



**A Speculative Critical Design Inquiry into the Impact of GenAI Chatbots on University**

**Students' Brainstorming**

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### Technology Statement

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	<p>I used the video creation platform Colossyan to create the video presentation component of my diegetic prototype. I have designed the PowerPoint slides of the video and written the script for the presentation myself. Leveraging Colossyan's AI capabilities, I transformed my script into a presentation delivered by an AI-generated avatar.</p> <p>I used the tool Atlas.ti for the manual coding of the data</p>
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## Abstract

Generative AI (GenAI) chatbots like ChatGPT, have gained widespread adoption in academia, with university students increasingly using GenAI in academic tasks, like brainstorming. Speculative Critical Design (SCD) envisions potential future implications of technology to investigate the current status quo critically. While previous research employing SCD examined GenAI in the context of academia, there remains a gap in studies on student hybrid brainstorming. This study investigated how SCD can be used to explore the effects of student hybrid brainstorming by zooming in on student creativity and autonomy. A workshop (n=13) was conducted. Participants looked at a *possible future* of hybrid brainstorming by engaging with a diegetic prototype comprising of a 2035 Pew research article describing the adoption of an AI-centric education system (ACES) and a research presentation on ACES. Following a focus group discussion was conducted. Afterwards, participants envisioned a *preferable future* through a brainstorming activity in which guidelines for GenAI-assisted but human-centred brainstorming were ideated and participants voted for their top guidelines. Results indicate that SCD facilitated the exploration finding that hybrid brainstorming's negative effects outweigh the positive ones. Regarding student creativity, GenAI can threaten independent idea generation and idea originality and novelty. Regarding autonomy, the effect of GenAI depends on how the tool is used as it can augment or automate brainstorming. Lastly, issues regarding navigating idea ownership and plagiarism were found. This study paves the way for future investigation on the topic. Guidelines were ideated to mitigate those effects.

*Keywords:* speculative critical design, generative AI, university students, hybrid brainstorming, creativity, autonomy

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## **A Speculative Critical Design Inquiry into the Impact of GenAI Chatbots on University Students' Brainstorming**

In November 2022, OpenAI launched Chat GPT-3 a generative artificial intelligence (GenAI) chatbot built on a large language model that uses deep learning to produce human-like text with high fluency and coherence (Bandi et al., 2023). Since its launch, ChatGPT usage has surged, reaching 260.2 million monthly users by May 2024 (Duarte, 2024). The vast adoption of GenAI chatbots is also seen among university students, with 60% using GenAI for academic tasks, out of which 81% use ChatGPT (Deschenes & McMahon, 2024). Students increasingly use GenAI in brainstorming (Chan & Hu, 2023; Zhang et al., 2024). Brainstorming is a (group) activity in which members generate, share and discuss ideas for creative solutions to problems (Osborn, 1953).

Prior research has studied the emergence of hybrid brainstorming teams comprising humans and GenAI, finding benefits like enhanced speed and scalability in generating ideas (Bouschery et al., 2024; Girotra et al., 2023). While individuals generate approximately five ideas within fifteen minutes, hybrid brainstorming teams can produce up to 200 (Girotra et al., 2023). This closely aligns with students' primary reason for using ChatGPT, namely time-saving (Niloy et al., 2024).

While students can benefit from hybrid brainstorming, it can also lead to negative consequences such as overreliance on GenAI (Zhang et al., 2024). Furthermore, it can have implications on student's creativity- the creation of original yet appropriate ideas, solutions or products (Runco & Jaeger, 2012). Hybrid brainstorming can cause fixations by anchoring students to chatbot-generated ideas, hindering independent thinking (Bordas et al., 2024;

Wadinambiarachchi et al., 2024). Furthermore, it has been found that using GenAI in brainstorming can degrade idea originality (Lee & Koo, 2024).

Besides creativity, GenAI can also impact students' autonomy in the brainstorming process. Peters et al. (2018) define human autonomy in human-computer interaction as humans having the feeling of agency and the ability to act by one's values and goals. Furthermore, autonomy can be assessed by the nature of human-machine collaboration, ranging from augmentation to automation. Augmentation involves the close collaboration of machines and humans to perform a task. Automation means that a human task is been taken over by a machine (Raisch & Krakowski, 2021). In brainstorming, GenAI can either replace human thinking (automation) or complement it (augmentation). Some studies state that GenAI augments brainstorming by keeping humans 'in the loop', through prompts and output modification (Bouschery et al., 2024; Vinchon et al., 2023). Others state that autonomous technologies, like GenAI, can threaten human autonomy by over-streamlining workflows, limiting users' decision-making, control or choice (Väänänen et al., 2021). Furthermore, students in a divergent thinking task reported that GenAI handled all thinking on their behalf, thereby automating brainstorming (Habib et al., 2024). The model of human-centred AI (HCAI) emerged to safeguard human autonomy in human-AI interaction, prioritizing it over AI autonomy. HCAI design seeks to augment, rather than replace, human capabilities (Shneiderman, 2020) such as idea generation in brainstorming.

Speculative Critical Design (SCD) can be used to envision the future of higher education in conjunction with genAI to explore how it could reshape student brainstorming. SCD uses design to explore potential futures to examine implications of technology and the current status quo critically (Dunne & Raby, 2013). SCD explores future possibilities by posing 'what if'

questions and creating diegetic prototypes, which serve as fragments of a speculative future scenario offering insights about the world in which they exist. This aims to provoke thought, raise reflection and trigger discussion among an audience about potential and preferable futures (Bowles, 2018; Dunne & Raby, 2013; Johannessen et al., 2019).

Previous research investigating GenAI in the context of higher education employing a SCD approach focused on social robots in education (Cox, 2021), addressing educational issues with AI-powered technical solutions (Rahm, 2024), techno-monitoring in education (Gazulla, 2021), remote teaching (Carbonel, 2023), or extended reality in design education (Jahwari et al., 2023). However, there remains a gap in applying SCD to explore GenAI in the context of student brainstorming.

This study aims to explore this gap using SCD to envision a possible and preferable future of genAI in student brainstorming. In doing so, this SCD inquiry contributes to the body of research on GenAI in higher education. Two research questions guide this study. The first one focuses on examining the current problem space of student GenAI usage in brainstorming by envisioning a possible future through a diegetic prototype. Consequently, the following research question is posed:

**RQ1:** *How can speculative critical design facilitate the exploration of generative AI chatbots' impact on university students' brainstorming?*

The second question centralizes the solution space of hybrid brainstorming teams of students and GenAI, envisioning a preferable future by creating HCAI guidelines. Therefore, the following research question is formulated:

**RQ2:** *What human-centred GenAI guidelines can emerge from the speculative critical design process to enhance student creativity and autonomy when using generative AI in brainstorming?*

The findings of this study can offer valuable insights into implications of hybrid brainstorming from the perspective of university students. Additionally, the ideated guidelines can reveal what negative implications students identify in hybrid brainstorming and how they would combat those shedding light on their needs. Finally, this study can provide a foundation for future research in this area, paving the way for deeper investigation into student hybrid brainstorming and its implications for creativity and autonomy.

## **Theoretical Framework**

### **Hybrid Brainstorming Teams of Humans and GenAI**

Alex Osborn (1953) coined the concept of brainstorming to facilitate idea generation and boost creativity in groups. Brainstorming systemizes creative thought, specifically divergent thinking (Kalargiros & Manning, 2015). In Osborn's (1953) brainstorming method, group members generate as many ideas as possible on a topic, following four guidelines to maximise creativity. First, unconventional ideas are encouraged. Second, no idea should be judged during the brainstorming session. Third, idea quantity is encouraged over quality. Fourth, generated ideas should be used as a springboard or merged to generate improved or additional ideas.

Conventionally, there are three brainstorming techniques. Traditional brainstorming where members interactively brainstorm as a team, nominal brainstorming where members of a team brainstorm individually, and electronic brainstorming where online resources such as browser-based systems are used to support group brainstorming (Kalargiros & Manning, 2015).

With the rise of GenAI tools, a fourth brainstorming technique emerged: hybrid brainstorming teams comprising humans brainstorming with GenAI.

Various studies have examined hybrid brainstorming. A brainstorming test comparing ideas generated by individuals, human teams, and hybrid teams showed that hybrid brainstorming teams surpassed the other two groups in creativity and quantity of generated ideas (Bouschery et al., 2024). Likewise, Lee & Chung (2024) found that using ChatGPT for idea generation boosted the creativity of ideas compared to using a conventional web search or no technology. Furthermore, individuals ideating with GenAI are 40 times more productive than without in speed and idea quantity (Girotra et al., 2023). Together these studies underscore that hybrid brainstorming teams surpass traditional and nominal brainstorming groups regarding productivity as well as idea quantity and quality. Additionally, they falsify the conventional belief that “AI could never match human creativity” (Marrone et al., 2022, p. 1). This study will investigate hybrid brainstorming teams further by zooming in on students.

### **Students Using GenAI for Brainstorming**

Surveys show that university students leverage the creative capacities of GenAI for brainstorming (Chan & Hu, 2023; Zhang et al., 2024). While this can offer benefits for productivity, idea quantity and quality, (Bouschery et al., 2024; Girotra et al., 2023; Lee & Chung, 2024) it may also impact students’ own creativity and autonomy in idea generation.

### ***Effects of Hybrid Brainstorming on Students’ Creativity***

First, students risk becoming overly dependent on GenAI for creative thinking (Zhang et al., 2024). Second, using GenAI can cause fixations towards provided ideas, hindering own divergent thinking rather than enhancing it (Bordas et al., 2024; Wadinambiarachchi et al., 2024).

Third, studies showed that GenAI usage reduced diversity and originality in student writing (Doshi & Hauser, 2023; Sudrajad et al., 2024). Lee and Koo (2024) found that idea originality is higher when not using GenAI in brainstorming. Inspired by random word brainstorming, implementing random word prompts emerged as a technique to increase the diversity in ChatGPT responses (Taveekitworachai & Thawonmas, 2023).

The studies on the effects of students' GenAI usage on their creativity have predominantly relied on a quantitative research design, leaving a gap in qualitative approaches. This study seeks to examine this gap by uniquely employing a qualitative SCD method, allowing an explorative analysis of hybrid brainstorming and its possible impacts on student creativity. To guide this inquiry, the study poses the following sub-research question:

**SQ1:** *How can speculative critical design facilitate the exploration of generative AI chatbots' impact on university students' creativity during brainstorming?*

### ***Effects of Hybrid Brainstorming on Students' Autonomy***

Besides creativity, autonomy can also be impacted by hybrid brainstorming. In hybrid brainstorming, there is a thin line between the augmentation and automation of idea generation. Previous studies disagree on whether AI functions as an assistant or replacement for humans in ideation. Bouschery et al. (2024) argue that although AI mostly autonomously generates ideas, human prompts affect AI's output, making the process rather an augmentation as humans are in the transition of input to output. Similarly, Vinchon et al., (2023) argue that humans prompt and modify AI-generated ideas. Hence, GenAI would not take over brainstorming but collaborate.

Conversely, university students engaged in a hybrid divergent thinking task remarked that ChatGPT was essentially thinking on their behalf (Habib et al., 2024), not understanding AI as a collaborator but as the sole creator. Thus, describing automation and reduced autonomy in

brainstorming. Väänänen et al., (2021) also argued that autonomous technologies, like GenAI, can threaten human autonomy by over-streamlining workflows, limiting users' decision-making opportunities, control or choice. Moreover, in hybrid brainstorming, differentiating between copying and drawing inspiration (Lewis, 2023), and identifying where “individual contribution ends and plagiarism begins” (Meyer et al., 2023, p. 4) becomes challenging. This complicates understanding how human autonomy in brainstorming be limited (sole copying) or complemented (drawing inspiration).

This study uses SCD to explore human autonomy in hybrid brainstorming, contributing to the investigation regarding the yet unresolved question of whether GenAI functions as an assistant or a replacement for humans in ideation by specifically zooming in on students.

Therefore the study poses the sub-question:

**SQ2:** *How can speculative critical design help investigate the effects of generative AI chatbots on student autonomy during brainstorming?*

## **Design Methods for Exploring Student GenAI Brainstorming**

### ***Speculative Critical Design***

SCD combines speculative and critical design practices both of which challenge, raise reflection and spark discussion (Johannessen et al., 2019). SCD is the antidote to affirmative design, understanding design as a medium rather than a solution, creating designs for debate rather than production, and serving society rather than industry (Dunne & Raby, 2013).

Speculative Design (SD) explores the various possible implications of technology before their occurrence. What-if scenarios including fictional products and services are designed situated in alternative futures for people to critically engage with them as consumer-citizens. SD

crafts possible futures to better understand the present and explore what futures are desirable. These possible future scenarios are provocative to challenge norms and trigger reactions and discussion. Design probes make future scenarios tangible to the audience. By representing a part of a scenario that reflects the whole, they offer insights and speculations about the world they inhabit. Kirby (2009), describes design probes using the term diegetic prototypes: in the fictional world, described by film and narration scholars as diegesis, they are used by people.

Critical Design (CD) understands design as means of critique challenging the status quo. Provocatively, CD opposes techno-utopianism by examining potential negative effects of technology. Like a cautionary tale, CD centralizes frightening possibilities by asking ‘what if’ questions. CD shows what could be, highlighting drawbacks of current norms and values along with social and technological developments. Therefore, CD raises awareness and facilitates space for debate on present norms and preferable futures (Dunne & Raby, 2013).

Different research used SCD to examine GenAI’s effects on higher education (Carbonel, 2023; Cox, 2021; Gazulla, 2021; Jahwari et al., 2023; Rahm, 2024). Furthermore, Vinchon et al. (2023) crafted four speculative future scenarios on GenAI’s effects on human creativity. In scenario *Co-cre-AI-tion*, creative augmentation through equal collaboration. *Organic*, values human creativity over AI. In *Plagiarism 3.0* AI is overused without citations. Lastly, *Shut Down* envisions more value in AI creative work, diminishing human engagement in creative activities.

A gap remains in using SCD to explore GenAI’s implications on student brainstorming, particularly regarding creativity and autonomy, which is investigated in this study. Through a diegetic prototype, this study explores a provocative future: by 2035, universities have adopted an AI-centric education system (ACES) where students outsource all creative thinking to GenAI to maximize efficiency. This what-if scenario urges reflection on the consequences of fully

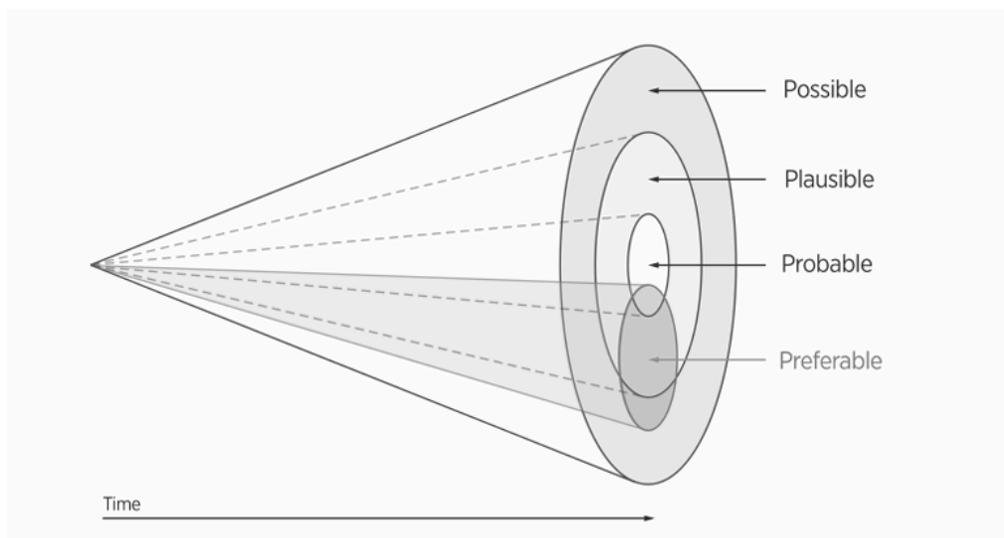
integrating GenAI into students' creative processes and invites debate on the present, possible and preferable futures.

