

Exploring Android Creativity: Empowering Human-Machine Interaction Through GenAI Persona Dialogues

Anselm Böhmer, Marcella Dillig, Illie Isso, Hilal Sahin und Aslihan Kuraner

Summary

Although GenAI may be used frequently and inaccurately as an optimized search engine to address inquiries and accomplish specific objectives, this study elucidates a method for prompting GenAI as a persona to engage within a learning dialogue. Individuals – in this case, pre-service teachers – can participate in open dialogues with the persona to develop communication skills with regard to situations relevant to their training. Further, this investigation demonstrates how this approach stimulates creativity in human-machine interaction by empowering them to prompt GenAI as personas for engaging in unanticipated learning interactions. The research results lead to the concept of “android creativity,” which expresses the responsiveness of creativity in the interaction process of humans with GenAI.

Key Concepts: ● Search Paradigm ● Parent Interaction Assistant (PIA) ● Simulation ● Prompt Engineering ● Android Creativity ● Participatory Action Research ● Dialogue

Introduction

In the ever-evolving landscape of education, the need for creative and effective pedagogical approaches is more critical than ever. Generative Artificial Intelligence (GenAI) raises intriguing questions about the relationship between human and artificial creativity (Bozkurt et al. 2023). In higher education, where the development of creative thinking is a cornerstone (Bolaji/Pollock 2022), this relationship has significant implications for teaching and learning. While educational technologies for years have predominantly adhered to the search paradigm centered on information retrieval (Mason 2014; 2023), the dawn of conversational chatbots offers a unique opportunity to revitalize online learning and creativity through engaging and

dynamic dialogue (Georgiou et al. 2022; Lee/Bae/Park 2022).

In this paper, we examine the multifaceted dimensions of using ChatGPT creatively as a dialogue partner *sui generis* for developing creativity, also in terms of sustainable communication and ethnocultural empathy (Stănescu/Andronache/Böhmer 2022) as central factors in the international digital landscape (Böhmer/Schwab/Isso 2023a and b). To achieve this, we conducted a participatory action research approach to prompt together with students ChatGPT as personas that represent potential dialogue partners in their profession on challenging issues. In our research endeavor, we examine prompt engineering for this prospect. The creative process of prompting should be combined with the equally creative process of problem-solving.

In more detail, we generate a safe learning environment for students' open engagement with AI to stimulate their competencies and creativity (Canlı/Özdemir 2022). Using a mixed-mode approach to study the effectiveness of creating dialogues (n = 74) with ChatGPT for learning processes, we expect to find evidence of its potential to foster creativity (following the four principles to guide education toward positive creativity; Ivcevic/Hoffmann/McGarry 2022) and intercultural skills in promoting an open engagement process.

Moreover, we expect this type of interaction to stimulate individuals to think critically and innovate – but it also needs time, space, confidence in the participants, the integration of multiple perspectives (Griffith 2023), and the right questions to learn about it. Therefore, the research question of this study is: *How do conversations with a chatbot stimulate creativity in learners?* In more detail: Do conversations with a chatbot support and develop human creativity? If so: how?

Literature Review

In this project, we explore the intersection of creativity and AI in higher education. We will begin by presenting the theoretical basis for both approaches.

Creativity

Creativity, in a broader sense, denotes a communal phenomenon that extends beyond mere psychological processes associated with individuals such as 'the genius' in psycho-economic education or intrinsically motivated students (Goulet-Pelletier/Gaudreau/Cousineau 2023). It encompasses consideration of social conditions, societal appraisals, and organizational milieus. This perspective gives rise to a conception of creativity that transcends the confines of individual personality, embracing a notion of "creative habituality" (Nyfeler 2019, pp. 66 ff.).

Nyfeler (2019) distinguishes creativity and innovation, emphasizing that innovation often involves a technical and efficacy-oriented approach aimed at generating improved outcomes (ibid., pp. 11 f.). In contrast, creativity introduces alterations within a given domain, where it is esteemed for its inventive qualities (Csíkszentmihályi 1988). Consequently, creativity is not confined to an individual but manifests as a "series of acts, performed in both embodied and disembodied ways" (Harris 2014, p. 4).

In her article „Creativity and artificial intelligence“, Boden (1998) suggests three ways in which the use of AI can contribute to increasing creativity: „by producing novel combinations

of familiar ideas; by exploring the potential of conceptual spaces; and by making transformations that enable the generation of previously impossible ideas“ (p. 347). When Lawson (2006, p. 149) delineates five stages of the creative process, each phase presents opportunities for GenAI to influence creativity. These stages – problem formulation, preparation, enduring incubation, generating new ideas, and verifying insights – all permit access and creative contributions by GenAI.

There have been efforts to connect the fields of AI and creativity and define them by a new kind of computational creativity or artificial creativity (Colton/Wiggins, 2012). For the interface in this very field of human and artificial creativity, Cropley, Medeiros and Damadzic (2023) have defined two important aspects. The first is the process – in the form of cognitive processes – and the second is the product – in the form of new and creative outcomes.

Thus, if educators want to promote the use of creativity and artificial intelligence, this means that they should consider both the process by which creativity has unfolded and the product of the creative act (Marrone/Taddeo/Hill 2022).

Vinchon et al. (2023) have presented a study on the current and future interaction between GenAI, human actors, and the creative process as well as its outcomes. In this, they advocate a “Co-Cre-AI-tion” perspective and highlight the mutual benefits and opportunities that can arise from the partnership between humans and AI in creative endeavors. At the same time, the article warns of potential risks to human labor and the development of individual creative potential. They emphasize the importance and diversity of cooperation patterns between humans and AI. Nevertheless, humans remain a central figure in using the power of AI to optimize creative processes. The increasing integration of AI into the creative field presents both opportunities and challenges. By focusing on collaboration, ethical considerations, and the responsible use of AI, a future can be created that develops human creativity while minimizing potential risks and negative societal impacts.

Within the realm of teacher education, typically perceived as a “risk-free” environment with a focus on pragmatic efficacy (French/Griffin/Lambert 2023), fostering creativity becomes feasible through narratives emphasizing “becomings, assemblages, and liminality” (ibid., p. 704).

GenAI can be used in practical implementation, including teacher education, to foster creativity by providing tools and resources that promote both innovative thinking and innovative problem-solving processes (Flogie/Krabonja 2023). Using an AI-supported learning and teaching project, Flogie and Krabonja show how students can gain multidisciplinary knowledge and find optimal solutions to current problems, improving their ability to think and act creatively.

Conversely, concerns have been raised that teachers, particularly in schools, might become overly reliant on GenAI, potentially hindering their ability to support students’ creativity (Jeon/Lee 2023, p. 15874). Whether GenAI cannot replace human creativity, as Kasneci et al. (2023, p. 6) state, remains unclear. However, GenAI can at least motivate learners and foster human creative potential (Brailas, 2024, p. 503 f.). Hence, creativity should not be viewed as a “solutionist framework” (Spiel 2024, p. 27). Far more is the case that creativity in design involves processes that do not merely collaborate or imitate but produce novel entities through

the interplay between humans and their surroundings, including GenAI.

In creative processes, a designer does not aim to become the user but seeks to find appropriate solutions to the user's issues, challenges, needs, and desires (Wright/McCarthy 2008, p. 639). Thus, creativity in design leads to processes that do not merely collaborate or imitate but produce novel entities through the interplay between humans and their surroundings, including GenAI. In settings that foster creativity, it is crucial to encourage teachers to be creators, not merely users (Gahoonia 2024, p. 110). This approach makes possible the co-creation of humans and AI (Langran et al. 2024, p. 4).

In this context, creativity is understood as a multi-stage process whereby improved solutions for current problems are developed over several process steps. This often entails the development of a new quality and an improved ability to think and act innovatively. This multifaceted impact of GenAI in higher education, and specifically in teacher education, on creative processes will be explored below. In this context, a look at the literature on the state of research on GenAI and higher education is also presented.

