likert scale (1 = *I don't find it to be very helpful* to 5 = *I find it very helpful and will definitely apply it*). In sum, all the recommendations received above-average ratings, with one exception. We also collected qualitative feedback in case there were any comments or suggestions regarding specific guidelines. This approach allowed us to capture both the numerical ratings and the detailed insights from the instructors, providing a comprehensive evaluation of the recommendations. Finally, we present our evaluation results with mean values (M) and standard deviations (SDs) in brackets.

6.1 The Effectiveness of the Recommendations for Instructors

The highest-rated recommendations—"Encourage the students to use ChatGPT" (M = 4.4, SD = 0.813) and "Teach the students how to properly use ChatGPT" (M = 4.4, SD = 0.684)—highlighted the instructors' strong support for AI integration in learning and the importance of fostering AI literacy. The recommendations relating to content creation, such as "Use

ChatGPT to create learning materials" (M = 4.0, SD = 1.106) and "Create quizzes with ChatGPT" (M = 4.1, SD = 0.658), were also well received, indicating ChatGPT's value in reducing workload and enhancing instructional resources. However, "Reflect on how ChatGPT can be used to achieve the learning goals" (3.6, SD = 0.916) and especially "Create new learning opportunities with ChatGPT" (M = 3.1, SD = 0.998) received lower ratings. Several instructors emphasized that the quiz questions should "match the level and depth of the exam questions," as otherwise they may not serve as an effective preparation tool for students. This suggests that, while instructors recognize ChatGPT's potential, they may need further guidance or examples on how to align AI with course objectives or how to explore innovative teaching methods. Overall, the results show strong support for ChatGPT in teaching but also highlight the need for more structured support in course planning and pedagogy. Figure 4 shows the M and SD for each teaching recommendation.
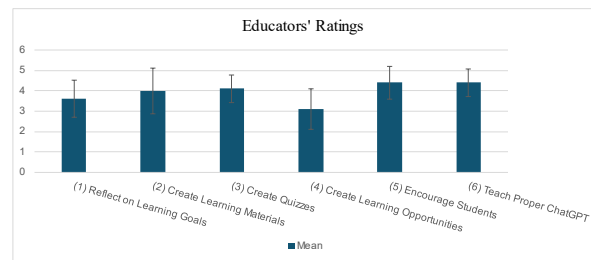

Figure 4. The Instructors' Evaluations of the Teaching Recommendations

The evaluation of examination practices highlighted a strong emphasis on academic integrity, with the highest scores for implementing guidelines to prevent plagiarism and copyright violations (M = 4.7, SD = 0.447) and the requirement that students declare their uses of ChatGPT (M = 4.9, SD = 1.015). This highlights the value placed on ensuring ethical standards and safeguarding academic work's credibility. Moderate scores for "innovate evaluation criteria" (M = 3.9, SD = 0.873) and "implementing *rules for tools*" (M = 3.6, SD = 0.772) reflect growing concerns about the responsible use of digital tools in assessments.

Further, "rethinking exam formats" (M = 4.3, SD = 0.752) shows interest in adapting assessment methods, while "focusing more on supervision" (M = 3.3, SD = 0.907) suggests a balanced approach to providing students with support. The recommendation "adapt your exam design" initially received a low rating (M = 2.3, SD = 1.065), indicating that the instructors did not initially find it particularly helpful. In detail, the instructors addressed the limitations of take-at-home exams and open-book exams. To address this, we provided a more detailed explanation in section 4.2.1, presenting concrete examples to illustrate how an exam design can be effectively adapted when using ChatGPT in academic settings. This additional clarification helped the instructors to better understand the potential applications and benefits of adjusting exam formats, which may have improved their perceptions of the guidelines. The results of the instructors' evaluations of the recommendations for assessing are shown in Figure 5.
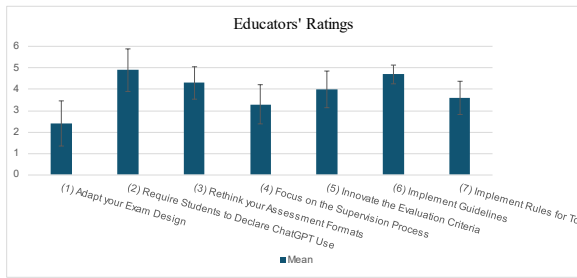
Figure 5. The Instructors' Evaluations of the Recommendations for Assessing