### *The Futures Cone*

SCD uses ‘futuring’, which views the future as plural, acknowledging the existence of multiple possible futures (Bowles, 2018). Dunne & Raby’s (2014) futures cone adapted by Bowles (2018) visually represents this plurality. Using the analogy of a flashlight beam, the futures cone illustrates a spectrum of potential futures, as shown in Figure 1.

**Figure 1**

### *The Futures Cone*



*Note.* From: *Future Ethics* [Copied figure], by Bowles, 2018, NowNext Press.

The beam light depicts four futures: probable, plausible, possible and preferable ones. Each future signifies a distinct level of likelihood regarding what may occur. The x-axis illustrates

time, with the beam spreading out from the present to the future with the near future being more predictable than the distant future (Bowles, 2018).

The central cone of the beam light shows *probable futures*. It is the most likely scenario to happen based on our current knowledge (Bowles, 2018). *Plausible futures* are less likely to happen than probable ones but are still previsible (Bowles, 2018). The cone at the beam's periphery represents *possible futures*, which are "space of speculative culture" (Dunne & Raby, 2014, p. 4). They should be scientifically possible, with a believable trajectory connecting the present and the future. This allows the audience to link future and present functioning as a catalyst for critical reflection (Dunne & Raby, 2014). The fourth cone, *preferable futures*, incorporates how we desire the world to be and the ways we could attain that ideal. This preferred scenario can be probable, located in the cone's centre or improbable on the periphery (Bowles, 2018).

This study, conducted a workshop using the the futures cone as a guiding concept. The workshop's first part addresses a problem space, students' current GenAI usage in academia, through a *possible future* evoked through a diegetic prototype, allowing participants to link the present to the future sparking reflection and debate (Dunne & Raby, 2014). The second part examines a solution space by envisioning a *preferable future*. The futures cone is used in the workshop because it provides a structured and visual approach to futuring, making the concepts of multiple futures more accessible to participants (Gall et al., 2022).

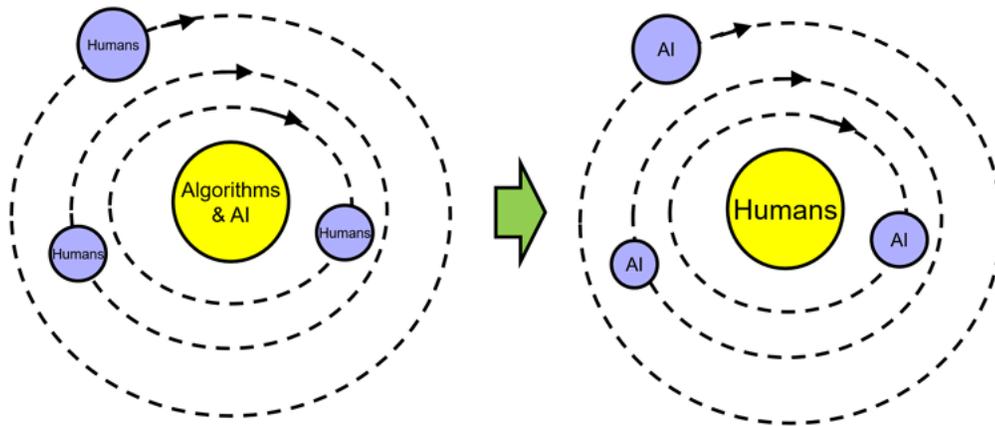
### ***Human-Centred AI***

The model of Human-Centred AI (HCAI) refers to the design and implementation of AI systems that meet human needs and centralize human autonomy rather than AI autonomy in human-AI interaction. HCAI replaces algorithms with humans at the centre of attention as

illustrated in Figure 2, and reframes the traditional concept of having humans ‘in the loop’ with AI, to one where AI is ‘in the loop’ with humans.

## Figure 2

*HCAI: A Shift from Algorithms and AI to Humans as the Center of Attention*



*Note.* From: Human-Centered Artificial Intelligence: Three Fresh Ideas [Copied figure], by Shneiderman, 2020, *AIS Transactions on Human-Computer Interaction*, 109–124.

<https://doi.org/10.17705/1thci.00131>

HCAI prioritizes human users by underscoring the importance of user experience design and supporting augmentation rather than replacement of human capabilities. Human-centred design principles, incorporate AI automation while supporting the augmentation rather than replacement of human capabilities. Additionally, HCAI guides the design of AI tools that enhance human creativity and active participation in human-computer interaction (Shneiderman, 2020).

According to Dengel (2021), the most valuable future AI systems will be those that adhere to three human-centred principles: *co-exist* with humans, *cooperate* rather than compete with them and *collaborate* rather than replace them.

Previous research on GenAI chatbots has used the HCAI framework to propose responses to identified ethical challenges (Sison et al., 2023) and concluded the existence of diverse challenges in GenAI due to the absence of HCAI design (Nah et al., 2023). Furthermore, studies on HCAI underlined its importance in the context of education. According to (Bezzina & Chariuc, 2023), AI is shaping the future of education and therefore, must be human-centred to ensure well-being. Furthermore, Gattupalli and Maloy (2024) found that HCAI principles are essential for leveraging GenAI's opportunities for education.

This study contributes to literature on HCAI in the context of education by specifically looking at GenAI in student brainstorming. The HCAI framework is implemented to envision a preferable future of student hybrid brainstorming which is GenAI assisted but human-centred. The three human-centred design principles: coexistence, cooperation and collaboration guide the workshops' brainstorming activity for HCAI guidelines for GenAI tools that enhance, rather than replace, student creativity and autonomy in hybrid brainstorming.

## **Methodology**

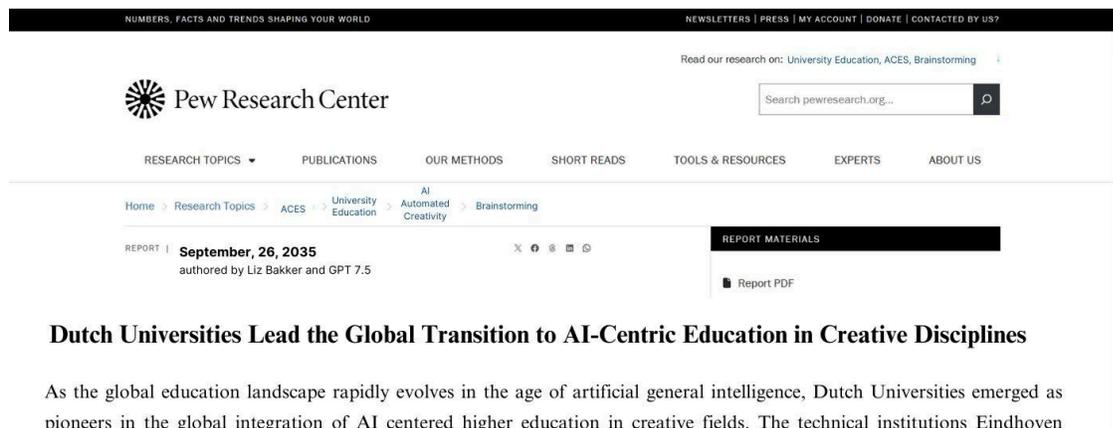
### **The Qualitative Research Design**

This study adopts a qualitative research approach by conducting a workshop employing the SCD and futures cone framework. The workshop is divided into two parts, aligned with two stages of the futures cone addressing what-if scenarios regarding possible and preferable futures of student hybrid brainstorming.

The workshop's first part delves into the current problem space regarding student GenAI usage for brainstorming by envisioning a possible future through a diegetic prototype. Using SCD, a "what-if" scenario is crafted and brought to life with a diegetic prototype consisting of 1) a Pew Research journal article from 2035 that describes a global shift among universities towards an AI-centric education system (ACES) detailing the implications brought about this new educational model (Figure 3) and 2) a research presentation given by the avatar of the Pew Research scholar who co-authored the article with 'ChatGPT 7.5' functioning as academic dissemination of the findings on the ACES (Figure 4).

### Figure 3

## *Diegetic Prototype: Component 1-Pew Research Article 'Dutch Universities Lead Global Transition to AI-Centric Education in Creative Disciplines' from 2035*



### **Dutch Universities Lead the Global Transition to AI-Centric Education in Creative Disciplines**

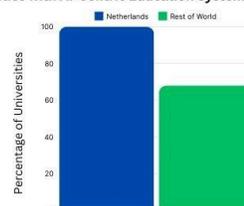
As the global education landscape rapidly evolves in the age of artificial general intelligence, Dutch Universities emerged as pioneers in the global integration of AI centered higher education in creative fields. The technical institutions Eindhoven University of Technology and Delft University of Technology are known as the founding fathers of the AI-Centric Education System (ACES) revolutionizing how students engage with creative tasks such as brainstorming, designing and innovation world wide. This system effectively equips students for a job market shaped by AI.

The ACES dictates that students outsource all creative and ideative tasks to generative AI. Students no longer brainstorm or engage in idea generation; they input parameters into AI systems, which generate a multitude of creative outputs tailored to specific academic needs. Whether it's an architectural design project or a philosophical essay, AI handles all intellectual labor. Students are no longer required nor encouraged to develop original ideas but are trained to manage and fine-tune AI-generated outputs. Students' performance assessment focuses on how effectively students can direct AI systems to produce optimal results. The de-humanization and automation of creativity facilitate instantaneous idea generation and output with an unprecedented level of expertise, precision, speed and scalability. This educational approach meets today's zeitgeist: Where human creativity used to be seen as the foundation of intellectual progress, by 2035, it is viewed as an inefficient approach for meeting the high demands of modern academia and society. This report examines the latest developments regarding the AI-Centric Education System.

#### **Among the main findings:**

The Netherlands became the first country where every University has fully integrated the AI-Centric Education System (ACES). Over 68% of universities worldwide now adhere to an ACES, where all creative processes, from ideation to project design, are managed by generative AI.

**Universities with AI-Centric Education System (ACES)**



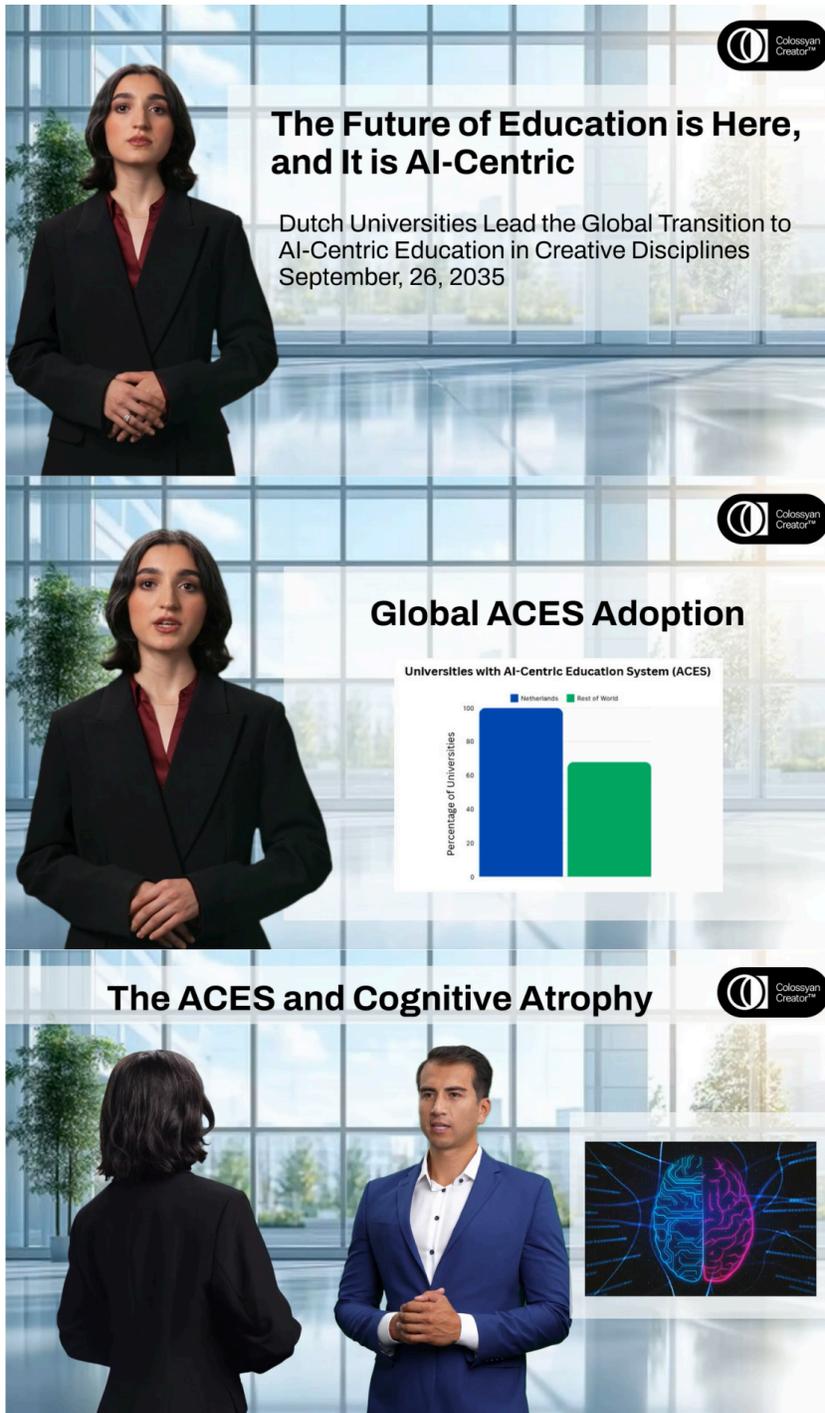
Nine out of ten surveyed AI experts agree that human brainstorming has become "redundant" and "inefficient" in modern academia, having been surpassed by the superior capabilities of AI systems.

95% of educators agree that "automating creative tasks and idea generation unlocks new levels of innovation and efficiency which will benefit society as a whole" while "sole human brainstorming equates to a missed opportunity to fully harness accessible creative potential."

78% of University students report feeling "disconnected" from the academic process, as they are no longer required to generate original thoughts or ideas. Every surveyed student (100%) acknowledged that the creative output achieved by AI far surpasses what can be accomplished by them.

**Figure 4**

*Diegetic Prototype: Component 2- Screenshots from the Research Presentation 'The Future of Education is Here, and It is AI-Centric.'*



*Note.* The full video can be accessed at [<https://app.colossyan.com/share/z14ihads>].