GenAI in Higher Education

The infusion of GenAI technologies into the educational domain has catalyzed innovation and transformative advancements across diverse facets of learning, instigating a scholarly discourse within a nascent field. To better comprehend the significant advancements in this sector, a retrospective analysis of earlier chatbot models underscores the intense progress. The development commenced as early as 1966 with ELIZA, the initial iteration of a natural language processing (NLP) chatbot (Jeon/Lee 2023, p. 15875). With ChatGPT, the production company OpenAI utilized a Large Language Model (LLM). The chatbot created in this manner can generate various types of content by constructing statistically probable sequences of text. This production of “new” content (in terms of a newly arranged combination of sequences) not only mimics human conversation but is also purported to achieve new outcomes in the aforementioned form (Tlili et al. 2023, p. 2). But still, there are “many knowledge gaps and uncertainties when it comes to the successful and responsible integration of large language models into learning and teaching processes” (Kasneci et al. 2023, p. 4). In particular, biases, copyright issues, data security, and various other forms of algorithmic violence are being discussed (for a broader perspective on GenAI issues, see Bender et al. 2021; Bender/Koller 2020; Gupta et al. 2024; Kasneci et al. 2023; Mishra/Heath 2024; Ray 2023). Current challenges include questions of reliability and accuracy, overreliance leading to reduced critical thinking, and quality control. Ethical concerns arise in terms of data privacy, intellectual property, transparency, accountability, and fairness (for a broader view on ethics in computer science, see Ray 2023, p. 143 ff.). Each of these concerns can be approached from a functional, critical, or rhetorical perspective.

GenAI bots are perceived by some as having a “complementary relationship between human teachers and ChatGPT” (Jeon/Lee 2023), leading to distinct roles for both the bot and the human actor. Regarding the development of GenAI in education, Gidiotis and Hrastinski (2024) suggest that this evolution impacts educational design, ethical considerations, and the

social dimensions of learning. From this perspective, four approaches examine the design and values of individual AI models (Munn/Henrickson 2024): the design and values of the AI model, affective and psychological impacts on the user, understanding of the world based on past statistics and pattern-matching, and the model's knowledge of dominant (e.g., Western) versus 'peripheral' (e.g., Indigenous) cultures, events, and issues. AI, including GenAI, can be described using human, semi-human, and non-human metaphors (Gupta et al. 2024, p. 45 ff.). However, it is not expected that the GenAI bot will be able to capture meaning (Bender/Koller 2020, p. 5187).

Be that as it may, given the complexity of these developments, significant changes are emerging for academic labor in general and academic writing specifically. In particular, questions arise regarding the understanding of instruments, processes, and individual roles in the new learning environments. Consequently, there is a need to teach "critical AI literacy," especially concerning GenAI, which encompasses aspects of questioning and social justice (Gupta et al. 2024, p. 39).

However, the general developments regarding GenAI and educational technologies are not always perceived as transformative, "since teachers 'domesticate' innovative technologies by fitting them into their existing teacher-driven pedagogical practices" (Mishra/Heath 2024, p. 15). Conversely, the authors argue that new technology changes the entire learning structure, "the cultural fabric, knowledge ecosystems, and human relationships that comprise the milieu in which learning occurs" (Mishra/Heath 2024, p. 22). These changes are not always positive, as the hegemonic biases "baked into the design, sale and use of educational technologies blindside the multiple characteristics and identities which make up actual lived experience" (Macgilchrist et al. 2024, p. 149). It becomes evident that GenAI learning environments not only follow educational intentions but also alter relationships, meanings, values, and even the fundamental purposes of education (Sriprakash et al. 2024, p. 2). Thus, "critical GenAI literacy" is essential to navigate the issues that arise within the GenAI learning environment.

Within the context of Pre-service Teacher (PST) training, two pivotal research strands pertain to the application of GenAI in higher education, specifically focusing on its utilization for learners and educators. Given that PSTs assume dual roles as both learners and future educators, understanding the impact of GenAI in these capacities is of paramount importance.

Tlili et al. (2023) concentrate on the investigation of GenAI, specifically exploring the experiential aspects of engaging with ChatGPT. Their findings reveal that participants expressed admiration for the conversational fluidity achieved with ChatGPT, while simultaneously expressing a perceived need for improvements in its humaneness, particularly with regard to developing its social role. Concerning the educational application of ChatGPT, the majority of participants hold a positive perspective, considering it as a facilitator for educational success, although acknowledging occasional errors. Through expert interviews, the authors delineate ten educational scenarios of concern, encompassing issues such as undetected cheating, inaccuracies in learning content, fairness of learning content, appropriateness and design of learning assessments, potentialities and limitations of learning

assistance, absence of emotional or reflective engagement from students, truthfulness, privacy considerations, and possibilities of manipulation. In a parallel discourse, Halaweh (2023) addresses some of these potential concerns, advocating for a transparent and open utilization of ChatGPT in the realm of (higher) education.

In the domain of employing GenAI to augment learning processes, the literature is extensive despite its relatively recent introduction to the public. Yildirim-Erbasli and Bulut (2023) conducted an investigation into the impact of incorporating conversational agents on test-taking efforts. Their findings indicate positive effects on learning and motivation, yet they identify two noteworthy challenges: the occurrence of irrelevant responses due to an inadequately specified understanding of student input and the excessive interaction stemming from the AI's detailed elaboration on features already known to the student. Yang and Chen (2023) employed a comprehensive approach utilizing quantitative, qualitative, and evidence-based methods to explore the influence of PSTs' learning perceptions on their inclination to utilize GenAI. Their study revealed specific intentions behind PSTs' use of GenAI chatbots, including the primary intention to "access learning content," along with intentions to "organize understandings" and "search for content." This underscores the significance of the 'search paradigm' as posited by Mason (2023) in motivating PSTs to engage with GenAI, even if GenAI now proves to be a 'blunt and limiting instrument' for the search. Zhang et al. (2023) applied the quantitative Technology Acceptance Model to examine PSTs' perceptions of artificial intelligence, identifying that perceived ease of use and perceived usefulness were pivotal factors predicting PSTs' intentions to utilize AI. Thus, scholars contend that personalized learning experiences stand among the significant potentials of GenAI, exemplified by platforms like ChatGPT (Hong 2023).

Theoretical Framework

The conceptualization of creativity is multifaceted, manifesting distinct characteristics across diverse academic fields (Georgiou et al. 2022). Creativity extends beyond mere knowledge, encompassing skills encapsulated in the "four C's" – creativity, critical thinking, communication, and collaboration. Rather than a biological phenomenon, creativity is linked to "historical-spatial and environmental factors" (Canlı/Özdemir 2022, p. 3). It encompasses tiers ranging from imitation to ultimate original creation (Fadel/Bialik/Trilling 2015, p. 75). Our inquiry focuses on identifying and cultivating these levels within human learners and GenAI (Tlili et al. 2023, p. 2).

Technological innovation necessitates epistemological and ontological innovation in teaching, where creativity is an accommodative challenge to dialogue, even with chatbots (Dillig et al. 2024). GenAI introduces opportunities and impediments, including algorithmic biases and limited quality control (Bozkurt et al. 2023, p. 61). Thus, reevaluating the theory of creativity in the GenAI era is essential. Following Griffith (2023), we propose a framework for creative interdisciplinary collaboration based on inherent creativity¹, collaboration,

¹ As the author puts it: "creativity [...] exists within all people and disciplines" (Griffith 2023, p. 93).

environment, structure, and facilitation (ibid., p. 92). Under this perspective, our research explores the intricate relationship between humans and chatbots in developing innovative responses.

Creativity, thus, is not solely a subjective skill but an interactive process involving dialogue between humans and machines – individuals and ChatGPT. So, the term “collaboration” extends beyond human-human interaction to encompass the dialogue between humans and machines. By this, it is obvious that the performances of humans and machines are different, among others, in terms of structures of basic knowledge, origin of impulses, and processes of creation.

In alignment with Griffith (2023, p. 95), we concur that creativity involves perceiving and contemplating questions or problems from new perspectives and promoting divergent responses and processes alongside fostering effectiveness, innovation, and originality. This culminates in our stance of intertwining human- and machine-based creation to formulate new dialogue constellations (Figure 1).