6.2 The Effectiveness of the Instructors' Recommendations for Students

One of the most highly rated teaching recommendations was "teaching ChatGPT as a writing partner" (M = 4.7, SD = 0.452), with the instructors recognizing its value in supporting tasks such as brainstorming and drafting. However, there was a strong emphasis on educating students about the ethical risks of using ChatGPT (M = 4.6, SD = 0.607), particularly concerning issues such as plagiarism and misinformation. The instructors also highlighted the importance of adhering to examination regulations when using ChatGPT (M = 4.3, SD = 0.749), underlining the need for its responsible use in academic settings. These findings indicate that, while ChatGPT is seen as a valuable tool for writing, the instructors are very concerned with ensuring ethical and responsible uses in academic frameworks.

The lowest-rated recommendation was using ChatGPT to summarize learning materials (M = 3.4, SD = 1.237). While the instructors acknowledged that ChatGPT can help condense content into a simpler form, they expressed concerns about its ability to accurately summarize more complex or nuanced academic material. This suggests that instructors are cautious about relying on ChatGPT for tasks that require a deeper understanding and critical content analysis. However, this recommendation also had the highest SD, indicating a wider spread of answers and a lower agreement between the respondents, as shown in Figure 6.
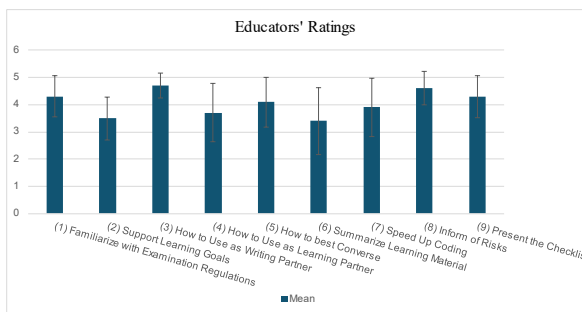

Figure 6. The Instructors' Evaluations of the Recommendations for Students

7. OUTLOOK

As AI becomes more prevalent daily, it will be impossible to ignore that students will use AI-based tools to succeed in higher education (Jacobsen, 2023). Further, they should use AI tools to be productive and acquire important digital skills. Although higher education is not the fastest-moving field, it must innovate its inherent educational structures as technological improvements are rapid and vast. Thus, there is no doubt that teaching and learning will change drastically. The media coverage has mainly focused on "cheating" and how universities can implement policies and procedures to manage "the AI problem." We argue for a more positive view of technological advancements such as GenAI, following the rules of good scientific practice. The debate and the innovation should focus on GenAI's potential benefits, such as improved learning, teaching, and the creation of equal opportunities for different groups of students.

On the side of technologies and GenAI systems, we can assume further rapid developments. Ever-more potent GPT-x models by OpenAI, comparable models by other vendors, more multimodal input and output to GenAI models, different interfaces to such models beyond conversational agents, and integration with other IT systems classes are clear paths ahead. OpenAI, Microsoft, Google, Meta, and others in academia and industry are working in these directions. The current version of ChatGPT and other tools such as Microsoft's Copilots and Google's Gemini are, therefore, likely only the first small step on a wide and long road towards increasingly powerful GenAI tools in higher education and beyond.

Conversational agents are an essential resource that instructors and students can and should use in teaching and learning. However, innovating teaching, assessing, and learning is only one field in a complex higher educational landscape. As the technology develops, GenAI's potentials go beyond *the teaching-learning trifecta* between students, instructors, and technical tools. GenAI will transform the entire student lifecycle, including admissions, enrollment, career services, and further areas of higher education management.

The easy access and rapid dissemination of ChatGPT, along with the associated challenges in learning, assessing, and teaching, have shown how quickly traditional patterns can be disrupted by technologies. As we deliberately focus on the impacts of ChatGPT and related tools on teaching and learning, we deliberately excluded other parts of higher education. However, students and instructors should seize the opportunities presented by technological developments in AI to rethink the world of higher education. They should be aware that ChatGPT may change people's expectations of future AI technologies, especially conversational agents, whether in terms of interaction or information quality.