Participants engage with the diegetic prototype and then in a focus group discussion. This aims to answer the first research question: *‘How can speculative critical design facilitate the exploration of generative AI chatbots' impact on university students' brainstorming?’* and subsequently *the impact on students' creativity (SQ1) and autonomy (SQ1) during brainstorming.*

The workshop's solution space examines a preferable future. In a brainstorming activity, participants ideate guidelines for GenAI-assisted but human-centred brainstorming where student creativity and autonomy are enhanced and vote for the top guidelines. This part aims to answer the second research question: *‘What human-centred GenAI guidelines can emerge from the speculative critical design process to enhance student creativity and autonomy when using generative AI in brainstorming?’*

The qualitative SCD method is used to critique techno-societal developments and provoke discussion about what defines a preferable future (Dunne & Raby, 2014; Johannessen et al., 2019). Hence, it aligns well with the aim of this study: to examine possible and preferable futures of student GenAI use in brainstorming along with the associated implications. The futures cone provides a framework for explaining how various potential futures unfold within an expanding realm of possibilities. It can make the concept of multiple futures more accessible to participants (Gall et al., 2022). Thus, in this workshop, the futures cone is a guiding concept, helping participants to understand the range of potential futures. Additionally, the use of a diegetic prototype can trigger a focused discussion since it brings a phenomenon “on the table” (Sanders & Stappers, 2014, p. 2) and is provocative by nature (Bowles, 2018). Thus it is an effective probe to evoke a focus group discussion.

Besides this, brainstorming is an effective practice to boost group creativity (Osborn, 1953). Osborn's (1953) four guidelines of group brainstorming have been proven effective for enhancing idea generation (Paulus & Brown, 2003; Putman & Paulus, 2009). Therefore, they will be applied during the workshop's brainstorming activity to enhance divergent thinking.

### **The Design Futuring Workshop**

Workshop invitations were sent via WhatsApp, along with a Qualtrics questionnaire containing an informed consent form (see Appendix A), demographic questions and questions regarding the existence of prior knowledge regarding the workshop's guiding concepts (see Appendix B). Assessing participants' prior knowledge helped tailor explanations during the workshop.

After providing informed consent and completing the questions, participants attended the workshop on November 30th, 2024, in a meeting room at Lochal for two hours. The workshop presentation slides are provided in Appendix D. The workshop activity schedule is presented in Table 1.

**Table 1**

*The workshop activity schedule*

Workshop activity	Approximate duration in minutes
1. Welcome and Introduction to Guiding Concepts	15

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(Futures Cone, SCD, Diegetic Prototypes)	
2. Exploring Problem Space: Possible Future	60 (total)
2.1 Present What-If Scenario through Diegetic Prototype	15
2.2 Focus Group Discussion	45
3. Exploring Solution Space: Preferable Future	41 (total)
3.1 Introduce HCAI	5
3.2 Present Osborn's (1953) Brainstorming Guidelines	5
3.3 Divide Participants in Sub-Groups	1
3.4 Brainstorming HCAI Guidelines	15
3.5 Voting for Top Guidelines	10
4. Wrapping Up and Debriefing	5

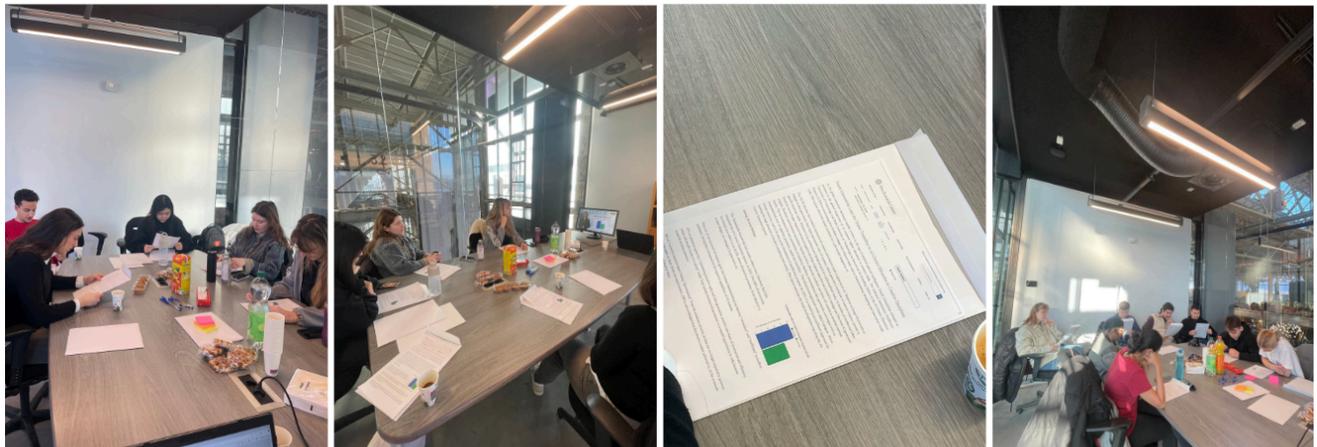
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The workshop began with a welcome and introduction to its agenda. Participants were introduced to the guiding concept of the workshop namely the futures cone, speculative critical design, and diegetic prototypes, equipping participants with knowledge to effectively engage in the workshop. Afterwards, the participants explored the study's problem space through a possible future. As shown in Figure 5, participants engaged with the diegetic prototype comprising of a Pew Research journal article from 2035 that describes a global trend towards an AI-centric

education system (ACES) and a research presentation given by the avatar of the Pew Research scholar who co-authored the article with ‘ChatGPT 7.5.’

## Figure 5

*Workshop participants engaging with the diegetic prototype*



Afterwards, a focus group discussion was conducted with guiding questions such as *What are the potential dangers of outsourcing human brainstorming to AI chatbots and the ACES?*, *Do you think that GenAI usage could affect your ability to generate ideas independently? If yes, how? If not, why not?*, and *How does using GenAI for brainstorming affect your sense of ownership over generated ideas?* The full question guide can be found in Appendix E.

A ten-minute break followed the discussion. Afterwards, participants explored the solution space by imagining a preferable future. The concept of HCAI was explained, followed by an introduction to Osborn’s (1953) four guidelines to enhance creativity in ideation. Participants were then divided into subgroups of two to three and brainstormed potential guidelines for designing human-centred GenAI systems that enhance student creativity and autonomy, writing their ideas on post-its. This process was guided by three ‘food for thought’

questions: *What safeguards or settings can be implemented to ensure AI systems remain assistive rather than directive in the creative process?, How can we ensure AI chatbots encourage rather than replace human creative thinking during brainstorming?, What AI features would give students more autonomy in idea generation?* Each sub-group shared its guidelines with the larger group. Afterwards, participants voted for their top three guidelines. Figure 6 shows the brainstorming activity.

### **Figure 6**

*Participants engaging in the brainstorming activity*



Finally, the workshop was wrapped up, Participants were debriefed on the study's purposes and thanked for their participation.

### **Workshop Participants**

Participants were recruited through non-probability convenience sampling, drawing from a pool of classmates and friends. An inclusion criterion was that participants must be university

students as the study specifically explores this demographic. Since the workshop spanned around two hours, drinks and snacks were provided to boost motivation.

The research sample consisted of 13 participants of which five were male and eight female. Most participants ( $n=12$ ) were aged 21-26 and one participant was 30 or older. The sample represented a diverse range of nationalities ( $n=10$ ) and included students from five different Dutch universities. Participants were enrolled in eight different Master's study programs.

The questionnaire revealed that most participants had little to no prior knowledge of SCD  $M = 0.61$  ( $SD = 1.12$ ), with zero being 'no knowledge' and four being 'very knowledgeable.' Similarly, low prior knowledge was observed for diegetic prototypes  $M = 0.23$  ( $SD = 0.44$ ), the futures cone  $M = 0.61$  ( $SD = 1.12$ ), and HCAI  $M = 1.15$  ( $SD = 0.80$ ). Therefore, the researcher explained the four concepts during the workshop. See Appendix C for the comprehensive sample characteristics and prior knowledge levels.

### **Analysis of Workshop Insights**

The data collected in this study is categorized into data gathered through the initial questionnaire, workshop insights from the focus group discussion, and the brainstorming activity.

The data from the questionnaire was analysed using the statistical software Jamovi deriving participants' descriptives regarding demographic characteristics, educational information and initial knowledge about the workshops' core concepts.

The focus group discussion and brainstorming output was distinctively analyzed using thematic analysis which involves "identifying, analysing and reporting patterns within data" deriving rich details (Braun & Clarke, 2006, p. 79). This study employs the six-step approach to thematic analysis as established by Braun and Clarke (2006). First, the researcher transcribed the

collected data (see Appendix H for all transcripts) and familiarised with it by making quotations and taking notes. Second, across the data, initial codes were identified which are data segments of importance regarding the research objective. This thesis employed the data-driven and bottom-up inductive coding approach with codes emerging organically from the textual data. Third, connections between codes were identified and codes were combined into overarching themes. Fourth, the themes were reviewed by evaluating whether they hold up in relation to the whole data set and the coded extracts. Fifth, the themes were ongoingly refined and finally defined and named (Braun & Clarke, 2006). Resultantly, two comprehensive coding schemes were developed. The focus group discussion coding scheme comprises three levels: themes, codes and sub-codes, along with example quotes from the transcripts (See Appendix F). The coding scheme of the brainstormed guidelines comprises two levels: codes and subcodes, along with the ideated guideline (See Appendix G). As step six, the results and discussion section was composed.

Thematic analysis with an inductive exploratory coding method was chosen since it provides rich contextual insights (Braun & Clarke, 2006). By focusing on the data itself, nuances and complexities can be captured in participants' experiences and perceptions regarding hybrid brainstorming and ideas regarding AI guidelines for AI-assisted but human-centred brainstorming.

## **Results**

### **Problem Space: Focus Group Discussion**

Thematic analysis of the focus group data identified six themes relating to the first research question RQ1: *How can speculative critical design facilitate the exploration of*

*generative AI chatbots' impact on university students' brainstorming?* and its two subquestions investigating the *impact on students' creativity (SQ1) and autonomy (SQ2) during brainstorming*. These five themes are: reactions to speculative scenario (ACES), student GenAI usage in brainstorming, effects of hybrid brainstorming, effects of hybrid brainstorming on creativity, and effects of hybrid brainstorming on autonomy. The first three themes contribute to answering RQ1, while the fourth theme addresses SQ1, and the final theme relates to SQ2. The results are presented below, following the themes sequentially. Table 2 shows the abridged Coding Scheme.

**Table 2**

*Abridged Coding Scheme of the Focus Group Discussion*

Theme	Code	Sub-Code
Reaction to AI-Centric Education System speculative scenario	Probability	Probable
		Improbable
	Dangers	Privacy Issues
		Lower cognitive and creative skills
		Erosion of human touch in

		ideation
		Erosion of critical thinking
		Standardization of thought
		Political manipulation
Student GenAI usage in brainstorming	Usage Frequency	A lot
		Never
	Usage Motivations	Efficiency
		Confidence boost
		Dependency
		Improve own ideas
		Inspiration
		Laziness
		Superiority of AI
		Non-usage motivation
	Enjoyment of brainstorming	
	Plagiarism issues	
	Safeguarding creative ownership	

Effects of Hybrid

Brainstoming

Positive Effects

Mistrust towards GenAI

More knowledge

Less time-consuming

Increased number of ideas

No shyness

No time limit 24/7

availability

Tailored output

Negative Effects

Lack of human experiences

Lack of cultural insights

Lack of dialogue

Less engaging

Less fun

Data/Algorithmic bias

Knowledge bubble

Reliability issues

Effects of hybrid  
brainstorming on creativity

Enhancing independent  
idea generation

Providing Inspiration

Providing starting point

Hindering Independent  
idea generation

Amplified laziness

GenAI output's anchoring  
effect

Overreliance leading to  
erosion of ideation skills

Discarding own ideas for AI  
ones

Shift from ideation to  
instruction

Idea originality

Idea homogenization

More generic ideas

Homogenization of idea  
formulation

Idea novelty

Confining novelty by design

Effects of hybrid brainstorming on autonomy	GenAI's role in brainstorming	Similarity between humans and GenAI
		Tool
		Collaborator
		Tool and Collaborator
	GenAI's function in brainstorming	Automation
		Augmentation
	Ownership over ideas from hybrid brainstorming	Doubting idea ownership
		No sense of ownership
		Existing sense of ownership
	Plagiarism	Plagiarism exists in AI outputs
		It is not plagiarism if cited appropriately
		Unclear what counts as plagiarism

*Note.* FG1 refers to Focus Group 1 and FG 2 refers to Focus Group 2. Participant numbers FG1 (1-5) FG2 (1-8) are used to maintain anonymity. Find the full coding scheme in Appendix F.

### ***Reactions to the Speculative Scenario (ACES)***

The speculative scenario of a globally adopted AI-centric education system, brought to life through a diegetic prototype sparked reactions. Opinions on the scenario's likelihood to occur were mixed among the different focus groups with the first group unanimously deeming it probable (n=5) and the second one improbable (n=8). In focus group one, key reasons for seeing the scenario as probable included the potential long-term effects of GenAI overreliance, like reduced creativity and amplified laziness, especially among GenAI growing up with GenAI.

Conversely, in focus group two, participants (n=8) considered the ACES unrealistic, agreeing with Participant 3 (FG2): "If you make education, AI-centric, that means that you forget about everything academia is for, you know, like personal development creativity, ideas."

Dangers of the ACES were also discussed, including privacy issues through vast user data aggregation, with three participants adding that this is already a current problem. Four participants addressed the erosion of the human touch and human imperfections in creative processes and academia. Additionally, the speculative scenario was seen as potentially leading to an erosion of critical thinking and standardization of thought, increasing threats of political manipulation: "Nobody is going to do political [...] [or] critical thinking and everybody is just in the same state of mind" (Participant 1, FG1).

### ***Student GenAI Usage in Brainstorming***

Participants discussed the frequency of using GenAI chatbots in brainstorming, with those using it opting for ChatGPT. Most participants (n=11) reported using GenAI a lot. Two participants claimed to never use it.

Those using GenAI for brainstorming described various usage motivations such as GenAI dependency (n=3), with Participant 1 (FG1) humorously comparing ChatGPT usage to an addiction and Participant 5 (FG1) explaining: “After you start using it, it is tough to quit it.” The most mentioned motivation, listed seven times, was efficiency including time-saving and task simplification. Two participants perceived AI as superior listing it as another motivation to use GenAI in brainstorming. Additionally, Participant 1 (FG1) stated using GenAI since it increased their confidence in their work. Laziness was also pointed out by two participants as a motivation for choosing hybrid over traditional brainstorming. Further motivations for using GenAI in brainstorming included seeking inspiration (Participant 6, FG2) and improving or adding depth to own ideas, mentioned by two students.

The two participants who never use GenAI in brainstorming described multiple non-usage motivations. Participant 3 (FG1) explained: “It gives me satisfaction to come up with something on my own” and was dissatisfied with ChatGPT’s outputs when trying it. Participant 1 (FG2) expressed mistrust of GenAI, plagiarism concerns and the intention to safeguard creative ownership over ideas: “I am also scared to put in my own ideas [...] because they are original ideas and I don't want the algorithm to pick that up” (Participant 1, FG2).