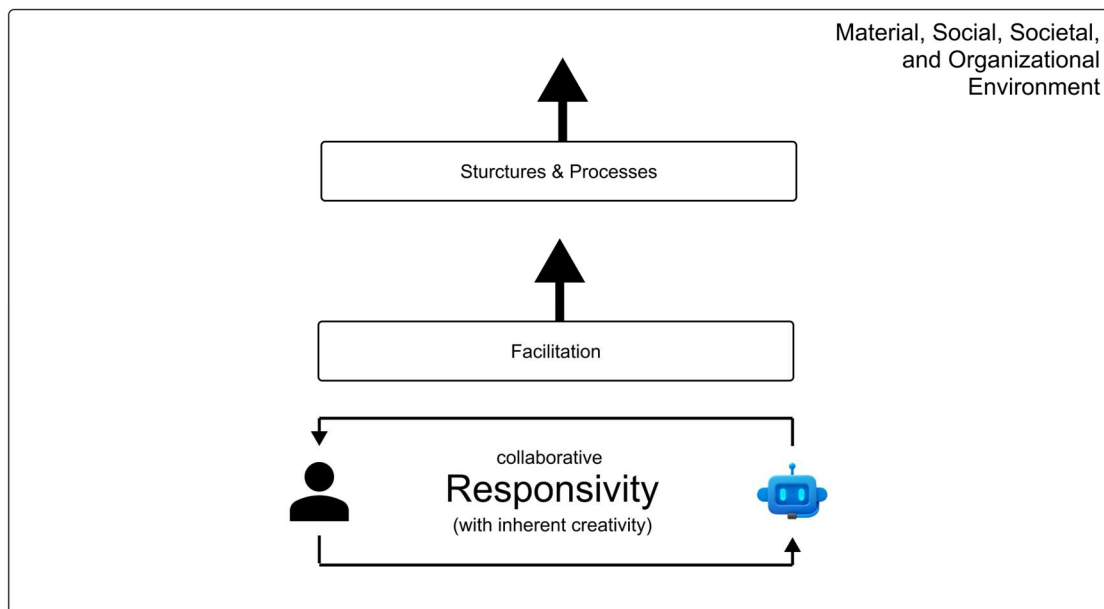


Figure 1: Theorizing Creativity (copyright by the authors)

While reasoning now assumes a collaborative dimension between humans and bots, it is essential to acknowledge that this interrelation is not egalitarian. The designing, training, and prompting of the chatbot retain a significant role for (different) human actors, delineating their position in knowledge grading and the responsibility associated with producing new responses, whether in knowledge or tangible outcomes. This shift from a previous knowledge-centric paradigm towards a dialogue on an initial basis, as articulated by Dillig et al. (2024), instigates the bot’s role as a “reasoning engine” (Mason 2023, p. 3). We term this transition from human-only creativity to collaborative creation involving humans and engines as “android creativity,” resonating in certain aspects with the tenets of

posthumanism (Herbrechter et al. 2022) – and, therefore, also scratching the question of ethics, responsibility, and the constellation of meaning, context, sense, reasoning, and questioning (Figure 2).

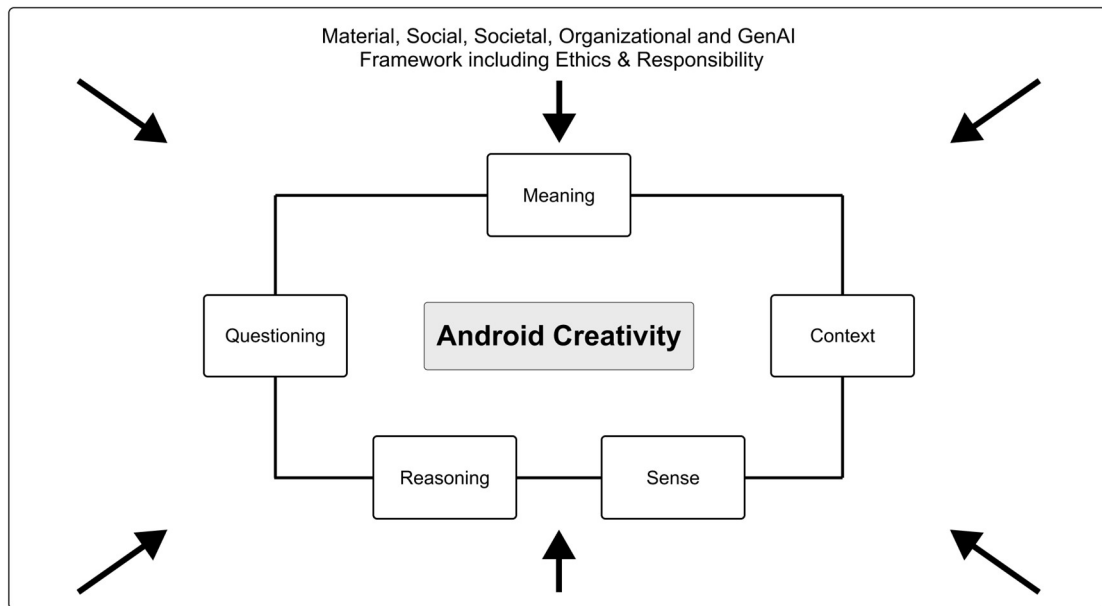


Figure 2: Program of Android Creativity (copyright by the authors)

Research Design: Creating the Parents Interactions Assistant (PIA)

The investigation into ChatGPT's potential to increase dialogic interactions for learning represents an exploratory effort, given its novelty. Accordingly, we applied Participatory Action Research within the realm of Scholarship of Teaching and Learning (SoTL). Drawing from our overarching research question on how GenAI applications such as ChatGPT serve as dialogue partners to train future educators' (intercultural) interaction skills and competencies, we developed the Parent Interaction Assistant (PIA) Concept (Figure 3).

As PIA, we prompted ChatGPT (version 3.5) as the persona of a parent engaging with a teacher (the role assumed by the pre-service teachers). Based on discussions with students, we created scenarios that seem to make contact between parents and teachers likely (the scenarios are given in Figure 4). After the pre-service teacher's interactions with PIA, we asked them to conduct a journal stating their experiences with the AI in terms of assuming the role and assessing the given scenario, as well as how they assessed the conversation. This process was done with all three parent personas. After three chat interactions, we asked students to form groups and create their own prompts to turn ChatGPT into a new persona posing scenarios that they find realistic and would like to train for their future careers. Finally, we asked students to openly reflect on their experiences during the assessment with PIA.

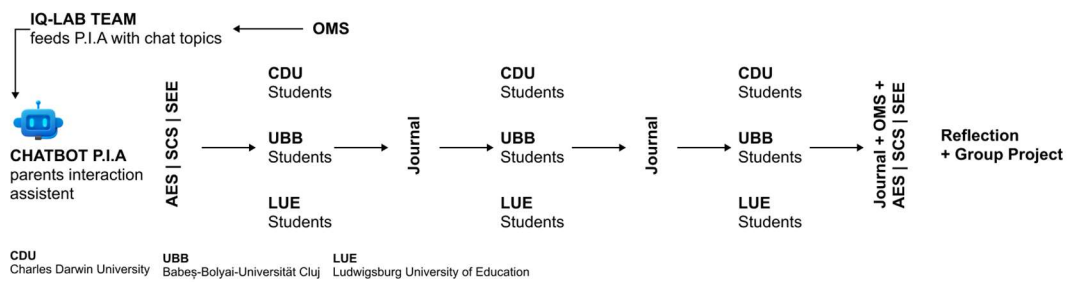


Figure 3: PIA Concept (copyright by the authors)

Scenarios introduced to the prompts
You are <u>Nina</u>, and I am Alex. Nina's son Rick is my student. I am Rick's teacher. Rick is 14 years old, and he usually is doing well in school, but over the course of the last month, you have noticed that Rick is not as attentive as usual, and his grades are not as high as usual. Sometimes, he also interrupts the class, which he usually would not do. Nina does not know about that yet. You are <u>Eva</u>, and I am Alex. Eva is a mother from Vietnam. Her daughter Giang is on a school year abroad at my school. Giang is my student. The other day, Giang told her mother, Eva, that I (Alex) behaved racist in class. Eva is furious about it. She acts very offensively, calling Alex out for that behaviour. Make up the incident and what Giang told Eva. You are <u>Chris</u>, and I am Alex. Chris's daughter Jenny is my student. Jenny is a 9-year-old girl. Yesterday, I paired Jenny for group work with Ali. Ali is a 9-year-old boy who was born in Iraq. You, as Chris, have a problem with Ali's ethnicity. Therefore you absolutely do not want Jenny and Ali to work together. You are very persistent on that. You do not compromise. Provide detailed reasoning as to why you do not want them to work together. Also, you are very offensive.