At a macro-level, universities must watch out for potential social inequalities when tools such as ChatGPT are only available for a service fee. On the other hand, users should not expect that every IT-based service provided via the Internet will be free. From a societal perspective, it is crucial to ensure that all students can access the same tools and resources to successfully complete their education. However, it is uncertain how long a free version of ChatGPT will be available for. In addition to the free version of ChatGPT, OpenAI released the premium version—ChatGPT Plus—for US$20 per month (OpenAI, 2023). It promises improved availability, unrestricted use, and access to more advanced LLMs. Users who can afford the premium version of ChatGPT or, more generally, the paid versions of advanced AI-based tools, will enjoy advantages. Thus, it is an open question whether this premium version's

availability already compromises the principle of equal opportunities for all students.

To ensure equal access to education, universities may consider providing fee-based tools, such as the premium version of ChatGPT, free of charge or at a significantly reduced rate for students. Several universities have already set up LLM-based conversational agents free of charge for their students. With a growing number of necessary cloud-based tools requiring license fees or high-quality substitutes operated by universities' data centers, ChatGPT adds to an ongoing discussion about funding digital transformation in higher education.

Another crucial question beyond individual study courses is what competencies students should develop in higher education. Domain-specific skills have always been important, and they remain important. From our perspective, transferable skills such as cognitive, metacognitive, socio-emotional, and digital skills are becoming increasingly important. These skills include logical reasoning, structured and critical thinking, problem-solving, collaboration, and the regulation of emotions. Not least, students should have the opportunity to develop and use AI-based tools responsibly. Such skills will help students succeed in an interconnected and fast-paced digital world. Students will succeed in an interconnected and fast-paced digital world. Aoun (2018) describes the necessary mindset as "robot-proof," focusing on unique cognitive human capabilities such as critical thinking, systems thinking, entrepreneurship, and cultural agility.

As GenAI continues to advance, it is crucial to explore how it impacts the development of these skills in higher education. With AI's ability to generate and provide information, there is a risk that students may become passive recipients of information rather than active thinkers. For instance, to ensure that critical thinking remains an essential component of education, higher education must actively develop strategies to foster critical thinking in classes. Thus, expanding a current curriculum by including lectures on how AI can be used to support critical thinking is crucial. Higher education must incorporate tasks and activities that promote critical thinking and develop assessment methods that measure a student's development of critical thinking skills in the context of GenAI. Ultimately, the challenge is to ensure that students continue to develop the skills they need to make informed decisions and solve complex problems in a world in which AI is increasingly prevalent, as these skills are highly appreciated in the business context and are much-needed in society.

Finally, we emphasize the need for further research into long-term strategies for integrating AI into higher education. As AI becomes increasingly ingrained and continually shapes learning and teaching practices, it is essential to explore how teaching methods can adapt sustainably over time, ensuring that instructors are equipped to effectively lever their potentials while addressing evolving challenges. This includes investigating frameworks that support ongoing adaptation and innovation in AI-enhanced teaching practices.

We have focused on students and instructors. Nonetheless, our article shows a clear need for action beyond the levels of individual students, instructors, and courses. Universities should encourage broad, multiperspective dialogue among many stakeholders in higher education:

- They should include all faculties and disciplines, since different fields have different traditions, requirements, and opportunities, which should be reflected in every university's approach to GenAI.
- They should involve their experts from the information systems, computer science, data science, and related disciplines who have been researching IT-based innovations and digital transformation for many years and, in many cases, have also researched GenAI. They can contribute to the knowledge of the technologies and the digital transformation process, and have first-hand experience in teaching at their university.
- They should involve their career centers and representatives from industry and society to inform dialogues with perspectives on the required educational profiles and skills.
- They should involve students who contribute their perspectives on learning objectives, formats, and study conditions.
- They should involve experts in university didactics to contribute important perspectives on learning objectives, teaching and learning formats, assessments, and the like.
- They should involve legal experts to examine the legal possibilities offered by the current laws and university regulations, and the changes required to make the desired use of GenAI tools possible and legally sound.
- They should involve the university's divisions that administrate study and teaching. These are important to the processes that should deliver fair, efficient, and high-quality teaching.
- They should involve the university's IT department to consult on access, infrastructure, licenses, IT security, etc.

With all these stakeholders, universities should engage in dialogue on how to promote and leverage ChatGPT in the short term and other GenAI tools in the medium term. The dialogue should lead to multiperspective insights that result in regulations, guidelines, handouts, tutorials, and implementations. If appropriate, it may be helpful to talk to external experts, exchange experiences with other universities, talk to the responsible supervisory authority, and demand the necessary resources for an excellent university education.