### ***Effects of Hybrid Brainstorming***

Participants pointed out six positive effects of hybrid brainstorming when comparing it to traditional and hybrid brainstorming. Firstly, participants (n=4) described it’s efficiency with

hybrid brainstorming being less time-consuming than with humans. Furthermore, participant 5 (FG1) noted that hybrid brainstorming can enhance the number of ideas generated and that GenAI tools are available 24/7 without any time limit. Additionally, GenAI can bring depth to ideas (Participant 3, FG2) and provide more “extant” knowledge by offering additional insights (Participant 2, FG2). GenAI also has the advantage of being a judgement-free tool removing potential social inhibitions like shyness from human interactions (Participant 5, FG1). Additionally, participant 5 (FG1) highlighted that GenAI can produce tailored output. Unlike a Google search, which presents a list of related websites, ChatGPT delivers the needed information directly.

While these positive effects of hybrid brainstorming were acknowledged, the discussion predominantly focused on its negative ones, identifying ten limitations. Firstly, participant 4 (FG1) described hybrid brainstorming as less fun and also less engaging than traditional brainstorming. Moreover, three Participants highlighted GenAI’s lack of human experiences which negatively affects the output quality compared to human contributions in brainstorming. Additionally, two students added that GenAI lacks cultural backgrounds, meaning that ideators are missing out on diverse perspectives enriching brainstorming.

Moreover, GenAI reduces diversity in brainstorming by creating “knowledge bubbles” (Participant 4, FG1), reinforcing user perspectives rather than expanding them (Participant 4, FG1). Furthermore, using GenAI eliminates the interactive nature of a human dialogue where both parties contribute ideas (Participant 4, FG2). Two participants explained that GenAI is limited to its training data, resulting in potential algorithmic biases. Lastly, Participants (n=2) highlighted reliability issues of GenAI disrupting brainstorming:

The biggest problem with AI right now is his confident lying, like it would tell you something that is absolutely not true, and he would say it as if it's for sure true. [...] sometimes it even cited me sources that did not exist [...] (Participant 5, FG1).

### *Effects of Hybrid Brainstorming on Creativity*

When discussing their GenAI usage in brainstorming, the students identified various ways it impacts their creativity. Participant 3 (FG2) described how GenAI can enhance their independent idea generation by providing a starting point. They add that ideating with GenAI is especially valuable for people like them, who consider themselves less creative. Participant 2 (FG1) conversely stated, that when they tell themselves that they use GenAI for inspiration it is merely an excuse.

Participants (n=5) described how GenAI usage hinders their own creativity and independent idea generation in various ways. In ideation, ChatGPT can have an anchoring effect to a specific direction, thereby limiting their own imagination:

Once it presents you with any sort of idea, everything that you kind of move from there on has an impact from the first things that you saw. So you don't have the imagination, you now have an imprint of what it's going to be about from there (Participant 2, FG1).

Furthermore, Participant 4 (FG1) described how hybrid brainstorming negatively affects their independent idea generation: “Sometimes I dismiss my own idea and start towards working what ChatGPT offered me.” Participant 3 (FG1) suggested that if they started using GenAI in brainstorming, it could shift their focus from ideating to instructing GenAI to brainstorm on their behalf, leading to a creative block (Participant 3, FG1). Furthermore, three participants pointed out that GenAI is restricting creativity by amplifying their laziness to ideate.

Furthermore, similarly to the diegetic prototype video in which cognitive atrophy is discussed as a consequence of ACES, Participant 4 (FG1) noted that GenAI overuse could lead to an erosion of ideation skills.

Besides this, students (n=7) also pointed out how hybrid brainstorming can negatively impact the originality of generated ideas. Four participants noted that hybrid brainstorming can amplify homogenization of ideas. Two participants stress that GenAI usage could also increase the generation of generic ideas. Furthermore, three students expressed that ideas can be similar not only in content but also in language, noting that ChatGPT tends to produce homogeneous outputs by using similar terms, sentence structures and writing styles. Moreover, participants identified negative implications on the novelty of generated ideas. Four participants reached consensus that by design, GenAI cannot produce novel ideas because of its limitation to pre-trained sources. Participant 5 (FG1) disagreed, arguing that human creativity, like GenAI builds on existing knowledge to create new ideas.

### ***Effects of Hybrid Brainstorming on Autonomy***

The implications of hybrid brainstorming on student's autonomy in the creative process were discussed. In light of that, participants addressed the role of GenAI in brainstorming with nine students describing it as a tool. One student saw GenAI as a collaborator and three saw it as a tool and collaborator.

When examining their autonomy in hybrid brainstorming, participants reflected on whether using GenAI in brainstorming leads to augmentation or automation of idea generation. All participants (n=13) agreed that there can be no one-size-fits-all answer to this. It was stressed that it depends on how GenAI is used and how much individual thought goes into the process, to assess whether it functions as an assistant or replacement for humans in ideation:

If you take the answers as inspiration, put it in the big hopper you have here [brain], and then something original rolls out of it, then it's augmentation. But then if you just take one of the ideas, do what ChatGPT says, it would be, automation (Participant 4, FG2).

The students' sense of ownership of ideas generated through hybrid brainstorming was also discussed. Most participants (n=10) declared doubting their idea ownership. One described: "I always feel like I'm an imposter" (Participant 4, FG1) and another explained the origin of their ownership doubts: "If you wouldn't use it [GenAI], that would mean that your idea is yours 100%, [...] with ChatGPT, you cannot say it" (Participant 7, FG2). Furthermore, two participants expressed feeling less connected to ideas generated in hybrid brainstorming (Participant 2, FG1; Participant 5, FG1).

The minority (n=3) disagreed, arguing that GenAI usage does not take away one's creative ownership since it is a tool used by oneself. Using the analogy of a nail, it is emphasized: "It doesn't matter if you use a hammer to put the nail on the wall or your hand, it's that the nail is there in the end. That matters" (Participant 3, FG2). Participant 2 (FG2) adds that ownership can be claimed when ideas from GenAI are refined as they then align with one's own purpose and intent.

Lastly, plagiarism in hybrid brainstorming was discussed shedding light on student's disagreement on where their "individual contribution ends and plagiarism begins" (Meyer et al., 2023, p. 4). While Participant 4 (FG1) expressed difficulties in navigating what counts as plagiarism in GenAI usage, two Participants agreed that copy-pasting GenAI output would exemplify plagiarism while using GenAI's ideas to initiate own thinking would not be. Participant 1 (FG1) stated that if cited appropriately, using GenAI would not be plagiarism, while

Participant 1 (FG2) deemed plagiarism inevitable arguing that it exists in GenAI output since it draws from its training data.

### **Solution Space: Brainstorming Activity**

In light of the second research question: *What human-centred GenAI guidelines can emerge from the speculative critical design process to enhance student creativity and autonomy when using generative AI in brainstorming?* The brainstormed ideas were categorized into three themes: guidelines for educational institutions, tailored ChatGPT editions/modes, and design guidelines for GenAI tools. Find the abridged Coding Scheme in Table 3.

**Table 3**

*Abridged Coding Scheme of the Brainstorming Activity*

Code	Sub-Code
Guidelines for educational institutions	Share conversation with institution
	Adjust assignments to existence of GenAI
	Value human touch in students' work
	Centre education into classrooms
	In-class ideation with GenAI
Tailored ChatGPT editions/modes	Brainstorming mode

## Design guidelines for GenAI tools

Research mode

Tailored editions

Provide sources

Time limit

Originality score

No-repeat policy

Autonomy score

Authenticity score

Prompt limitations

Idea generation guidance

Open-ended feedback

Generalized ideas

Task adjusted directiveness

Bullet points instead of sentences

Output words limit

Determining goal of interaction

Counterpoint inclusion

Team meeting

Cross-check analysis

No guideline necessary

*Note.* Find the full coding scheme in Appendix G.

### ***Guidelines for Educational Institutions***

The first theme, guidelines for educational institutions, encompasses recommendations for teaching practices that integrate GenAI tools in a human-centred way, safeguarding students' creativity and autonomy in brainstorming. One guideline centralizes interaction transparency suggesting that “students share their conversation with ChatGPT with their educational institution” (FG1). Another guideline suggested implementing a balance of AI-allowed and non-allowed assessments, aiming to “encourage human creativity and thinking whilst still using AI as a tool” (FG2). GenAI should also be used in in-class-ideation “as a collaborator with multiple other humans.” Additionally, education should be “centred into classrooms” as this encourages critical thinking needed for GenAI usage (FG2). Furthermore, universities should encourage human thinking and value the human touch in students' work by normalizing imperfections (FG2).

### ***Tailored ChatGPT Editions/Modes***

Brainstormed guidelines for human-centred but GenAI-assisted brainstorming also encompass creating different editions or modes of ChatGPT. Different ChatGPT editions are suggested, tailored for various users such as students, workers, or researchers (FG2). For

instance, a school edition of ChatGPT would increase students' creative thought by limiting outputs (FG2). Additionally, students ideated a research mode in which GenAI is "more precise and truthful" (FG1). Similarly, a brainstorming mode should be created that safeguards students' creative independent idea generation by "asking questions rather than providing answers" (FG1).

### ***Design Guidelines for GenAI Tools***

Design guidelines for GenAI tools were also ideated. To encourage students' active participation in hybrid brainstorming, GenAI systems should provide users with an autonomy score ranking their level of involvement in the process leading to the outcomes (FG1). Moreover, to enhance the originality of ideas, GenAI should provide a score indicating how often it has provided that answers to other users (FG1). Other guidelines to safeguard idea originality were a no-repeat policy that disables GenAI from giving the same idea to different users (FG2) or a score users obtain for generating original ideas with less generic ideas getting more points (FG1). To enhance students' own idea generation, a 1-hour GenAI usage time limit for students (FG2) was proposed. Additionally, for GenAI to "function assistive rather than directive" it should guide human thinking and not provide finished ideas (FG2). Similarly, prompt limitations could assist humans to "get to the final result on their own" by asking questions (FG1). A team meeting feature was also proposed in which humans ideate and GenAI contributes by asking questions (FG2). Moreover, a "human-guided approach" to hybrid brainstorming is suggested. Before anything, the GenAI asks what the user is looking for out of the interaction, allowing humans to direct the process.

Further guidelines were that GenAI only gives "open-ended feedback to prompts" (FG2) or less specific and generalized answers instead of tailored and specific ideas that directly solve an issue (FG2). Additionally, GenAI output should have a word limit or consist of short bullet

points allowing students to elaborate more. Another guideline proposed that GenAI models should be trained to differentiate between creative and non-creative tasks. Accordingly, GenAI should tailor output specificity, with answers requiring creativity being less directive (FG2).

To minimize drawbacks of hybrid brainstorming such as GenAI’s reliability issues, GenAI has to provide sources with every output (FG1) or perform a cross-check analysis (FG2). Another guideline states that GenAI should “provide opposing points of view other than aligning ones” (FG2) to minimize echo chambers and enhance divergent thinking. Lastly, Participant 3, FG2 stated that guidelines for human-centred hybrid brainstorming are not necessary since “AI is a tool and depends highly on the person using it.”

### ***Top Voted Human-Centred GenAI Guidelines***

Participants voted for their preferred guidelines for human-centred GenAI tools in student brainstorming. Table 4 shows the top-voted guidelines.

**Table 4**

#### *Top-Voted Human-Centred GenAI Guidelines*

Brainstormed Guideline	Votes
“Create a school version of AI that limits outputs to increase human creativity” (FG2)	4
“With every output, ChatGPT has to provide a source of information” (FG1)	4

“Brainstorming mode: asking questions rather than providing answers” (FG1)	3
“Autonomy score eg. 4/10: after a conversation, GenAI provides a score that ranks the level of human autonomy and involvement in the process leading to the final output” (FG1)	3
“Originality score: the less generic an idea is the more points a user makes” (FG2)	3
“AI should not provide finished ideas but guide human thinking for them to find the answer themselves. Function assistive rather than directive” (FG2)	3
“Academic institutions must have a balance of AI-allowed assessments and non-AI-allowed assessments to encourage human creativity and thinking whilst still using AI as a tool” (FG2)	3
“Make sure education is centred into classrooms because self-taught options need critical thinking” (FG2)	3
“Originality score: with an output, the AI provides a score that indicates how often it has provided that answer or similar answers to other users” (FG1)	2
“AI gives open-ended feedback to prompts” (FG2)	2
“Implement team meetings with AI where you say your ideas, and AI acts as a human by contributing to the conversation and asking questions” (FG2)	2

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## Discussion

This study conducted a workshop using speculative critical design and the futures cone framework to examine the implications of student GenAI usage in brainstorming. Using a diegetic prototype, a focus group discussion gathering findings to address RQ1: *'How can speculative critical design facilitate the exploration of generative AI chatbots' impact on university students' brainstorming?'*, and subsequently the *impact on university students' creativity (SQ1)*, and *autonomy during brainstorming (SQ2)*. Building on the discussion, a brainstorming activity was conducted in light of RQ2: *'What human-centred GenAI guidelines can emerge from the speculative critical design process to enhance student creativity and autonomy when using generative AI in brainstorming?'*. This chapter delves into the research findings, discussing them in regard to prior research. Finally, the study's limitations along with suggestions for future research are addressed.

### Positive Effects of Hybrid Brainstorming

In the focus group discussion, sparked by the participants' engagement with the diegetic prototype, students identified positive implications of using GenAI in brainstorming. Firstly, hybrid brainstorming reduces the time required for idea generation, therefore improving efficiency. This is in line with studies highlighting a significant increase of speed and productivity by using GenAI in brainstorming (Girotra et al., 2023; Zhang et al., 2024).

Furthermore, hybrid brainstorming provides access to more extant knowledge benefiting idea generation. Participants also stressed that unlike humans, GenAI is available 24/7 without a time limit, aligning with scholars declaring GenAI as being available "almost anywhere, anytime." (Bouschery et al., 2024). Moreover, social inhibitions, like shyness in human

interactions, are eliminated when interacting with GenAI, which corresponds with the study results of Wieland et al. (2022), demonstrating the benefits of ChatGPT as a judgement free tool in brainstorming. GenAI providing immediate tailored outputs was also stressed as a positive effect of hybrid brainstorming. This contributes to research identifying GenAI as offering students “personalized learning experiences” (Li et al., 2024, p. 2).

### **Negative Effects of Hybrid Brainstorming**

First, participants pointed out that GenAI lacks human experiences and cultural insights of humans. These limitations erase the diversity and depth of human contribution to idea generation. Furthermore, one participant stated that GenAI tools merely “solve problems that you feed to it” (Participant 3, FG2) erasing the interactive nature of a human dialogue where both parties share ideas. Furthermore, privacy issues were listed as an implication of hybrid brainstorming. Participants stressed privacy issues through GenAI’s vast aggregation of detailed user data. Research on ChatGPT’s privacy policy exemplifies GenAI’s vast data collection, including users’ account details, usage content, communication information, device information, social media data, cookies and analytics (Wu et al., 2023). Amplified vulnerability of students to algorithmic biases of GenAI tools was also mentioned. Ferrara (2023) show that biased or incomplete training data can lead to GenAI outputs that replicate these patterns highlighting that biases in responses are a realistic threat to using GenAI in brainstorming. Another negative implication mentioned was that GenAI reflects users own perspective rather than expanding it by creating self-reinforcing “knowledge bubbles” (Participants 4, FG1), which correlates with Nehring et al. (2024) findings that GenAI models tend to act as echo chambers by aligning with their user’s opinions. Finally, reliability issues were mentioned. Participants criticised that GenAI can threaten brainstorming by sharing false information through “confident[ly] lying” and

creating fabricated references. Indeed, research highlights that GenAI hallucinates meaning that it distorts or invents ‘facts’ and creates made-up sources (Chatelan et al., 2023). This phenomenon is especially critical in light of research findings showing that GenAI models provide incorrect information that does not get checked by most users (Jacob et al., 2024).