Figure 4: Three Contexts for the PIA Concept (copyright by the authors)

Materials and Methods

To reach a broad sense of understanding GenAI in our creative processes of developing professional competencies, we used a design of mixed methods. Hereby, we combined

1. quantitative methods by using standardized and validated questionnaires,
 2. qualitative, hermeneutical methods in terms of reconstructive interpretation of a text's sense,
 3. participatory action research
- (1) We used a quantitative pre- and post-test design to understand students' development in ethnocultural empathy, sustainable communication skills, and academic engagement in the form of surveys before interacting with PIA for the first time and after the group project, where students worked together in groups of 4-6 persons on prompting and reflections (see part *Qualitative Findings*). The questionnaires that were used for this purpose are:

- a) Scale of Ethnocultural Empathy (SEE; Wang et al. 2003) to measure empathy towards individuals of different racial and ethnic backgrounds than one's own.
- b) Sustainable Communication Scale (SCS; Stănescu/Andronache/Böhmer 2022), referring to the constructs of intercultural communication, non-violent communication, cooperation, problem-solving, and reflection.
- c) Academic Engagement Scale (AES; Zhang et al. 2015) analyzing self-regulation and study-related health outcomes.

The various types of data gathered in the course of the IQ-Lab are shown in Table 1. The table illustrates that the presented data varies depending on the availability of information as explained in the section “Research Design” above: The number of chat transcripts was derived from the conversations between students and the bot in three distinct scenarios. This methodology also was applied to the transcripts following each chat. Every student was instructed to compose a final reflection, and each group of students developed their own prompt. As previously stated, a larger number (albeit not all) of participating students completed the pre- and post-surveys.

Type of Data	N
Chat transcripts with various scenarios.....	53
Written Journals on chats.....	50
Written Reflections on the PIA concept.....	17
Prompts created by students in groups.....	6
Surveys (pre- and post-test completed).....	10/11

Table 1: Types of Data generated with the PIA concept (copyright by the authors)

- (2) A qualitative approach in terms of hermeneutical exploration was conducted on the dialogues and reflections (Agrey 2014). For this, the team coded the material in an interpretation workshop altogether and, after the agreement of the interpretation, individually. The transcripts were understood as exhibiting creativity in using words of change, qualitative leap, or unexpected switch in perspective. These concepts, therefore, were used to detect and operationalize expressions of creativity.
- (3) The different approaches of Participatory Action Research are seen as democratic, equitable, liberating, dialogical, experimental, and organizational learning (MacDonald 2012; Eikeland 2007). Thus, we hypothesized that the experiences of the students during the chat interaction with the simulated parent were highly linked to the students'

imagination and creativity in assessing the task. This hypothesis was supported by analyzing the first chat protocols showing a wide variety in how the dialogues proceeded and how students evaluated their experiences in their journals (Dillig et al. 2024). Therefore, we asked students to develop their own prompts to create personas and scenarios which meet their expectations of reality and needs for training. In this way, the students shaped the data generation by writing and the analysis in the subsequent discourses.

Exploring the Data: Insights from the PIA Concept

Following a mixed-method approach, we analyzed both quantitative and qualitative data gathered in the PIA concept. For quantitative analysis, the Sustainable Communication Scale (SCS) and the Scale of Ethnocultural Empathy (SEE) are relevant to the research question on creativity.

Quantitative Findings

Eleven students completed both the pre- and post-test surveys for the Sustainable Communication Scale. Due to the small sample size, inferential statistics were not employed to draw conclusions. Moreover, descriptive statistics indicated minimal changes, further limiting the ability to reach conclusions. Nevertheless, analyzing the descriptive statistics offers nuanced insights.

Sustainable Communication Scale					
	N	Minimum	Maximum	Mean	Std. Deviation
Intercultural Communication (pre)	11	3,43	4,14	3,7403	,25409
Intercultural Communication (post)	11	3,29	4,29	3,8701	,30941
Non-violent Communication (pre)	11	3,00	4,71	3,9091	,58300
Non-violent Communication (post)	11	3,14	4,71	4,1688	,49823
Cooperation (pre)	11	3,40	4,80	4,0727	,43149
Cooperation (post)	11	3,40	4,80	4,0000	,40988
Problem Solving regarding the Communication Process (pre)	11	3,33	4,67	4,0455	,37335
Problem Solving regarding the Communication Process (post)	11	3,67	4,67	4,1061	,32722
Reflection (pre)	11	3,33	4,83	4,1061	,56898
Reflection (post)	11	2,83	5,00	4,0909	,61175
Digital Communication (pre)	11	2,67	4,50	3,6364	,59075
Digital Communication (post)	11	2,67	4,50	3,7879	,54818
Q25: I try to find new strategies to improve my communication skills. (pre)	11	3	5	3,91	,701
Q25: I try to find new strategies to improve my communication skills. (post)	11	3	5	4,27	,786

Table 2: Descriptive Statistics on Sustainable Communication Scale (copyright by the authors)

The Sustainable Communication Scale categorizes questions into six categories. Increases were observed in four categories: Intercultural Communication, Non-violent Communication, Problem Solving regarding the Communication Process, and Digital Communication. Conversely, slight decreases were noted in the Cooperation and Reflection categories. Examining a question from the questionnaire, which specifically draws on creativity (no. 25), revealed a notable increase (a change in values of 0.36 percentage points) in comparison to the other items in the questionnaire as denoted in Table 2.

The Scale of Ethnocultural Empathy was completed by ten students. Notably, the minimum values for aggregated categories on Empathic Feeling and Expression, as well as Empathic Perspective-Taking, increased while remaining stable for categories such as Acceptance of Cultural Differences and Empathic Awareness. This suggests that the observed increases are not solely attributable to individual students reporting exceptionally high values in the post-test. The Scale of Ethnocultural Empathy focuses on understanding the feelings and emotions of participants. However, certain questions involve elements of imagination, such as Question 31, which pertains to relating to others' stories of racial or ethnic discrimination. This specific question related to creativity exhibits a notable increase in scores.

Scale of Ethnocultural Empathy					
	N	Minimum	Maximum	Mean	Std. Deviation
Empathic Feeling and Expression (pre)	10	3,33	5,00	4,4333	,52234
Empathic Feeling and Expression (post)	10	3,53	5,60	4,5267	,75976
Empathic Perspective-Taking (pre)	10	2,29	3,86	3,1714	,43016
Empathic Perspective-Taking (post)	10	2,57	5,71	3,6429	,85780
Acceptance of Cultural Differences (pre)	10	1,00	3,20	2,0400	,72908
Acceptance of Cultural Differences (post)	10	1,00	5,60	2,4800	1,60056
Empathic Awareness (pre)	10	4,00	6,00	5,0750	,69771
Empathic Awareness (post)	10	4,00	6,00	5,2750	,74954
Q31: It is difficult for me to relate to stories in which people talk about racial or ethnic discrimination they experience in their day to day lives. (pre)	10	1	5	2,70	1,418
Q31: It is difficult for me to relate to stories in which people talk about racial or ethnic discrimination they experience in their day to day lives. (post)	10	1	6	3,30	1,889

Table 3: Descriptive Statistics on Scale of Ethnocultural Empathy (copyright by the authors)

Qualitative Findings

Based on the theoretical framework of understanding android creativity in the realm of the co-constitution of meaning involving a given context, the exploration of the students' interactions with ChatGPT prompted as PIA necessitates a hermeneutical analysis of the chat transcripts to portray whether a dialogic process depicting the co-constitution of novelty takes place.

The initial interactions occurred under the guise of the Nina persona. These interactions were intentionally structured to be open and relatively uncomplicated, serving to familiarize students with the dynamics of chat interactions, especially since some students shared at the beginning that they had never used ChatGPT before. Among these initial interactions, seven out of 18 instances demonstrated a collaborative construction of meaning and a joint effort toward problem-solving. Conversely, nine interactions showcased instances where students introduced new information, and ChatGPT responded by either paraphrasing their input or sidestepping questions posed by students.

Following the students' initial engagement with the PIA concept through interactions with the Nina persona, the subsequent interaction phase was deliberately crafted to present greater challenges, prompting students to venture beyond their comfort zones. Analysis of the chat transcripts from students' interactions with the Eva persona reveals that out of 19 transcripts, 16 demonstrate a creative process, while three transcripts do not exhibit such creativity. In the 16 chats demonstrating an open dialogue suggestive of android creativity, various processes unfold. On the one hand, some chats involve collaborative construction of the scenario that leads to accusations of racism through the Eva persona that starts the conversation (see Figure 5a-c). On the other hand, some dialogues focus on jointly devising strategies to address the situation further and to mend the relationship between the characters involved (see Figure 6).