While there are many ideas and discussions on managing and leveraging such tools, instructors should first learn how ChatGPT and comparable tools work and should modify their teaching methods, contents, and processes accordingly. Further, changes to examination formats cannot happen immediately; rather, they require careful development and adaptation following exam regulations.

As such, integrating ChatGPT into higher education will require patience and careful planning to ensure its successful implementation. Instructors should encourage their students not to wait for the university-level discourse to end and for all instructors to have adapted. Instead, students should actively engage with GenAI. If they have not yet used ChatGPT, they should get a free account and gain first-hand experience with its possibilities and limits. They should reflect on their learning goals, methods, and processes, and should engage with other stakeholders in higher education to shape the dialogue on AI-powered higher education.

As we call instructors to action regarding ChatGPT and provide these recommendations, we strongly recommend that

their use of ChatGPT should comply with legislation, university regulations, good scientific practices, and OpenAI's terms and conditions. If this is in fact the case, this article will have provided food for thought regarding using GenAI, LLMs such as GPT-4o, and tools such as ChatGPT in higher education.

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AUTHOR BIOGRAPHIES

Henner Gimpel is a professor of information systems and holds the Chair of Digital Management in the Faculty of Business, Economics and Social Sciences at the University of Hohenheim. He is a director of the Research Center for Information Management and a member of the Fraunhofer FIT. He studied Industrial Engineering and Management and obtained a doctorate from the Karlsruhe Institute of Technology. His behavioral and design-oriented research centers around collective, hybrid, and artificial intelligence, IT use, digital health and well-being, smart sustainability, and digital ethics.

Kristina Hall is a postdoctoral researcher at the University of Bayreuth and Fraunhofer FIT's Branch Business & Information Systems Engineering. Her research focuses on the digital society at the individual and organizational levels and the implications of digital technologies on human well-being. Further, she is concerned with questions of human-computer interaction, the psychological effects of technology use at the individual level, and the design of socio-technical systems based on behavioral economic theories. Hall is author of various papers at conferences and journals in the field of Human-Computer Interaction.

Stefan Decker is the Director of the Fraunhofer Institute for Applied Information Technology (FIT) and holds the Chair of Information Systems and Databases at RWTH Aachen University. Previously, he was a Professor of Digital Enterprise at the National University of Ireland, Galway, and Executive Director of the Digital Enterprise Research Institute (DERI). Decker studied computer science at the University of Kaiserslautern and earned his doctorate from the University of Karlsruhe. His research interests include global information systems, web science, data science, and the semantic web.

Torsten Eymann is a professor of business & information systems engineering in the faculty for law, business, and economics at the University of Bayreuth in Bayreuth, Germany. His research focuses on the digital transformation of higher education and healthcare.

Niklas Gutheil is a doctoral student in information systems at the University of Bayreuth and researcher at the Fraunhofer Institute for Applied Information Technology (FIT). Previously, he studied industrial engineering. His research focuses on Generative AI and its impact on business and society.
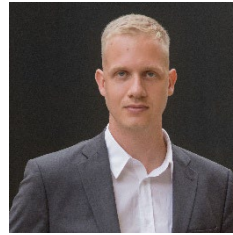
Luis Lämmermann received the B.S. and M.S. degrees in industrial engineering from the University of Bayreuth, Bayreuth, Germany, in 2020, where he is currently pursuing the Ph.D. degree in applied artificial intelligence. From 2020 to 2024, he was a Researcher with the University of Bayreuth, the Frankfurt University of Applied Sciences, and the Fraunhofer Institute for Applied Information Technology (FIT). Since 2024, he has been a Senior AI Consultant with TRUSTEQ GmbH, Munich, Germany. He is the author of over 15 academic publications. His research interests include human-AI collaboration, AI management, and autonomous AI agents. Mr. Lämmermann actively engages with the research community and regularly contributes as a reviewer for renowned journals in the information systems field.
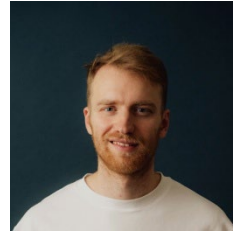
Niklas Braig is a student at the University of Bayreuth who works as a research assistant at the Chair for Business and Information System Engineering. He studied Business and Management as a Bachelor's degree and Business Administration as Master's degree.