### **Effects of Hybrid Brainstorming on Student Creativity**

A positive impact of hybrid brainstorming on students’ creativity was that GenAI provides a starting point for a student who considers themselves less creative. Conversely, a student who identifies themselves as a creative person described negative effects, including increased laziness and restricted own creative thinking. These findings are in line with previous research showing that students’ creative-self concept impacts their perceived usefulness of ChatGPT in idea generation with those less confident in their creativity tending to consider ChatGPT as more useful (Leung & Lo, 2024).

Overall, negative effects on students’ creativity dominated the discussion such as GenAI outputs’ anchoring effect limiting divergent thinking. This is consistent with research showing that GenAI usage can reinforce fixations (Bordas et al., 2024; Wadinambiarachchi et al., 2024). It has also been found that hybrid brainstorming is less engaging and fun for students. Since studies have shown that emotions affect creativity with positive emotions supporting creative thinking (Isen et al., 1987; Langley, 2018) it can be inferred that reduced positive emotions in hybrid brainstorming lead to reduced student creativity. Additionally, it was found that using GenAI amplifies laziness to engage in independent idea generation, supporting research findings posing that GenAI usage can increase laziness (Fan et al., 2024). This is critical as students expressed using GenAI out of laziness which in turn amplifies their laziness creating a vicious cycle.

Furthermore, participants reported that GenAI generates generic ideas and diminishes the originality of generated ideas as well as the formulation of those ideas by fostering homogenization. This aligns with studies reflecting increased similarity and reduced originality in student writing through GenAI usage (Doshi & Hauser, 2023; Sudrajad et al., 2024). Lee and Koo (2024) also found that idea originality is higher when not using GenAI in brainstorming. However, the authors found that GenAI enhances idea expression, which is contrary to this study's findings suggesting that idea expression is degraded. This difference may arise from Lee and Koo's (2024) focus on GenAI's ability to aid students in clearly expressing their ideas, while this study centralized how GenAI usage can cause standardized idea formulation, diminishing students' individuality.

Additionally, students argued that GenAI hinders the novelty of generated ideas since by design it can only draw from the data it was trained on. This negative effect on creativity in brainstorming resonates with previous findings showing that ChatGPT creates “incrementally (versus radically) new ideas” (Lee & Chung, 2024, p. 1906). Moreover, it is found that hybrid brainstorming shifts students' focus from ideating to instructing GenAI to brainstorm on their behalf. Similarly, Leung and Lo (2024), found that students were fixated on creative outputs by focusing on giving requests to ChatGPT rather than the creative process by coming up with ideas. Lastly, participants claimed that overreliance on GenAI for brainstorming could lead to the erosion of ideation skills. As ChatGPT is available for merely two years, the long-term effects have yet to be studied and should be addressed by future research.

### **Effects of Hybrid Brainstorming on Student Autonomy**

The SCD process revealed that most participants (n=12) considered GenAI as a tool, emphasizing that its impact on their autonomy depends on how it is used. Therefore, the students

approached the topic of autonomy in hybrid brainstorming from the perspective of technological instrumentalism. This philosophical stance to human-technology interaction sees technology as a neutral tool and “means to an end,” whose impact depends on how it is used (Fernandez, 2021). The participants described how GenAI could augment brainstorming, when using it as a source of “inspiration” (Participant 4, FG1), adding “individual thought” (Participant 3, FG1) and creating something original out of the suggestions. However, it could also automate brainstorming, if users outsource the ideation task entirely to GenAI and solely adopt its ideas. Thus, it depends on the student using GenAI in brainstorming whether the GenAI tool enhances or limits their autonomy in the process. A study (n=202) showed a balance of automation and augmentation among students with 39.2% often and 3.8% always using ChatGPT without independent thought and 37.7% using ChatGPT as a “starting point” expanding independently and 19.3% thinking independently before using ChatGPT (Swaraj & Chavan, 2024).

In this study, most students (n=10) expressed doubts about their ownership of ideas or felt less connected to ideas generated with GenAI than independently. This reflects that with GenAI, “human authorship becomes more ambiguous” (Chesterman, 2024, p. 7) sparking legal and ethical debates about whether ideas belong to the user, ChatGPT, OpenAI, or humans whose work is used in the training data (Chesterman, 2024).

Plagiarism was also addressed revealing confusion on where students’ “individual contribution ends and plagiarism begins” (Meyer et al., 2023, p. 4) in hybrid brainstorming. While one participant stated that using GenAI ideas would feel like plagiarizing since AI outputs ultimately stem from “somebody else’s work” (Participant 1, FG1). Others said that if citing appropriately and not copy-pasting but adding own input, hybrid brainstorming does not equate to plagiarism. This highlights that individual contribution to work and academic integrity

becomes increasingly hard to navigate in times of GenAI tools with users experiencing confusion, whether they are “chatting, cheating, or cocreating when employing generative AI in academic processes” (Bozkurt, 2024).

### **Guidelines for GenAI-Assisted but Human-Centred Brainstorming**

It becomes clear that the ideated guidelines directly address the negative implications of hybrid brainstorming discussed in the focus group discussion, demonstrating a clear connection between the issues raised in the problem space and the guidelines created in the workshop’s solution space.

Firstly, the discussed uncertainty around GenAI use and academic integrity is reflected in the guideline that students share their conversations with their educational institution, to provide transparency for ethical usage. The reliability issues of GenAI stemming from misinforming output are addressed by prompting GenAI to perform cross-check analyses and provide sources, along with the ideated research mode that provides more precise and truthful outputs. Echo chambers as a threat to student brainstorming are combatted by GenAI providing opposing points of view other than aligning ones.

Hybrid brainstorming being less fun and engaging is addressed by integrating GenAI as an addition to other humans in in-class-ideation. That way, the joyful experience of brainstorming with humans remains, while benefiting from GenAI’s advantages.

To combat the discussed hindered independent idea generation through GenAI usage, several guidelines were proposed such as GenAI’s brainstorming mode, which asks questions rather than providing answers, or a team meeting function in which GenAI acts as a human ideation partner posing questions. GenAI providing open-ended feedback to prompts and generalized and unspecific answers was also brainstormed. Further ideas encompassed that

GenAI provides guidance for human thinking rather than ideas by ensuring that outputs cannot lead to a finished solution but rather assist thinking through a school edition or limitation feature. A daily 1-hour GenAI time limit for students was also proposed to encourage students own thinking when unable to access the tool. Another guideline declared that universities must have a balance of AI-allowed assessments and non-AI-allowed assessments, forcing students to think independently sometimes while benefiting from GenAI's benefits other times.

The homogenization of ideas and diminishing originality of idea content and formulation were addressed through guidelines such as the no-repeat policy that disables GenAI from providing the same idea to different users. Different approaches to safeguarding idea originality were that with an output, GenAI provides a score indicating how often it has provided that answer to others or a user reward system in which users gain points for generating less generic ideas. Moreover, universities should value the human touch in students' work more by normalizing imperfect writing styles.

Furthermore, the guidelines centralized ensuring that GenAI augments instead of automates the creative process. A human-guided approach is suggested where before brainstorming, students tell the chatbot, what they are looking for out of the interaction, allowing them to direct the process. Another guideline is that after hybrid brainstorming, GenAI provides a score that ranks the level of human autonomy and involvement in the process leading to the final output. A word limit of GenAI outputs or a reduction of outputs to bullet points are also ideated to encourage students to get more involved by elaborating on ideas. Furthermore, students wanted to enhance augmentation in creative tasks by providing less directive answers to creative questions.

The instrumentalist perspective towards GenAI is reflected in one participant's opinion that no guidelines are needed since "AI is a tool and depends highly on the person using it" (Participant 3, FG2). Ultimately, students identified seven key implications of hybrid brainstorming to improve through guidelines. These included: uncertainty about academic integrity, GenAI reliability issues, reduced engagement and fun, declining critical thinking, hindered independent idea generation, lack of idea originality, and brainstorming automation. The last three received the most attention through the number of generated guidelines.

### **Limitations**

While this study provides valuable findings, several limitations must be acknowledged. Firstly, the recruitment using convenience sampling may have caused biases. All participants were Master's students of Dutch universities, which excluded perspectives of students beyond this demographic. Secondly, one researcher conducted the thematic analysis. This one coder approach potentially led to subjective data interpretation which could have been mitigated by employing multiple coders. Furthermore, the diegetic prototype used in the study may have influenced the topics discussed in the focus group discussions. For instance, one participant stated that hybrid brainstorming could pose a risk to student's cognitive abilities, referencing cognitive atrophy, mentioned in the diegetic prototype. Lastly, dynamics within the focus groups may have influenced individual opinions. For instance, focus group one unanimously agreed on the probability of the scenario and focus group two agreed on its improbability. It is likely that participants have influenced each other's opinions resulting in group conformity.

## **Future Research**

Multiple participants described how GenAI usage could, over time, lead to the erosion of ideation skills. Longitudinal studies, building on this study, would be valuable for examining this potential long-term effect. Additionally, future research could examine hybrid brainstorming and its effects not only among university students but also among high school and primary school students. These younger cohorts are the first generation to grow up having access to GenAI in academia making them of key interest. While this study includes participants of ten different nationalities, it is limited to students in the Netherlands. Future research could conduct comparative studies across students enrolled at universities in different countries to reveal potentially different insights on the topic. Another SCD study could implement a participatory design approach, involving participants in the co-creation of artefacts that explore student hybrid brainstorming rather than introducing them to a diegetic prototype. This could uncover novel insights that might not surface in a researcher-led design. Moreover, this study focused on AI chatbots like ChatGPT that generate text, future studies could centralize image generation tools like DALL-E to investigate their use and implications for student hybrid brainstorming. Lastly, this qualitative study provides an in-depth exploration of participants' perspectives, not generalizable results. Hence, quantitative studies for instance those with an experimental design could examine the researched topic offering results with external validity.

Overall, these findings contribute to literature on GenAI in the context of academia and brainstorming. The implications identified in this study, along with the guidelines created to address the drawbacks of GenAI in brainstorming, provide a foundation for future research in this area. Combined future research findings can then be leveraged to inform GenAI design

decisions to drive enhanced user experiences for brainstorming, shape educational guidelines for implementing GenAI in a human-centred way or contribute to informed student GenAI usage.

## **Conclusion**

This study conducted a workshop to examine how SCD can facilitate the exploration of the effects of student hybrid brainstorming. The workshop's first part examined the current problem space of student hybrid brainstorming by envisioning a possible future through a diegetic prototype comprising of a 2035 Pew Research article and a research presentation, centralizing an AI-centric education system.

Findings indicate that SCD facilitated the exploration of student hybrid brainstorming with participants drawing connections between the possible future and current reality. The prototype sparked reflection on the scenarios' likelihood to occur and critical thinking on GenAI's dangers. Key findings from the discussion include that negative implications of hybrid brainstorming outweigh the positive ones. The findings indicate negative implications on student creativity by diminishing independent idea generation, idea originality and novelty. In terms of autonomy, GenAI is understood as a tool and its usage determines whether it augments or automates or brainstorming. Further effects include issues of navigating idea ownership and plagiarism.

The workshops' solution space built on the problem space to envision a preferable future of hybrid brainstorming. To mitigate discussed effects guidelines for GenAI-assisted but human-centred brainstorming were ideated. Those focused on recommendations for educational institutions, user-tailored models of GenAI, and design guidelines for GenAI tools.

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## **Appendices**

### **Appendix A: Informed Consent Form**

Thank you for your involvement in this research. This consent form gives you all the details about the study, including your rights both during and after your participation.

#### **Study Overview**

I invite you to take part in a workshop conducted for a master's thesis research project in the Communication and Information Sciences program, specifically the New Media Design track, at Tilburg University. Your contribution counts. The study's working title is 'A Speculative and Critical Design Inquiry into the Impact of AI Chatbots on University Students' Creativity and Autonomy in Brainstorming Sessions'. It aims to 1) examine the implications of student GenAI usage for brainstorming and 2) gather guidelines for GenAI applications for AI-assisted but human-centred brainstorming.

#### **Duration and Procedures**

The expected duration of this workshop is 2 hours. During this workshop, you will engage in a focus group discussion and a brainstorming activity.

#### **Advantages and disadvantages for participants**

Among the advantages of workshop contribution is that participants will contribute to scientific research in an underexplored area. Simultaneously, they will learn about speculative critical design practices. Participants will also investigate the impact of student GenAI usage for creative tasks a topic of growing importance in higher education.

Risks associated with participation are not higher than those one encounters in daily life.

#### **Voluntary Participation**

Study participation is highly valued but voluntary. Participants are free to withdraw consent at any time, until the study submission (10th of January 2024 at the latest) without having to provide any explanation and encountering any negative consequences from the researcher (Nathalie Schabio) or institution (Tilburg University). Withdrawing consent includes that all data associated with a participant will be restricted or removed from the study. For more information see: [www.tilburguniversity.edu/privacy](http://www.tilburguniversity.edu/privacy)

### **Data Collection**

This questionnaire will gather some demographic information (eg. your age) and educational information (eg. the university you are currently enrolled in). During the focus group and brainstorming activity, participants' responses and interactions will be collected through an audio recording. This audio recording will be transcribed by the researcher and deleted afterwards. The transcripts will be analyzed using Atlas.ti. Additionally, pictures will be taken of the workshop's activities and used in the final analysis. Collected data will only be used for the scientific research project of the researcher.

### **Anonymity & Confidentiality**

The collected participants' data will be exclusively accessible to Nathalie Schabio (researcher), Supraja Sankaran (supervisor) and Simone Ashby (second reader). The researcher will strictly protect the anonymity and confidentiality of participants' (personal) information and identity to the fullest possible extent and according to the GDPR (General Data Protection Regulation). This includes that through anonymization (eg. Participant 1 said...), information cannot be traced back to individual participants.

## Researcher Contact information

If you have any remaining questions regarding the workshop or want to request further information please contact Nathalie Schabio at Tilburg University [n.schabio@tilburguniversity.edu](mailto:n.schabio@tilburguniversity.edu).

## Informed Consent

When giving informed consent, I agree to participate in the study ‘A Speculative and Critical Design Inquiry into the Impact of AI Chatbots on University Students’ conducted by Nathalie Schabio. I confirm that I am 18 years old or older and agree with the study conditions.