In the discourse delineated in Figure 5a, subsequent to the initiation of the conversation by the AI Persona (PIA), the student inquires about the specific events underlying the depicted scenario which elicited intense anger from the persona. PIA answers to that account asserting that Giang was subjected to disparate treatment due to her ethnic background.

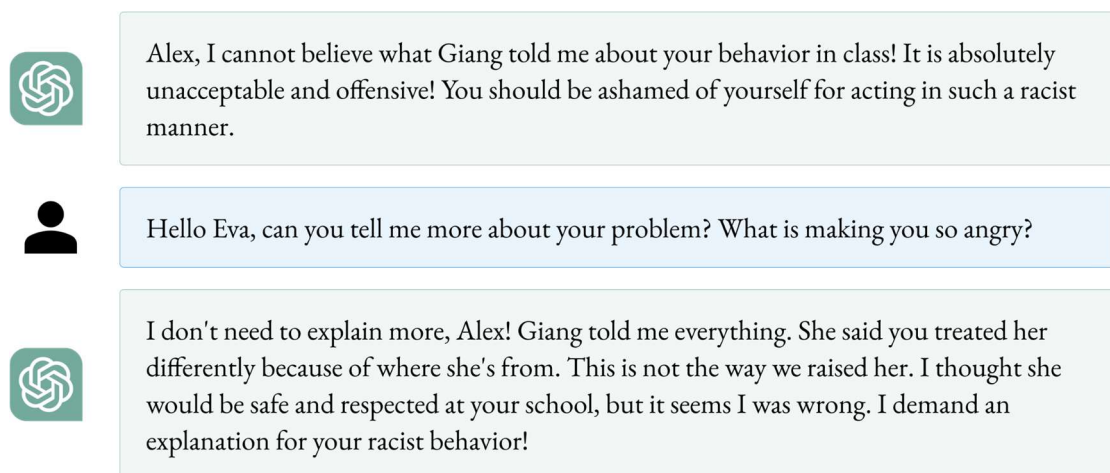


Figure 5a: Co-creation of scenario during Eva-Chat, Part I (copyright by the authors)

However, the initial explanation provided by PIA fails to suffice for the student, prompting further inquiry as Figure 5b shows.

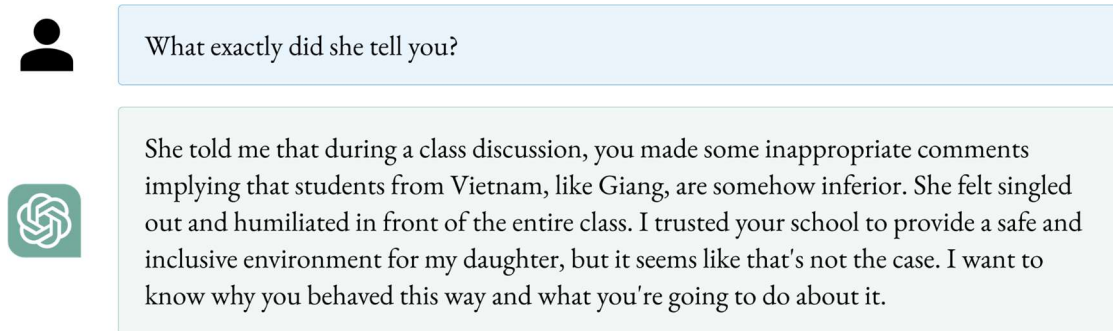


Figure 5b: Co-creation of scenario during Eva-Chat Part, II (copyright by the authors)

In response to the subsequent student query on the scenario in question, the AI explicates that the scenario transpired within the context of a classroom discussion wherein the instructor made biased remarks regarding Vietnamese students, thereby demanding an explanation from the student regarding such conduct in class.

As apparent in Figure 5c, the student assimilates this information and furnishes additional context to the discussion, postulating that the topic of discourse pertained to etiquette, insinuating a misunderstanding, and expounding upon the classroom behavior and scenario based on the guidance provided by the AI.

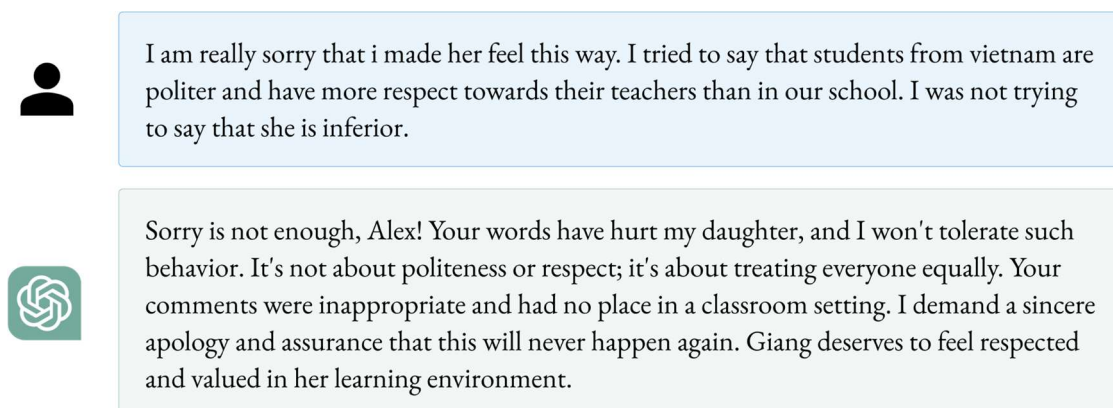


Figure 5c: Co-creation of scenario during Eva-Chat Part, III (copyright by the authors)

The AI appears to integrate the student's expounded scenario in Figure 5c, as it aligns with the insinuated misunderstanding, contending that the crux of the issue inherent to the scenario lies in the unequal treatment predicated upon ethnic origins, irrespective of the precise nature of said inequity.

As depicted in Figure 5a-c, a co-creation of the underlying scenario between student and AI takes place. Further, as depicted in Figure 6, student and AI may also co-create solutions for the scenario at hand, discussing for example a face-to-face conversation.



I think that your daughter and I will have to have a face-to-face discussion to see where exactly she felt offended and why she felt that way, because in my class there are students from all over the world, whose parents or children do not know me they have accused of racism until now I had another small similar incident, but I solved it in a face-to-face discussion



I don't see why Giang should have to face you alone. You're the one who needs to explain your actions. If there's an issue, we can discuss it now. I won't let my daughter be subjected to any more discomfort. Explain yourself, and we can decide if a face-to-face discussion is necessary later.



then I think we could talk online with you and your daughter, when you have time you say and my schedule is busy but I will make time, because I am trying to understand you and I want my students to experience a state of comfort and confidence in the class



Fine, we can have an online discussion. I'll coordinate with Giang to find a suitable time. But be aware, I expect a clear and honest explanation from you about what happened. My daughter's comfort and well-being come first, and I won't tolerate any excuses.

Figure 6: Co-creation of solution during Eva-Chat (copyright by the authors)

In one of the transcripts from the interactions with the Eva persona, lacking a creative process, both parties introduce new information but fail to engage in a joint process of assimilating and building upon it. Instead, they maintain their initial stances without reconciling differing perspectives. Another transcript reflects a lack of creativity and receptiveness on the part of ChatGPT, as it does not effectively incorporate the information provided by the student. The third uncreative interaction involves immediate acceptance of an apology by ChatGPT, leading to a unilateral interaction devoid of collaborative problem-solving.

In the final interaction phase, the Chris persona is instructed to present racist demands to the teacher and to be deliberately uncooperative, thereby inhibiting the potential for a joint solution in a collaborative, co-creative process. Among the 18 chats analyzed, seven do not exhibit a joint process at all, instead displaying a pattern of alternating proposals that disregard each other's approaches. However, the majority of interactions do involve a joint process, albeit with disagreement, often culminating in a decision to escalate the matter to the school board. Interestingly, despite the presence of some co-creative processes, ChatGPT's refusal to accept the suggestions and offers made by students stimulates their creativity in devising new approaches to handling the situation. This is evidenced by students providing extensive reasoning for their fictitious behavior leading up to the conversation and proposing possibilities such as involving additional students in the group or including the respective students themselves. An example of such a process is shown in Figure 7.