Alexander Maedche is a professor of information systems at the Karlsruhe Institute of Technology (KIT), Germany. He heads the human-centered systems lab (h-lab) at the Institute for Information Systems (WIN). His work is positioned at the intersection of Information Systems and Human-Computer Interaction (HCI). Specifically, his research is focused on designing human-centered systems for better work and life. His work has been published in leading international information systems and computer science outlets such as the *Management Information Systems Quarterly* (MISQ), *Information Systems Research* (ISR), and the ACM Conferences on Human Factors in Computing (CHI) and on Computer-Supported Cooperative Work & Social Computing (CSCW)

Maximilian Röglinger is professor of information systems and business process management at the University of Bayreuth. Maximilian also serves as Academic Director of the FIM Research Center for Information Management and works in a leading position at Fraunhofer FIT. Maximilian's activities in research, teaching, and transfer center around business process management, digital innovation, and digital transformation.

Caroline Ruiner is professor for sociology at the University of Hohenheim in Germany and Prorector for Digital Transformation and Sustainability. Her research focuses on the impact of digital technologies on individual, team and organizational levels as well as with regard to industrial relations. Moreover, she investigates the interrelation of sustainability and digitalization in the context of the twin transformation.

Manfred Schoch is professor for information systems at the University of Applied Sciences Esslingen. He is also a member of the FIM Research Center and the Branch Business & Information Systems Engineering of the Fraunhofer FIT. He received his doctorate degree in economics from the University of Hohenheim. The focus of his work is on the analysis of IS use and the design of digital technologies to facilitate human-centered digitalization. He is a passionate lecturer and curious about the impact of GenAI on teaching, learning, and working.

Mareike Schoop is full professor of information systems at the University of Hohenheim in Stuttgart, Germany. She holds a PhD from the University of Manchester, UK, and a Habilitation from RWTH Aachen University, Germany. She was visiting professor at the University of Oxford, UK, and the Technical University of Vienna, Austria. Her research focuses on artificial intelligence, digital negotiations, and innovative approaches to digital learning. She has published over 150 papers in journals and international conferences. She is currently Editor-in-Chief of the Springer *Journal of Group Decision and Negotiation* and has served as editor in various other journals.

Nils Urbach is professor of information systems and Director of the Research Lab for Digital Innovation & Transformation at the Frankfurt University of Applied Sciences. Furthermore, he is Director at the FIM Research Center for Information Management and the Branch Business & Information Systems Engineering of Fraunhofer FIT. Nils Urbach has been working in the fields of digital innovation and transformation for several years. His work has been published in several academic journals such as *Information Systems Research* (ISR), the *Journal of Strategic Information Systems* (JSIS) and the *Journal of Information Technology* (JIT). He advises several companies on digitalization issues and regularly appears as a speaker on this topic.

Steffen Vandirk is a student at the University of Bayreuth who works as a research assistant at the Chair for Business and Information System Engineering. He studied Sport, Business and Law, Bachelor of Science (B.S.).

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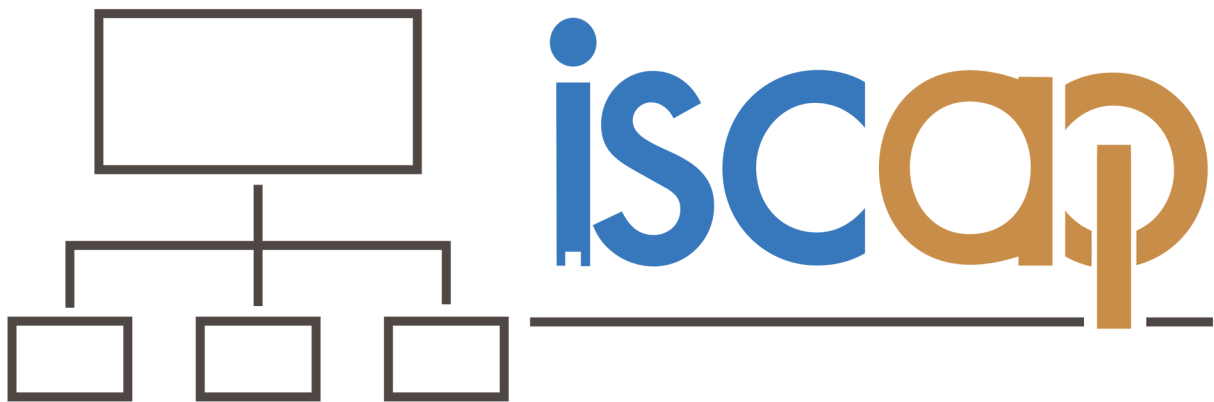
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