These conditions are:

- I voluntarily participate in this research project. There are no explicit or implicit compulsions for my contribution.
- I have read and understood the informed consent form and had the opportunity to ask questions which were answered sufficiently
- I got sufficient information on the topic and aim of the study
- I have the right to withdraw from this study at any point (before the project submission) without explanation or negative consequences
- I have the right to privacy and collected data will be anonymized and cannot be traced back to me
- I provide permission for the processing, storing and use of anonymized data for (exclusively) the purpose of the described study

Yes, I consent

No, I do not consent

## Appendix B: Questionnaire Overview

Question	Answer option
What is your age?	18-20
	21-23
	24-26
	27-29
	30 or older
How do you identify your gender?	Male
	Female
	Non-binary
	Other, namely (open)
	Prefer not to say
What is your nationality?	(open)

Question	Answer option
What is the highest degree or level of education you have completed?	HBO  University Bachelor's Degree  University Master's Degree  Other, namely (open)
What University are you currently enrolled in?	(open)
What study program are you currently enrolled in?	(open)
Do you know about speculative critical design (SCD)?	5-Point Likert Scale  I do not know anything about it  I know little about it  I know a fair amount about it  I know a lot about it  I am very knowledgeable about it

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Question	Answer option
Do you know about diegetic prototypes?	5-Point Likert Scale
	I do not know anything about it
	I know little about it
	I know a fair amount about it
	I know a lot about it
	I am very knowledgeable about it
Do you know about the concept of the ‘futures cone’?	5-Point Likert Scale
	I do not know anything about it
	I know little about it
	I know a fair amount about it
	I know a lot about it

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Question	Answer option
Do you know about the concept of human-centered AI (HCAI)?	I am very knowledgeable about it
	5-Point Likert Scale
	I do not know anything about it
	I know little about it
	I know a fair amount about it
	I know a lot about it
	I am very knowledgeable about it

---

### Appendix C: Sample Characteristics

Category	Results
<b>Age</b>	
18-20	n = 0
21-23	n = 9
24-26	n = 3
27-29	n = 0
30 or older	n = 1
<b>Gender identity</b>	
Male	n = 5
Female	n = 8
Non-binary	n = 0
Other, namely (open)	n = 0
Prefer not to say	n = 0
<b>Nationality</b>	
American	n = 1

Category	Results
Bulgarian	n = 1
Dutch	n = 1
German	n = 1
Indian	n = 1
Italian	n = 1
Romanian	n = 2
Tunisian	n = 1
Turkish	n = 3
Vietnamese	n = 1
<b>Highest level of education completed</b>	
HBO	n = 0
University Bachelor's Degree	n = 11
University Master's Degree	n = 2
Other, namely (open)	n = 0
<b>Current university</b>	

Category	Results
Tilburg University	n = 9
Erasmus University Rotterdam	n = 1
JADS	n = 1
Leiden University	n = 1
University of Amsterdam	n = 1
<b>Current study program</b>	
MA Asian Studies	n = 1
MS Communication and Information Sciences	n = 5
MS Data Science	n = 1
LLM International Business Law	n = 2
LLM International Criminal Law	n = 1
LLM International and European Law	n = 1
MA Media and Creative Industries	n = 1
MS Public Governance & Strategy	n = 1
<b>Knowledge of Speculative Critical Design (SCD)</b>	

Category	Results
0. No knowledge	n = 6
1. Little knowledge	n = 4
2. Fair knowledge	n = 1
3. A lot of knowledge	n = 2
4. Very knowledgeable	n = 0
<b>Knowledge of Diegetic Prototypes</b>	
0. No knowledge	n = 10
1. Little knowledge	n = 3
2. Fair knowledge	n = 0
3. A lot of knowledge	n = 0
4. Very knowledgeable	n = 0
<b>Knowledge of the Futures Cone</b>	
0. No knowledge	n = 9
1. Little knowledge	n = 2
2. Fair knowledge	n = 0

Category	Results
3. A lot of knowledge	n = 2
4. Very knowledgeable	n = 0
<b>Knowledge of Human-Centred AI</b>	
0. No knowledge	n = 2
1. Little knowledge	n = 8
2. Fair knowledge	n = 2
3. A lot of knowledge	n = 1
4. Very knowledgeable	n = 0

*Note.* The survey's categorical data such as gender identity is reported in participant number (n).

The total sample is (n=13 participants).

## Appendix D: Workshop Presentation Slides



*Note.* This is slide one. The complete presentation with all slides can be found by following this link:

[[https://www.canva.com/design/DAGXabcaTqA/uGSzkSmeGfz6Y54PFql0Og/view?utm\\_content=DAGXabcaTqA&utm\\_campaign=share\\_your\\_design&utm\\_medium=link&utm\\_source=share\\_yourdesignpanel](https://www.canva.com/design/DAGXabcaTqA/uGSzkSmeGfz6Y54PFql0Og/view?utm_content=DAGXabcaTqA&utm_campaign=share_your_design&utm_medium=link&utm_source=share_yourdesignpanel)]

## Appendix E: Focus Group Question Guide

Topic	Question
Participants' Chat GPT usage in brainstorming	<p>How often do you use GenAI like ChatGPT for brainstorming?</p> <p>What motivates you to use ChatGPT?</p> <p>How does using ChatGPT compare to your previous brainstorming methods?</p>
AI-Centric Education System scenario: initial reaction	<p>How does this future feel to you?</p> <p>Regarding current social, technological and educational developments, do you think this scenario is possible?</p> <p><i>Follow up:</i></p> <p>Do you think the timeline of 2035 is a reasonable projection for the future described, or does it seem too soon or too far away?</p>

Topic	Question
Participants' Chat GPT usage in brainstorming	<p data-bbox="824 279 1386 384">How often do you use GenAI like ChatGPT for brainstorming?</p> <p data-bbox="824 499 1308 531">What motivates you to use ChatGPT?</p> <p data-bbox="824 646 1377 751">How does using ChatGPT compare to your previous brainstorming methods?</p> <p data-bbox="824 825 1414 993">What are the potential dangers of outsourcing human brainstorming to AI chatbots under the AI-Centric Education System?</p>
GenAI's implications for human creativity	<p data-bbox="824 1098 1398 1276">Do you think that GenAI usage could affect your ability to generate ideas independently? If yes, how? If not, why not?</p> <p data-bbox="824 1350 964 1381"><i>Follow up:</i></p> <p data-bbox="824 1455 1398 1633">Consider long-term reliance on GenAI for idea generation over time. Could AI improve or weaken natural creative abilities?</p> <p data-bbox="824 1707 1338 1812">Do you believe that using ChatGPT for brainstorming affects the originality and</p>

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Topic	Question
Participants' Chat GPT usage in brainstorming	How often do you use GenAI like ChatGPT for brainstorming?  What motivates you to use ChatGPT?  How does using ChatGPT compare to your previous brainstorming methods?  novelty of generated ideas?  Do you think that ideas generated by AI-human brainstorming tend to be predictable and conventional or unpredictable and unconventional?  Does AI help to enhance one's creative potential by suggesting ideas, or does it limit the scope of one's own ideas by providing pre-defined suggestions?  How do you compare ChatGPT as a brainstorming partner compared to fellow students? In what ways is it better or worse, and why?

How do you judge the role of ChatGPT in your creative process? Do you consider it a tool, a collaborator, a substitute or something else?

*Follow up:*

How do you consider the human role in the creative process?

Do you think that GenAI augments or automates the brainstorming process? Explain why

How does the usage of AI for brainstorming affect your sense of authorship/ownership over generated ideas?

*Follow up:*

Do you feel less connected to AI-generated ideas?

In your opinion, when you use ideas generated by GenAI, where does your individual contribution end and plagiarism

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Topic	Question
Participants' Chat GPT usage in brainstorming	How often do you use GenAI like ChatGPT for brainstorming?  What motivates you to use ChatGPT?  How does using ChatGPT compare to your previous brainstorming methods?  begin?

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## Appendix F: Focus Group Discussion Coding Scheme

Theme	Code	Sub-Code	Transcript Quotes
Reaction to AI-centric education system speculative scenario	Probability	Probable	<p><i>“If we look at the cone that we were looking at before, and I feel like this, for me it's probable, like it's quite it could happen for sure, maybe not in ten years, but maybe in 30, 40 years, because think about it. Like it's true. Your brain always needs to be stimulated, right? Even like you always heard when you were a kid, like, oh, you should do music because if someone does music when they're a kid is stimulates more their creative side of the brain. and also with with other things in general, so I can definitely see if in the long term, since you're a kid, because now we got introduced to ChatGPT in our 20s more, but imagine now, like the new generations already growing up with ChatGPT. Since you're young, your are working with this system, let's say. So it definitely stimulates less the creative side of your brain”</i> (Participant 1, FG1)</p> <p><i>“I agree”</i> (Participant 5, FG1) answering (Participant 1, FG1)</p> <p><i>“I think this is also probable because I'm trying to imagine myself using ChatGPT when I was really young. I would definitely give up on doing anything by myself even now I feel so much lazier to be honest”</i> (Participant 4, FG1).</p> <p><i>“Something similar, can happen yes”</i> (Participant 4, FG4)</p> <p><i>“Yes”</i> (Participant 3, FG1) answering (Participant 4, FG4)</p>

Theme	Code	Sub-Code	Transcript Quotes
			<i>“Sometimes the technology comes out of nowhere and it changes more than we think it would. So probable, I guess” (Participant 4, FG1)</i>
		Improbable	<i>“Unrealistic happen. there's a thing like academia is something completely different. It always supported things just the beginning of time of a new developments. [...] And with the development, I think it adapts, but like AI-centric, if you make education, AI centric, that means that you forget everything about academia is for, you know, like personal development creativity, ideas. It just it just basically kills I mean, we can't make assumptions because in your papers, it says GPT 7.5, right? So maybe it's gonna be something that thinks what you're thinking of and makes everything up. So maybe then we we might need it, but I think it's against the whole morality of it” (Participant 5, FG2)</i>
			<i>“If we use it in academia, it's not going to be in the creative faculties. It's going to be in the scientific faculties in, like mathematics and stuff, because, like we've said before, I feel like that's what it's best at. And these creative departments, like the humanities are, it's it's there's something human about and that's what gives its value” (Participant 4, FG2)</i>
			<i>Group consensus confirmed by researcher</i>
Dangers		Privacy Issues	<i>“If you're always placing so much personal information on AI [...] we as humans, eventually become very vulnerable to AI because they know everything then at that point, they know how we work. They know how we think.” (Participant 1, FG 1)</i>

Theme	Code	Sub-Code	Transcript Quotes
			<p><i>“I want to add to privacy, like there was this um I think in last week there was this trend of asking AI, like, well, how do you think my life looks like? And then it produced like a picture. And I tried it and it was almost the same so I'm also like I think everything is already out there like with the cookies and stuff” (Participant 4, FG1)</i></p>
			<p><i>“On that [Participant 4's example] like also a video where they' like, where am I? Where's my location? And the ChatGPT is like, boom gives you all the coordinates where exactly you are” (Participant 1, FG1)</i></p>
			<p><i>“You can also ask it give me a summary of what you know about me, and then you just like, you you you're gonna find stuff that you don't even know about yourself” (Participant 5, FG1)</i></p>
		<p>Erosion of human touch in ideation</p>	<p><i>“Human brainstorming is human brainstorming because it's imperfect, but um if ChatGPT produces uh better results, then what would be the point of stimulating this creative touch in human brainstorming. So basically what I'm trying to say is that universities won't really need the human touch anymore and in a way they won't need students anymore if students don't produce efficient results and instead rely entirely on ChatGPT rather than use it as um helping tool” (Participant 3, FG1)</i></p>
			<p><i>“Yes, it would would entirely shift the focus of education” (Participant 1, FG1) answering (Participant 3, FG1)</i></p>
			<p><i>“If it [GenAI] can produce, for example, academic work by itself, then it [ACES] might eliminate some of the people that</i></p>

Theme	Code	Sub-Code	Transcript Quotes
			<i>would pursue otherwise” (Participant 4, FG1)</i>
			<i>“It like the human touch in some aspects of academia is very important, like art or like I study law, for example, at the international business law. When we're doing, for example, valuations, of course, I'm gonna use ChatGPT. Of course it's like tasks of time, even our professors encourage us to use ChatGPT when we're doing this kind of stuff, because it's basically just tasks that we should get over with in order to create time, but for example, a journalist, I don't think it makes sense for a journalist to get used to killing their creativity. I I think it's very bad” (Participant 3, FG2)</i>
		Erosion of critical thinking	<i>“If the scenario you narrated is going to be real, like I think everybody's critical thinking will go down” (Participant 1, FG2)</i>
		Standardization of thought	<i>“Everybody is just in the same state of mind” (Participant 1, FG2)</i>
		Political manipulation	<i>And um if it maybe easy for extremist political parties to manipulate you like nobody is going to do political thinking nobody is going to do critical thinking (Participant 1, FG2).</i>
Student GenAI usage in academics/ brainstorming	Usage frequency	A lot	<i>“[I use GenAI] all the time” (Participant 1, FG1)</i>  <i>“I'm hook like now I use it a lot” (Participant 4, FG1)</i>  <i>“It is uncontrollable to be honest, how much I use ChatGPT. I use it for everything” Participant 5, FG1)</i>  <i>“In academics, I use it a lot” (Participant 3, FG2)</i>

Theme	Code	Sub-Code	Transcript Quotes
			<i>"[I use GenAI] quite often. Yeah, mostly all the time" (Participant 2, FG1)</i>
		Never	<i>"I don't [use GenAI]. I never do" (Participant 3, FG1)</i>
			<i>"Never [use GenAI]" (Participant 1, FG2)</i>
Usage motivations		Efficiency	<i>"And it definitely makes the whole, like research process, like a lot faster, more efficient, [...] It [GenAI] just already gives me some ideas and then based on those ideas, I already know what to look for or what to search. So it definitely reduces the time for me" (Participant 2, FG1)</i>
			<i>"I mean its, faster like it would take me longer to get there on my own" (Participant 1, FG1)</i>
			<i>"I think we are living in a very fast and dynamic society. So we're also demanded to be very fast and efficient. So I'm just using it to like keep up with everything and everyone else to be on this" (Participant 4, FG1)</i>
			<i>"Sometimes when you want information that you don't necessarily like when you have to really go through to look with like long articles and stuff, it can just give you like a general summary" (Participant 2, FG1)</i>
			<i>"It [GenAI] makes your work much easier" (Participant 3, FG2)</i>
			<i>"I also use it to save time mostly" (Participant 6, FG2)</i>
			<i>"[GenAI usage] in order to create time" (Participant 3, FG2)</i>
		Confidence	<i>"I kept using it all the time and I felt more</i>

Theme	Code	Sub-Code	Transcript Quotes
		boost	<i>confident with my research, to be honest” (Participant 1, FG1)</i>
		Dependency	<i>“It's like an addiction” (Participant 1, FG1)</i>  <i>“After you start using it [GenAI], it is tough to quit it” (Participant 5, FG1)</i>  <i>“I didn't use it [GenAI] until this year, and now I'm hooked” (Participant 4, FG1)</i>  <i>“I also got a bit hooked on it” (Participant 1, FG1)</i>
		Laziness	<i>“Laziness” [is a GenAI usage motiation] (Participant 4, FG2)</i>  <i>“When it's a task that needs to be done that I don't wanna do by myself, but I need to do” (Participant 3, FG2)</i>
		Improve own ideas	<i>“I think I use it to supplement my ideas, so if I have an idea, how can I kind of make it better or like ask it for different variations of the of the idea that I have? So kind of to supplement” (Participant 5, FG2)</i>  <i>“[GenAI] can also bring depth into it [ideas] in a sense that it has unlimited access to the Internet” (Participant 3, FG2)</i>  <i>“I can add own my own knowledge, or I can make it add on to my what I made. So in the sense of ideation, if I want to come up with a topic, sometimes I can't form it properly, so I just tell, hey, I have this, this, this on mind, you know, and I want to make a impact like this, this this, what could be a potential way of wording this?” (Participant 3, FG2)</i>
		Inspiration	<i>“If I really have no idea about I don't</i>