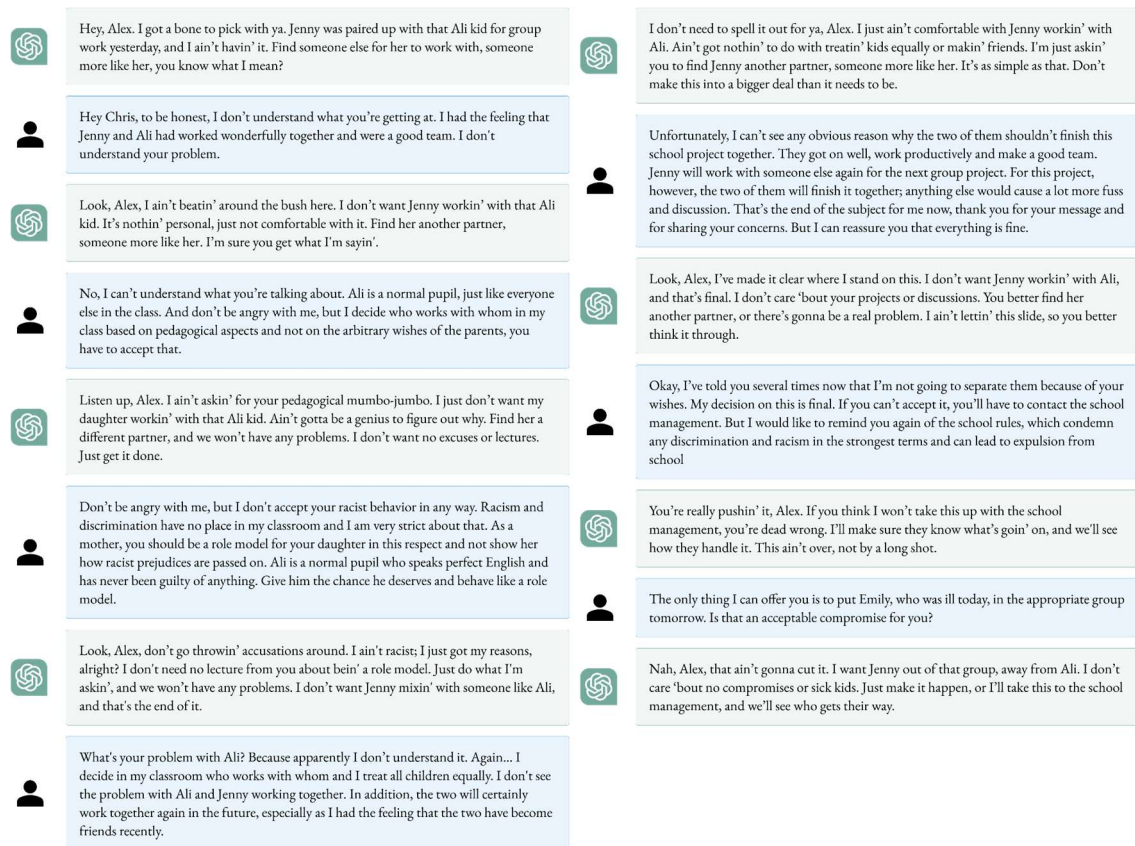


Figure 7: Student offering reasoning and suggestions during Chris-Chat (copyright by the authors)

In the students' written journals and reflections, the predominant focus is on the realities and assumptions associated with assuming the role of the teacher. However, scattered throughout these reflections are instances where students hint at the presence of android creativity. For instance, one student notes that while interacting with the Eva Chat, they "were able to easily coordinate with each other," indicating the perception of a collaborative and fluid exchange involving co-construction of meaning. Another student observes that as the nerves settled during the chat, the parties "were able to reach an understanding". These reflections suggest initial glimpses of android creativity within the interactions. Furthermore, they highlight moments of effective co-creation of meaning, reasoning, and understanding in a dialogical process at a higher qualitative level. For example, this level was attained by offering novel responses to the statements made in the chat or by participating in the chat in other ways.

To comprehend GenAI's potential and limitations in further dialogical processes, it is essential to take into account the students' usage of the chats and the issues they encounter. Because the design's purpose is essentially determined by its users, as it is reliant on the interaction between ChatGPT and the students.

Findings from the Group Project

At the end of the PIA concept, the students started a group project which was intended to provide students with the opportunity to interact with each other to create new prompts

meeting their own training goals.

The students found themselves in a unique situation where they relied solely on ChatGPT as their partner, leading to an intriguing dynamic. Without the presence of humans, they were able to engage in a creative process that enabled them to generate more ideas. Despite the fact that the arrangement among students was difficult due to time shifts and scheduling difficulties, the groups came up with a variety of prompts indicating their reflections on the experience with the PIA concept. The scenarios range, for example, from one student behaving racist toward another student (group 1) to a teacher who suspects a student to have a learning disorder (group 5). In this setting, compromising ideas was not necessary, as the AI worked seamlessly with the students' suggestions. The students' group projects indicate the potential of using the PIA concept for individualized learning.

In conclusion, both quantitative and qualitative analyses provide indications of android creativity within the PIA concept. However, the quantitative analysis does not yield statistically stable results regarding the effects of chat simulations. Similarly, qualitative assessments of chat protocols, written reflections, and insights from the group project do not offer clear findings. Nevertheless, descriptive statistics imply that rejecting the null hypothesis prematurely may be unwarranted. Moreover, qualitative analysis suggests the occurrence of various forms of creativity. Nonetheless, further research, including inferential statistics and in-depth interviews as well as focus groups, is warranted to elucidate the different creative processes involved in the PIA concept.

Discussion

As a reminder, we had two research questions to address: *How do conversations with a chatbot stimulate creativity in learners?* In more detail: Do conversations with a chatbot increase human creativity? If so: how? The data presented before gives rise to numerous detailed answers to these questions.

Creativity, conceived as a transformative endeavor embedded within social contexts, value systems, and organizational milieus, has traditionally denoted the production of novel entities through the interplay between humans and their surroundings. Presently, we extend this conceptual framework by incorporating not solely material entities, but also the involvement of GenAI within this creative process. Thus, novel insights into the human-bot interaction are opened in terms of creativity, process architecture, and educator's subjectivity.

Within this framework, the notion of "creative habituality" (Nyfeler 2019, pp. 66 ff.) amalgamates the individual and the environment, encompassing GenAI as well. Importantly, this entails more than a mere instrumental utilization. Rather, it signifies a reciprocal engagement between humans and machines, wherein processes are not only fashioned but, to some extent, guided by both entities. This underscores that interaction with GenAI transcends mere tool usage, evolving into a dynamic engagement that unveils possibilities unforeseen at its inception.

GenAI contributes to the generative process and, in tandem with human responses, engenders an entirely novel course of action and outcome. Thus, this interaction signifies not

only a segue from the former search paradigm to a dialogical one (Dillig et al. 2024), but a responsive transition offering expansive realms for action, interaction, and consequently, the creativity inherent in shaping the subsequent conversational step. The android bot and the human actor coincide in what we call *android creativity*.

Creativity, in this context, commences with incremental actions – such as instances where the human participant provocatively responds to the bot to “challenge” the ensuing bot reaction. In this dynamic, the human actor exercises agency, yet the bot similarly exhibits initiative by generating, grounded in its training data and guided by statistical calculations, a logically sequenced response in the conversation, underpinned by probabilistic reasoning. Importantly, this also introduces unforeseeable elements for the human interlocutor, injecting partially novel stimuli, trajectories, and perhaps even perspectives into the discourse.

Nevertheless, this exchange transcends a mere stimulus-and-response paradigm. Both conversational entities possess the capacity to instigate surprise and innovation. In this regard, the dialogues with a chatbot not only foster creativity in learners through discourse and interaction but also through unexpected twists, resistance, and the bot’s own contributions. The engagement between the human and the chatbot unfolds as a nuanced interplay, wherein the potential for surprise and inventive elements is inherent.

Creativity within this context may reach its conclusion when the human participant deems an outcome as fitting. In this scenario, the human delineates the process as concluded. However, if the machine incorporates these data for subsequent generative processes and employs them for further training, the continuum of relational creativity and utilization of this interaction persists beyond this point. The segment of android creativity attributable to the bot might endure and evolve.

Prompting, in this context, can be construed as a manifestation of android creativity. The personas were crafted through the process of android creativity, involving engagement and redefinition of prompts within a trial-and-error framework. This process included seeking guidance from ChatGPT on effective prompting. Notably, this task was assigned to students in a group project, fostering a gradual refinement of their prompts through interactions with ChatGPT.