Theme	Code	Sub-Code	Transcript Quotes
			<i>know, like a title for my thesis or something, I was trying to find something with Chat GPT and then out of the results, I tried to find my own version. So I yeah, like as an inspiration” (Participant 6, FG2)</i>
		Superiority of AI	<i>“It is uncontrollable because every time I discover that is so much better than any human I know at taking a lot of information and then coming up with something. It's it's really good” (Participant 5, FG1)</i>
			<i>“Just cause for me, I feel like ChatGPT was giving better answers in a way, and I couldn't really get to those on my own that fast” (Participant 1, FG1)</i>
	Non-usage motivations	Dissatisfaction with outputs	<i>“I was dissatisfied with the result that it produced, [...] so that demotivates me to use ChatGPT” (Participant 3, FG1)</i>
		Enjoyment of brainstorming	<i>“I just brainstorm on my own because I enjoy the process and it gives me satisfaction to come up with something on my own” (Participant 3, FG 1)</i>
		Plagiarism issues	<i>“I think I'm scared of plagiarism because a lot of those stuff that has come out of ChatGPT has had some plagiarism issues” (Participant 1, FG 2)</i>
		Safeguarding creative ownership	<i>“I'm also scared to put in my own ideas there because they are original ideas and I don't want the algorithm to pick that up” (Participant 1, FG 2)</i>
		Mistrust towards GenAI	<i>“So I also don't consider it like a point of inspiration. I um I don't know, I don't trust it and I think um I just maybe Google a few things and I build on that and then discuss it with people and discussing it with somebody older than we sometimes help somebody who has more experience,</i>

Theme	Code	Sub-Code	Transcript Quotes
			<i>that helps. So, yeah, I wouldn't um go to ChatGPT for inspiration” (Participant 1, FG 2)</i>
Effects of hybrid brainstorming	Positive effects	More knowledge	<i>I think the knowledge is a bit more extant because of that it can also provide you with additional stuff (Participant 2, FG2)</i>
		Efficiency	<i>“It's time like it's less time consuming” (Participant 1, FG1)</i>
			<i>“It's actually very valuable to have AI because it's a lot more efficient” (Participant 5, FG1)</i>
			<i>“And it definitely makes the whole, like research process, like a lot faster; more efficient, [...] It [GenAI] just already gives me some ideas and then based on those ideas, I already know what to look for or what to search. So it definitely reduces the time for me” (Participant 2, FG1)</i>
			<i>“I mean its, faster like it would take me longer to get there on my own” (Participant 1, FG1)</i>
		<i>“It [GenAI] makes your work much easier” (Participant 3, FG2)</i>	
Increased number of ideas	<i>“I brainstorm myself. I came up with three ideas. It's by my own. I'm very happy with it. But the AI came up with like 20. And then I'm looking at the three ideas like just like this, and not realizing there's another other 20 that I could look at, while if the AI does it, I can just see and choose the best out of the 20 ideas for me” (Participant 5, FG1)</i>		
No shyness	<i>“Also I wouldn't feel like bad asking any question, you know, ask and ask again if I don't understand ask again with the person or with a professor, you'd be like, yeah, can maybe ask maybe help me with this</i>		

Theme	Code	Sub-Code	Transcript Quotes
			<i>and sometimes you feel shy, ask it again if you don't understand” (Participant 5, FG1)</i>
	No time-limit 24/7 availability		<i>“Also I wouldn't feel like bad asking any question [to GenAI], you know, ask and ask again if I don't understand ask again with the person or with a professor, you'd [...] feel shy, to ask again if you don't understand” (Participant 5, FG1)</i>
		Tailored output	<i>“You know how SEO works when you just type on Google to search for an information, it just gives you websites that most related to what you said, but with ChatGPT, it gives you directly the information you need. So if you ask the specific question, you'll get a specific answer very quick and you don't need to scroll through seven or eight websites to get maybe an approximate answer” (Participant 5, FG1)</i>
Negative effects		Lack of human experiences	<p><i>“Each of us have like different experiences in life as well. [...] Yeah, so it's like more like brainstorming for me” (Participant 2, FG1)</i></p> <p><i>“I think AI doesn't have human experiences at all. It's like the experiences that each person goes through affects how they think and how they act and all of that. So an AI will never get to that point where they will have human experiences. So I think like we as people give a different input, and with the help of AI, we can, like, fine-tune it, but I don't think we would use it as much” (Participant 5, FG2)</i></p> <p><i>“Different educational backgrounds can definitely like really improve the brainstorming. If you have it with people, but then all the people in that brainstorming session needs to be like not in expert but they already need to have a</i></p>

Theme	Code	Sub-Code	Transcript Quotes
			<i>good knowledge, and then that's when the brainstorming session I would say would definitely be very useful and efficient compared to ChatGPT. So it depends, but I agree different educational and backgrounds, different, knowledge” (Participant 1, FG1).</i>
		Lack of cultural insights	<i>“Each of us have like different experiences in life as well. The cultures and everything, so we may have different perspective in looking at something. like, for example, you're doing something about climate, maybe climates communication in my country is different than yours, so I can add in something” (Participant 2, FG1)</i>
			<i>“That's so true. That's what I thought about as well” (Participant 1, FG1) answering (Participant 2, FG1)</i>
		Lack of dialogue	<i>“I feel like that's the best example of how, uh brainstorming dialogue with a person is different from with AI, that when you're talking to a person it's a dialogue, both of you have ideas at AIs are programmed to solve problems that you feed to it. Like you give their problems and it spits out an answer. It's not a dialogue” (Participant 4, FG2)</i>
			<i>“Exactly” (Participant 3, FG2) answering (Participant 4, FG2)</i>
		Less engaging	<i>“I was more engaged with the sessions [with fellow students]. But now I am in the mindset of just getting it done with easier if I just use ChatGPT” (Participant 4, FG1)</i>
		Less fun	<i>“I think for me when I was in my bachelors I brainstormed with people and it was definitely more fun” (Participant 4, FG 1)</i>

Theme	Code	Sub-Code	Transcript Quotes
		Data/Algorithmic bias	<p><i>“I think that overall AI relies on the sources that it has access to. So in certain cases where you want to do research, let's say on indigenous cultures or just cultures that don't interact with the internet that much or their culture is not documented well enough on the Internet. I think relying on AI to brainstorm in this specific field is not going to produce as good results as, let's say if you want, if you go to the place on your own and talk with the people there” (Participant 3, FG1)</i></p> <p><i>“There have been studies already showing that the LLM that have been used right now are so biased that they think a certain things, you know the same human biases have gotten into the algorithm and um whatever human's thought was um I mean, the discriminatory stuff that existed maybe some 40, 50 years ago that has gotten into algorithm and they still do” (Participant 1, FG2)</i></p>
		Knowledge bubble	<p><i>“It depends again, I think, because if the other persons also researching on similar stuff, then yes. For example, now I'm doing my thesis for climate communication, and I have a very close friend of mine, also doing environmental studies masters. So I brainstorm with him and it was very interesting because he's doing something else and so I kind of reflected on what I was doing and I was a whole another perspective for the same subject. But if I do it with ChatGPT it's more like I'm kind of talking to a reflection of mine, so it's not very doesn't give me so much other perspectives compared to if I talk to a human, I think. Because I'm doing the prompts and I have no idea what those people are doing. So it's kind of producing this bubble of knowledge I think, sometimes” (Participant 4, FG1)</i></p>

Theme	Code	Sub-Code	Transcript Quotes
		Reliability issues	<p><i>“I mean, older brainstorming, for me was like a lot more reliable in a way because it was information that I was actually gathering from actual sources. While ChatGPT, especially with like law, a lot of the cases that ChatGPT would give me were fake. They were not real, so I would then search them up and they wouldn't exist” (Participant 1, FG1)</i></p> <p><i>“I think the biggest problem with AI right now is like his confident lying, like it would tell you something that is absolutely not true, and he would say it as if like it's for sure true. So that's also like coming back to the point that if you don't know about the topic you using AI for, you can get quite lost and you wouldn't even realize, because AI is gonna act like it's knowing everything. Sometimes it even cited me sources that did not exist gave me link and named the source, but then when you click on the link, you get a different source. Sometimes it's really good at lying that you can be like oh, this is not good” (Participant 5, FG1)</i></p> <p><i>“If he [ChatGPT] doesn't know enough or he doesn't have enough data about the topic or the topic has not been been researched enough, then you will give you lies and he will think he's right. So, like, you ask him about a topic he never heard of or like there is maybe two articles about on the web, then he would answer you and create things and like act as if like it's true, but then when you check this information they don't doesn't even exist” (Participant 5, FG1)</i></p>
Effects of hybrid brainstorming on creativity	Enhancing independent idea generation	Providing starting point	<i>“It helps when there is a specific topic and I know how I want to approach it, but I just don't know where to begin, I think it's a good way that pushes me. Some people</i>

Theme	Code	Sub-Code	Transcript Quotes
			<i>don't need it, but I need it. I know for myself that I don't have that creative touch to come up with an idea to work on” (Participant 3, FG 2)</i>
	Hindering independent idea generation	GenAI output’s anchoring effect	<i>“I think the thing is once it presents you with any sort of idea, everything that you kind of move from there on has an impact. From the first things that you saw. So you don't have the imagination, you now have generally like an imprint of what it's going to be about from there” (Participant 2, FG 2)</i>
		Amplified laziness	<i>“Again, I it's already making me lazier, so it is only gonna negatively affect [independant idea generation]” (Participant 4, FG2) .</i>
			<i>“Maybe from a creative person perspective, I didn’t study law I studied online culture right and I'm also in an artsy masters. So for me, I also use ChatGPT quite a lot, but I feel that it's, yeah, making me more lazy and also restricting my creativity. I'm a very creative person. Now I'm trying to I ask ChatGPT often hey, can you give me some nice ideas, but I feel like it's not good for my own creativity. So now that I'm more aware of it, I stopped doing it and I actually get different ideas and really nice things” (Participant 6, FG2)</i>
			<i>“I do think it kind of hindereders my own ideas as well, because like, for example, personally, I feel like if I say that I use ChatGPT just for inspiration, for me, it's not really true.[...] I just like making excuses to avoid a little bit work more than that[...]. But actually it's more like, yeah, it's kind of hinder your like inner own creativity, yes” (Participant 2, FG1)</i>
		Shift from	<i>“If I start using Chat GPT more often in</i>

Theme	Code	Sub-Code	Transcript Quotes
		ideation to instruction	<i>the future, which I don't dismiss as a scenario, I think that just my focus would shift and instead of focusing on the brainstorming, I would focus on how to instruct ChatGPT to better brainstorm on my behalf, which would lead to a creative block that I wouldn't know how to get out of unless I rely on technology” (Participant 3, FG1)</i>
		Discarding own ideas for AI ones	<i>“I think I sometimes hinder myself because I want to just get it done, like my assignment and I try to fix uh, like maybe I had a different idea and then I had I got another idea from ChatGPT with like some structure and I and I like oh this is looking good. And then sometimes I dismiss my own idea and start towards working what the ChatGPT offered me” (Participant 4, FG 1)</i>
		Overreliance leading to erosion of ideation skills	<i>“Yes, I think it [ability to generate ideas independantly] might downgrade um because it's an accumulation of usage of AI, I think, because if you start use AI, at a certain point, and you might also learn less because of that, and then the idea creation, maybe your' knowledge like base is not there anymore, so it might diminish” (Participant 4, FG1)</i>
Originality of ideas	Idea	homogenization	<i>“That we are that we're becoming really dependent on it. And it's like a risk, for example, when you get an assignment in school, because we were talking about students, and everybody can use ChatGPT it's very easy to get exactly the same report as one of your colleagues compared to before when we used to do it on our own, almost impossible if you don't copy somebody to get the exact same wording or the exact same content, exact same topic as one of your colleagues, but with AI, everybody just puts the assignment there and asks him, like a similar request.</i>

Theme	Code	Sub-Code	Transcript Quotes
			<p><i>We can actually get the same exact report” (Participant 5, FG 1)</i></p>
			<p><i>“If you're simply paraphrasing as you're going, then the individuality kind of diminishes” (Participant 2, FG2)</i></p>
			<p><i>“I think it kills character in what you're reading, especially in like a humanitarian social science way, journalism, like I think it the way somebody writes is so important for me that I sometimes like when I used to read newspapers, I always chose that specific person that writes that article weekly, because that person's way of writing that fits with my artistic needs, basically. So that's important for me, but if you only use AI then everybody's gonna write the same thing” (Participant 3, FG1)</i></p>
			<p><i>“So all of us like have because like if I do research and another one do the research themselves, we have different idea already because we look for different articles. But so yeah, but if we just put in like exactly the same prompt together, so we might got a similar one. So yes.” (Participant 2, FG1)</i></p>
			<p><i>“Like, in a way, ChatGPT can if everyone would start relying more on on ChatGPT when brainstorming, I feel like the available sources are like they it's like standardizing, the sources available for researching. So it's like always the same ones, because if everyone uses ChatGPT to brainstorm, I feel like ChatGPT already has a set of sources inside, like its own system. And so, like what variety is there then, you know, if everyone just takes it from ChatGPT directly, maybe I guess it depends per country. I don't know, maybe where you are located, ChatGPT automatically extracts different sources. But in like the future, I feel like yeah,</i></p>

Theme	Code	Sub-Code	Transcript Quotes
			<i>there's not that much of a variety anymore, maybe, because it's all from ChatGPT"</i> (Participant 3, FG1)
		More generic ideas	<i>"But at the same time, uh, it can really come up with very bland generic end results as well"</i> (Participant 2, FG2)
			<i>"It just gives like the most basic stuff ever"</i> (Participant 7, FG2)
		Homogenization of idea formulation	<i>"I think content wise it might be similar, yes, but also language wise, I think we see that uh ChatGPT uses some words more often than the others. Also, there are some uh sentence structures that it use a lot and also it never it always like if you're writing I am, it never writes it like whole, it always does the abriviation. So there are some of the things that people came up with so they can detect AI. So it's already like, I think more prominent thing that we see is the use of language is the same if you if you use it, you can definitely say, oh, this sounds a bit of ChatGPT. It's very even for like a normal human eye, you can sense that it's not original"</i> (Participant 4, FG 1)
			<i>"Like there there's patterns that ChatGPT uses like certain words like 'delve' like after ChatT like came about like that word increased so much 'delved'[...] Its always the same words. It is very predictable"</i> (Participant 5, FG2)
			<i>"Yeah like robust"</i> (Participant 3, FG2) <i>answering</i> (Participant 5, FG2)
	Idea novelty	Confining novelty by design	<i>"Of course it is going to affect it [novelty] because it doesn't really come up with anything new. It has a database of stuff that already exists, and then if it like tries to solve whatever problem you can based on what it already knows. So by design, it's</i>

Theme	Code	Sub-Code	Transcript Quotes
			<i>bad at coming up with new stuff” (Participant 4, FG2)</i>
			<i>“I just wanna add in a little bit because I I have the course of large language model before. And it's about ChatGPT, and prompts and how it works, basically. So I do want to like, currently the ChatGPT can just generate it from the like pre trained sources. So it's just like how you say like they generate different thing together to make a new idea. But if you say like it's a completely new thing that never happened before known it is not, because like it's generated from different thing together. It's nothing like really, you know, never like someone never seen before” (Participant 2, FG1)</i>
			<i>“So it's not novel in a way” (Participant 4, FG1) answering to Participant 2)</i>
			<i>“I don't think the outcome from AI is enough to create something out of the blue” (Participant 3, FG2)</i>
		Similarity between humans and GenAI	<i>“But that's also what I think about humans. Like we never created something that has never been seen before. like in even the inventions of humans, it was always inspired by multiple multiple different scholars and scientists before them, like electricity or like like glasses the ones you see, before glasses there was one piece that you put to see, and then before that there was just the glass that you put from here to see. But then it you always base yourself on previous stuff, and then you try to come up with something new to complement it” (Participant 5, FG1)</i>
			<i>“I was gonna ask the same thing because if you're taking something from others and then you add onto it, but if ChatGPT gets</i>

Theme	Code	Sub-Code	Transcript Quotes
Effects of hybrid brainstorming on autonomy	GenAI's role in brainstorming	Tool	<p><i>something from x and meshes it up to a new thing, is it the same” (Participant 4, FG1) adressing (Participant 5, FG1)</i></p>
			<p><i>“It is kinda the same. AI has something called the black box a lot of things come in, and then what comes out, we don't know what happens inside of that black box. And in some kind of way similar to the human brain. That's why we call it artificial intelligence. Just we have so many background information from our childhood school, middle school, and everything. and then we just come up with ideas and we don't know how these ideas came to us, but we just spit it out that” (Participant 5, FG1)</i></p>
			<p><i>“Yeah, I definitely consider it as a tool, because in order to use it effectively, you have to have the knowledge of how to use it” (Participant 3, FG1)</i></p>
			<p><i>“Yeah, I think it's the same for me. I have to check if what Chat GPT is saing is true [...] I have to be careful to where to put it, maybe not too much trust, so more like a handy tool” (Participant 4, FG1)</i></p>
			<p><i>“ It's like as a tool because like we do need to have some kind of knowledge beforehand to use it as well, so we can kind of, you know, criticize if it's like kind of right or in it right track” (Participant 2, FG1)</i></p>
			<p><i>“Yeah, for me, I think it's a tool and it depends how well you know how to use it, because uh for example finding sources if you know how to search something, it could be very helpful in finding, I don't know something that you didn't think of and yeah., so you also think it' a tool” (Participant 8, FG2)</i></p>

Theme	Code	Sub-Code	Transcript Quotes
			<p><i>“I think its a tool, the way that it allows you to it's basically contributes to what you're doing and you can use it to utilize some of your work, make it easier for you, and also in a creative sense, I think it can be used as a tool to come up with some ideas or something, but, yeah, I think it's a tool” (Participant 3, FG2)</i></p>
			<p><i>“It's a tool. It makes you what you say” (Participant 2, FG2)</i></p>
			<p><i>“I also say would say it's a tool, just because I don't use it for everything, but it just supplements it like what I when I need help, it will supplement me. Kind of like Google, but more quicker and more to the point than me having to search through different things. So only when I don't care about something is basically when it's a useful tool” (Participant 5, FG2)</i></p>
			<p><i>“I would be open to trying it. I was trying it out as a tool, maybe sometime in the future, not right now when I'm working on my thesis and um yeah, I don't see how in in what kind of a tool it can be used as I don't see it as a creative tool at all, uh but I would be open to trying it out sometime” (Participant 1, FG2)</i></p>
		Collaborator	<p><i>“So I think it's so coraborator again for some stuff [...]. I think you just need to really work together. with it” (Participant 7, FG2)</i></p>
		Tool and Collaborator	<p><i>“ I think like if you use the third option you said, like substitute your thinking. that's when it becomes a problem. If you use it as a tool, or as a collaborator, even, it's okay. But if you don't know anything as a as I also said earlier, like if you don't know anything about the topic and ask AI to do</i></p>

Theme	Code	Sub-Code	Transcript Quotes
			<p><i>it for you, then don't be surprised you get a very crap output” (Participant 5, FG1)</i></p>
			<p><i>“I would say the same, actually, a tool and collaborator. It's more like as if ChatGPT is my assistant. So it's still like everything that is being given by Chat GPT, still have to check over it and make sure it's right. So, but it's kind of like my little research assistant, my collaborator” (Participant 1, FG1)</i></p>
			<p><i>“Tool in the sense of outlining as well, or I don't know, when I have to work on a project and I can just ask ChatGPT which steps should I consider and that could give me like an inspiration? But I don't have to follow every single step. It just in first idea if I really don't know where to start. And a collaborator mm I think for my bachelor thesis, it really helped me sometimes to find the right words in English, because I had like the idea in German, but I didn't know exactly how I can yeah, translate it in English” (Participant 6, FG2)</i></p>
	GenAI's function in brainstorming	Augmentation	<p><i>“It depends on how much individual thought you brought into it [...]. If they [students] also try to mix up, like a least a few of the ideas that ChatGPT suggested and try to come up with something outside of them, then it [GenAI] can augment it [brainstoring]” (Participant 3, FG2)</i></p>
			<p><i>“It depends on how you use it [...]. If you try to use it for inspiration, it can augment it” (Participant 4, FG2)</i></p>
			<p><i>“It depends on how you use it, right? Because if if you take the answers as inspiration, put it in the big hopper you have here [brain], and then something original rolls out of it, then it's augmentation” (Participant 4, FG2).</i></p>

Theme	Code	Sub-Code	Transcript Quotes
			<i>Group consensus confirmed by researcher</i>
		Automation	<p><i>“I think I answered this like saying, uh sometimes I give up my own ideas and pursue Chat GPT. So in that way, it's automated, it can be automated, but it can be also I think it can be both again, like what I said previously” (Participant 4, FG1)</i></p> <p><i>“It depends on how much individual thought you brought into it? Because if Chat GPT generates an idea and like that in the student is like yeah, that works just fine for me. And they they rely entirely on Chat GPT” (Participant 3, FG2)</i></p> <p><i>“It depends on how you use it. If you try to outsource the creative process to AI it would automate the process” (Participant 4, FG2)</i></p> <p><i>“It depends on how you use it, right? [...] If you just take one of the ideas, do what ChatGPT says, would be, automation” (Participant 4, FG2)</i></p>
			<i>Group consensus confirmed by researcher</i>
	Ownership over ideas from hybrid brainstorming	Doubting idea ownership	<p><i>“I mean, like for sometimes when I use Chat GPT, I really considering myself like, am I doing the masters myself or is Chat GPT doing it? Like I feel like, do I I've spent a lot of money on, you know, the school” (Participant 2, FG1)</i></p> <p><i>“I always feel like I'm kind of an imposter for sure” (Participant 4, FG1)</i></p> <p><i>“I would say that to” (Participant 1, FG1) answering to (Participant 4, FG1)</i></p> <p><i>“So I really question about it [idea</i></p>

Theme	Code	Sub-Code	Transcript Quotes
			<i>ownership] as well” (Participant 2, FG1)</i>
			<i>“Yeah, I do question [idea ownership]” (Participant 6, FG2)</i>
			<i>“I still question because if you wouldn't use it, that you mean that you idea is yours 100%, like 100, 100, which ChatGPT, you cannot say it” (Participant 7, FG2)</i>
			<i>“You didn't think it eventually” (Participant 3, FG2)</i>
			<i>“Exactly it is not your idea” (Participant 6, FG2) answering (Participant 3, FG2)</i>
			<i>“If something other than you, like commingles everything and produces the result that than comes out, I think you have less ownership over it. Even if you are the one who decided what the prompt was, you fed it with” (Participant 3, FG2)</i>
		Existing sense of ownership	<i>“Yes. You are the one who made it If not then lets not use books to research about something as well. Every idea needs another idea to be build upon? It doesn't matter how you get that idea” (Participant 4, FG2)</i>
			<i>“As long as you use if you used AI to support your uh argumentation, and if you used it in a certain way that allows you to make a better point then it's your work. You just use the tool to me. That's why we said, if we all agreed that it's a tool, then we all have to agree that it's it's your work, because you're using a tool to make it.It doesn't matter if you use a hammer to put the nail on the wall or your hand, it's it's what the nail is there in the end. That matters” (Participant 4, FG2)</i>
			<i>“If you are refining the information and</i>

Theme	Code	Sub-Code	Transcript Quotes
			<i>starting to write then you can take ownership because there is your purpose to it as well” (Participant 2, FG2)</i>
			<i>“You just put one person up the supply chain. It's just for efficiency. You just made somebody think something that you are trying to think, but just went over with” (Participant 3, FG2)</i>
	Plagiarism	Plagiarism exists in AI outputs	<i>“I'm I would still be skeptical of using some text generated by AI, even if I edited as much as I can, I would still feel like it has picked it up from some kind of training data so that is somebody else's work. So it would still feel like plagiarism to me” (Participant 1, FG2)</i>
			<i>“The way it [ChatGPT] extracts and information, I feel like it maybe still needs to learn how to properly cite as well. Citations from ChatGPT are quite bad” (Participant 1, FG1)</i>
		Unclear what counts as plagiarism	<i>“I just want to say that one last thing.. Plagiarism is a bit confusing me thinking about ChatGPT because also, I think plagiarism is different than AI usage in its limitations in educational contexts. So, I'm I'm having a hard time coinciding two concepts, or if using ChatGPT directly means you're plagiarizing” (Participant 4, FG1)</i>
		It is not plagiarism if cited appropriately	<i>“Yeah, plagiarising is a lot more like this is my idea when it's not, and even if you take it from ChatGPT but judge ChatGPT is giving you the source or somehow you still cite the source from where because it's not judge ChatGPT's idea. It's just getting it from somewhere else. So as long as you're citing it or you're acknowledging the fact that this was someone else's idea, I don't that's not really plagiarism” (Participant 1, FG1)</i>

Theme	Code	Sub-Code	Transcript Quotes
		Copy past is plagiarizing	<p><i>“If you copy past it or if you exactly thing that the AI comes up its plagiarism” (Participant 3, FG 2)</i></p> <p><i>“It's a tool, you know? It's a tool that you're utilizing. You tell it what you want in it, you tell it what what is it? And then it comes up with something. If you copy and paste it into your work, that's plagiarism. But if you use this as an influence to back up your own ideas and then you build upon it, you use it to make something out of it, then that's not what I if you copy page of it generates” (Participant 3, FG2)</i></p>

*Note.* FG1 refers to Focus Group 1 and FG 2 refers to Focus Group 2. Participant numbers FG1 (1-5) FG2 (1-8) are used to maintain anonymity.

### Appendix G: Brainstorming Activity Coding Scheme

Code	Sub-Code	Brainstormed Guideline
Guidelines for educational institutions	Share conversation with institution	<i>“Students share conversation with ChatGPT with their educational institution” (FG1)</i>
	Adjust assignments to existence of GenAI	<i>“Academic institutions must have a balance of AI-allowed assessments and non-AI-allowed assessments to encourage human creativity and thinking whilst still using AI as a tool” (FG2)</i>
	Value human touch in students work	<i>“Normalize imperfect writing styles again: encourage human thinking and human touch in writing” (FG2)</i>
	Center education into classrooms	<i>“Make sure education is centred into classrooms because self-taught options need critical thinking” (FG2)</i>
	In-class ideation with GenAI	<i>“Use AI as a collaborator with multiple other humans that are in a classroom” (FG2)</i>

Tailored ChatGPT editions/modes	Brainstorming mode	<i>“Brainstorming mode: asking questions rather than providing answers (FG1)”</i>
	Research Mode	<i>“Research Mode: for GenAI to be more precise and truthful” (FG1)</i>
	Tailored editions	<i>“Different ChatGPT editions: Students, workers, scientists/researchers” (FG1)</i>
	School edition	<i>“Create a school version of AI that limits outputs to increase human creativity” (FG2)</i>
Design Guidelines for GenAI tools	Provide sources	<i>“With every output, ChatGPT has to provide a source of information” (FG1)</i>
	Time limit	<i>“1-hour AI usage time limit for students” (FG2)</i>
	Originality score	<i>“Originality score: with an output, the AI provides a score that indicates how often it has provided that answer or similar answers to other users” (FG1)</i>

No repeat policy	<i>“AI does not repeat ideas, that have been given to someone else” (FG2)</i>
Autonomy score	<i>“Autonomy score e.g. 4/10: after a conversation, GenAI provides a score that ranks the level of human autonomy and involvement in the process leading to the final output” (FG1)</i>
Authenticity score	<i>“Authenticity score: the less generic an idea is the more points a user makes” (FG1)</i>
Prompt limitations	<i>“Prompts cannot lead to a finished solution but rather assist thinking: Humans need to ask questions and get to the final result on their own” (FG1)</i>
Idea generation guidance	<i>“AI should not provide finished ideas but guide human thinking for them to find the answer themselves. Function assistive rather than directive” (FG2)</i>
Open-ended feedback	<i>“AI gives open-ended feedback to prompts” (FG2)</i>

Generalized ideas	<i>“Generalized/ less specific answers instead of tailored/specific ideas that directly solve an issue” (FG2)</i>
Task adjusted directives	<i>“AI model should be trained to differentiate tasks that require creativity, and which do not.  Adjust the level of direct answers accordingly: e.g. answers to math questions more directive than those from e.g. social sciences which need more human touch” (FG2)</i>
Bullet points instead of sentences	<i>“AI gives short bullet points instead of sentences so students can elaborate more” (FG2)</i>
Output word limit	<i>“AI gives a maximum of x sentences per prompt” (FG2)</i>
Determining goal of interaction	<i>“Human-guided approach: 1st step to complete before placing info/ Questions  What are you looking for out of this interaction” (FG1)</i>

Counterpoint inclusion	<i>“For political or history-related topics, provide opposing points of view other than aligning ones” (FG2)</i>
Team meetings	<i>“Implement team meetings with AI where you say your ideas, and AI acts as a human by contributing to the conversation and asking questions” (FG2)</i>
Cross-check analysis	<i>“Make AI do a cross-check analysis at the end of the use” (FG2)</i>
No guideline necessary	<i>“Do nothing, AI is a tool and depends highly on the person using it” (FG2)</i>

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*Note.* FG1 refers to Focus Group 1 and FG 2 refers to Focus Group 2.

## **Appendix H: Focus Group Discussion and Brainstorming Activity Transcripts**

By following this link, the anonymized transcripts of the focus group discussion of FG1 and FG2 as well as the transcripts of the brainstorming activity FG1 and FG2 can be found gathered in a folder:

[https://drive.google.com/drive/folders/1E-u8kI8wT5hpOqgrPhK2f-8xH9xdsc7X?usp=drive\\_link](https://drive.google.com/drive/folders/1E-u8kI8wT5hpOqgrPhK2f-8xH9xdsc7X?usp=drive_link)