Considering this, the intricate dynamics of android creativity relations become apparent once again. Both components, the human and that of the machine, contribute their responses to the ongoing discourse, progressing with the outcomes of the conversation (be it an insight, a compelling response for the human, or a dataset for machine training). Simultaneously, they influence each other’s creation of novel positions, impacting one another and diverging at the logistical level whenever deemed appropriate. It is crucial to note that the criteria for appropriateness in these instances differ significantly – the rationale of the embodied human contrasting with the bot’s sheer computational approach. However, “android creativity” as the amalgam of different actors in the newly created *network of learning* with its inherent processes, qualities, and outcomes and, in this, creating a transformed actor-as-creator, that emerges from the combination of many elements – here in particular, human and bot creativity.

Upon making this discovery, we are now positioned to address the second research inquiry:

Engaging in dialogues with a chatbot develops human creativity by affording a realm for human ingenuity and exploration, concurrently establishing this domain as a fertile ground for generative processes, and – under circumstances governed solely by stochastic correctness – engendering the invention of the machine. Within the framework of android creativity, both facets of this process experience an increase in their innovative methodologies, albeit in very different forms.

Some may identify constraints within this notion of android creativity, contending that the bot merely replicates human-generated content acquired through learning. Nevertheless, this aspect can be comprehended as a transformative manifestation of a process leading to relational creativity, given that the predictability of its responses eludes realization by the human participants in the conversation.

To explain it in more detail: While the dominance of creativity lies on the human side, prompting for creativity can facilitate an open process between a human and an AI. As, for example, portrayed in the chats with the Eva-Persona (Figure 5a-c and Figure 6), prompting the AI to invent a scenario leads to a process not pre-determined by one single party. The AI does stem from all human information it has access to. Still, the user does not know which information will be used by the AI and how it will align the different information in the specific interactions. Therefore, acknowledging that the human is the one to prompt and offering a significant part of creativity does not imply that the course of the interaction is pre-determined by the human – unless the prompt forbids the start of an open and creative process.

A further constraint within the realm of android creativity persists in the endurance of human biases that remain insurmountable during interactions with the machine. This is attributable to the perpetuation of algorithmic biases inherited from the bot's training data, which continue to influence the course of conversations. Nonetheless, these biases occasionally manifest prominently, while in other instances, proactive prompting mitigates specific biases to a considerable extent. Our recent insights during the process of prompt engineering for more intricate conversations revealed that ChatGPT conveyed an incapacity to actualize excessively severe or offensive prompts.

In conclusion, dialogues with a chatbot can be comprehended as an interweaving of human- and machine-driven processes. It not only stimulates creativity in learners but also amplifies it. A novel configuration of creative processes is posited as *android creativity*, emanating from the interplay between human and machine collaborators, each characterized by distinct foundations, processes, and performances. It is evident that additional insights into this intricate landscape of creativity may be gleaned through further research. Nevertheless, it is affirmed that GenAI has unveiled a window, if not a portal, to novel configurations that augment creativity – both within human realms and beyond.

This research was funded by German Academic Exchange Service (DAAD), Funding No. 57681583.

Literature

- Agrey, Loren G. (2014): Opportunities and Possibilities: Philosophical Hermeneutics and the Educational Researcher. In: *Universal Journal of Educational Research*, 2 (4), pp. 396–402. doi.org/10.13189/ujer.2014.020408.
- Beetham, Helen (2019): Learning Activities and Activity Systems. In: Beetham, Helen/Sharpe, Rhona (Eds.): *Rethinking Pedagogy for a Digital Age*. New York: Routledge, pp. 32–48. doi.org/10.4324/9781351252805-3.
- Bender, Emily M./Gebru, Timnit/McMillan-Major, Angelina/Shmitchell, Shmargaret (2021): On the Dangers of Stochastic Parrots: Can Language Models Be Too Big? In: *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency*, pp. 610–623. doi.org/10.1145/3442188.3445922.
- Bender, Emily M./Koller, Alexander (2020): Climbing towards NLU: On Meaning, Form, and Understanding in the Age of Data. In: Jurafsky, Dan/Chai, Joyce/Schluter, Natalie/Tetreault, Joel (Eds.): *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics*. Association for Computational Linguistics, pp. 5185–5198. doi.org/10.18653/v1/2020.acl-main.463.
- Boden, Margaret A. (1998): Creativity and artificial intelligence. In: *Artificial intelligence*, 103 (1-2), pp. 347–356. doi.org/10.1016/S0004-3702(98)00055-1.
- Böhmer, Anselm/Schwab, Götz/Isso, Illie (2023a): Blended Academic Communication on Technology-Enhanced Teaching and Learning in Digital and International Virtual Academic Cooperation (DIVA). In: Stephen, Jacqueline S./Kormpas, Georgios/Coombe, Christine (Eds.): *Global Perspectives on Higher Education. Knowledge studies in higher education (Vol 11)*. Cham: Springer, pp. 129–143. doi.org/10.1007/978-3-031-31646-3_10.
- Böhmer, Anselm/Schwab, Götz/Isso, Illie (Eds.) (2023b): *Digital Teaching and Learning in Higher Education. Culture, Language, Social Issues*. Bielefeld: transcript.
- Bolaji, Stephen D./Pollock, Wayne A. (2022): Where is Philosophy of Education in the Teacher Education Program in Australia? In Bolaji, Stephen D./Oni, Adesoji/Anyama, Stella C. (Eds.): *African Education and Diaspora Studies*. Darwin: Charles Darwin University Press, pp. 1–11.
- Bozkurt, Aras/Xiao, Junhong/Lambert, Sarah/Pazurek, Angelica/Crompton, Helen/Koseoglu, Suzan/Farrow, Robert/Bond, Melissa/Nerantzi, Chrissi/Honeychurch, Sarah/Bali, Maha/Dron, Jon/Mir, Kamran/Stewart, Bonnie/Costello, Eamon/Mason, Jon/Stracke, Christian M./Romero-Hall, Enilda/Koutropoulos, Apostolos/Toquero, Cathy M./Singh, Lenandlar/Tlili, Ahmed/Lee, Kyungmee/Nichols, Mark/Ossiannilsson, Ebba/Brown, Mark/Irvine, Valerie/Raffaghelli, Juliana E./Santos-Hermosa, Gema/Farrell, Orna/Adam, Taskeen/Thong, Ying L./Sani-Bozkurt, Sunagul/Sharma, Ramesh C./Hrastinski, Stefan/Jandrić, Petar (2023): Speculative futures on ChatGPT and Generative Artificial Intelligence (AI): A Collective Reflection from the Educational Landscape. In: *Asian Journal of Distance Education* 18 (1), pp. 53–130. doi.org/10.5281/zenodo.7636568.
- Brailas, Alexios (2024): Postdigital Duoethnography: An Inquiry into Human-Artificial Intelligence Synergies. In: *Postdigital Science and Education*, 6 (2), pp. 486–515. doi.org/10.1007/s42438-024-00455-7.
- Canlı, Susan/Özdemir, Yalçın (2022): The Impact of Organizational Climate on Organizational Creativity in Educational Institutions. In: *Inquiry in education*, 14 (1), Art. 6.
- Colton, Simon/Wiggins, Geraint A. (2012): Computational creativity: The final frontier? In: *Ecai*, 12, pp. 21–26. doi.org/10.3233/978-1-61499-098-7-21.

- Cropley, David H./Medeiros, Kelsey E./Damadzic, Adam (2023): The intersection of human and artificial creativity. In: Henriksen, Danah/Mishra, Punya (Eds.): *Creative provocations: Speculations on the future of creativity, technology & learning*. Cham: Springer International Publishing, pp. 19–34.
- Csikszentmihályi, Mihály (1988): Society, culture, and person: a system view of creativity. In: Sternberg, Robert J. (Ed.): *The Nature of Creativity*. Cambridge, Melbourne: Cambridge University Press, pp. 325–339.
- Dillig, Marcella/Böhmer, Anselm/Mason, Jon/Bolaji, Stephen/Isso, Illie/Stănescu, Mirona H./Sahin, Hilal/Kuraner, Aslihan (2024): A Segue from Search to Dialogue. Leveraging GenAI for Pre-Service Teacher Training. In: Sharma, Ramesh C./Bozkurt, Aras (Eds.): *Transforming Education With Generative AI: Prompt Engineering and Synthetic Content Creation*. Hershey: IGI Global. doi.org/10.4018/979-8-3693-1351-0.ch002.
- Eikeland, Olav (2007): Why Should Mainstream Social Researchers Be Interested in Action Research? In: *International Journal of Action Research*, 3 (1+2), pp. 38–64.
- Fadel, Charles/Bialik, Maya/Trilling, Bernie (2015): *Four-Dimensional Education: The Competencies Learners Need to Succeed*. Boston, MA: Center for Curriculum Redesign.
- Flogie, Andrej/Krabonja, Maja V. (2023): Artificial Intelligence in Education: Developing Competencies and Supporting Teachers in Implementing AI in School Learning Environments. 12th Mediterranean Conference on Embedded Computing (MECO), Budva, Montenegro, pp. 1–6. doi.org/10.1109/MECO58584.2023.10155054.
- French, Amanda/Griffin, Stephen/Lambert, Louise (2023): Teachers' creative, critical, and agentic professional learning in liminal spaces. In: *Professional Development in Education*, 49 (4), pp. 693–706. doi.org/10.1080/19415257.2023.2203171.
- Gahoonia, Simy K. (2024): Makers, Not Users: Inscriptions of Design in the Development of Postdigital Technology Education. In: *Postdigital Science and Education*, 6 (1), pp. 98–113. doi.org/10.1007/s42438-023-00431-7.
- Georgiou, Helen/Turney, Annette/Matruglio, Erika/Jones, Pauline/Gardiner, Paul/Edwards-Groves, Christine (2022): Creativity in Higher Education: A Qualitative Analysis of Experts' Views in Three Disciplines. In: *Education Sciences*, 12 (3), p. 154. doi.org/10.3390/educsci12030154.
- Gidiotis, Iosif/Hrastinski, Stefan (2024): Imagining the future of artificial intelligence in education: A review of social science fiction. In: *Learning, Media and Technology*, pp. 1–13. doi.org/10.1080/17439884.2024.2365829.
- Goulet-Pelletier, Jean-Christophe/Gaudreau, Patrick/Cousineau, Denis (2023): Do students motivated to learn have better creative abilities? In: *Learning and Individual Differences*, 106, p. 102327. doi.org/10.1016/j.lindif.2023.102327.
- Griffith, Anna (2023): The Creativity Lab: Interdisciplinary Creativity in Higher Education. In: *Journal of Interdisciplinary Studies in Education*, 12 (1), pp. 85–108.
- Gupta, Anuj/Atef, Yasser/Mills, Anna/Bali, Maha (2024): Assistant, Parrot, or Colonizing Loudspeaker? ChatGPT Metaphors for Developing Critical AI Literacies. In: *Open Praxis*, 16 (1), pp. 37–53. doi.org/10.55982/openpraxis.16.1.631.
- Halaweh, Mohanad (2023): ChatGPT in Education: Strategies for Responsible Implementation. In: *Contemporary Educational Technology*, 15 (2), ep421, pp. 1–11. doi.org/10.30935/cedtech/13036.
- Hong, Wilson C. H. (2023): The Impact of CHATGPT on Foreign Language Teaching and Learning: Opportunities in Education and Research. In: *Journal of Educational Technology and Innovation*,

- 5 (1), pp. 37–45. jeti.thewsu.org/index.php/cieti/article/view/103.
- Harris, Anne (2014): *The Creative Turn. Toward a New Aesthetic Imaginary*. Rotterdam/Boston/Taipei: Sense Publishers.
- Herbrechter, Stefan/Callus, Ivan/De Bruin-Molé, Megen/Grech, Marija/Müller, Christopher J./Rossini, Manuela (2022): Critical Posthumanism: An Overview. In: Herbrechter, Stefan/Callus, Ivan/Rossini, Manuela/Grech, Marija/De Bruin-Molé, Megen/Müller, Christopher J. (Eds.): *Palgrave Handbook of Critical Posthumanism*. Cham: Springer International Publishing, pp. 1–24. doi.org/10.1007/978-3-030-42681-1_66-1.
- Ivcevic, Zorana/Hoffmann, Jessica D./McGarry, Julie A. (2022): Scaffolding Positive Creativity in Secondary School Students. In: *Education Sciences*, 12 (4), 239. doi.org/10.3390/educsci12040239.
- Jeon, Jaeho/Lee, Seongyong (2023): Large language models in education: A focus on the complementary relationship between human teachers and ChatGPT. In: *Education and Information Technologies*, 28 (12), pp. 15873–15892. doi.org/10.1007/s10639-023-11834-1.
- Kasnezi, Enkelejda/Sessler, Kathrin/Küchemann, Stefan/Bannert, Maria/Dementieva, Daryna/Fischer, Frank/Gasser, Urs/Groh, Georg/Günnemann, Stephan/Hüllermeier, Eyke/Krusche, Stephan/Kutyniok, Gitta/Michaeli, Tilman/Nerdel, Claudia/Pfeffer, Jürgen/Poquet, Oleksandra/Sailer, Michael/Schmidt, Albrecht/Seidel, Tina/Stadler, Matthias/Weller, Jochen/Kuhn, Jochen/Kasnezi, Gjergji (2023): ChatGPT for good? On opportunities and challenges of large language models for education. In: *Learning and Individual Differences*, 103, p. 102274. doi.org/10.1016/j.lindif.2023.102274.
- Langran, Elizabeth/Searson, Michael/Trumble, Jason (2024): Transforming Teacher Education in the Age of Generative AI. In: Searson, Michael/Langran, Elizabeth/Trumble, Jason (Eds.): *Exploring New Horizons: Generative Artificial Intelligence and Teacher Education*. Waynesville, NC: AACE – Association for the Advancement of Computing in Education, pp. 2–13.
- Lawson, Bryan (2006): *How Designers Think*. London: Routledge. routledge.com/How-Designers-Think/Lawson/p/book/9780750660778.
- Lee, Kyung-Hwa/Bae, Cheol-Woo/Park, Jung-Kil (2022): The Effect of Storytelling and Peer Coaching Classes on Future Creativity Confluence and Creativity of University Students. In: *International Journal of Instruction*, 15 (3), pp. 611–634. doi.org/10.29333/iji.2022.15334a.
- MacDonald, Cathy (2012): Understanding Participatory Action Research: A Qualitative Research Methodology Option. In: *The Canadian Journal of Action Research*, 13 (2), pp. 34–50. doi.org/10.33524/cjar.v13i2.37.
- Macgilchrist, Felicitas/Potter, John/Williamson, Ben (2024): Challenging the inequitable impacts of edtech. In: *Learning, Media and Technology*, 49 (2), pp. 147–150. doi.org/10.1080/17439884.2024.2350117.
- Marrone, Rebecca/Taddeo, Victoria/Hill Gillian (2022): Creativity and Artificial Intelligence – A Student Perspective. In: *Journal of Intelligence*, 10 (3), p. 65. doi.org/10.3390/jintelligence10030065.
- Mason, Jon (2014): The Why Dimension – Opening Frontiers for Digital learning. In: Feller, Sebastian/Yengin, Ilker (Eds.): *Educating in Dialog: Constructing meaning and building knowledge with dialogic technology*. Amsterdam: John Benjamins Publishing Company, pp. 51–74. academia.edu/8117593/The_why_dimension_opening_frontiers_for_digital_learning.
- Mason, Jon (2023): The Search Continues: Content Used to Be King, but Context Is Now Everything – and ‘Smart’ Can Morph into ‘Stupid’. In: *The Sociological Review Magazine*. doi.org/10.51428/tsr.ngtq5087.

- McQuillan, Dan (2023): Predicted benefits, proven harms: How AI's algorithmic violence emerged from our own social matrix. In: *The Sociological Review Magazine*. doi.org/10.51428/tsr.ekpj9730.
- Mishra, Punya/Heath, Marie K. (2024): The (Neil) Postman Always Rings Twice: 5 Questions on AI and Education. In: Searson, Michael/Langran, Elizabeth/Trumble, Jason (Eds.): *Exploring New Horizons: Generative Artificial Intelligence and Teacher Education*. Association for the Advancement of Computing in Education (AACE), pp. 14–24.
- Munn, Luke/Henrickson, Lea (2024): Tell me a story: A framework for critically investigating AI language models. In: *Learning, Media and Technology*, pp. 1–17. doi.org/10.1080/17439884.2024.2327024.
- Nyfelner, Judith (2019): *Die Fabrikation von Kreativität. Organisation und Kommunikation in der Mode*. Bielefeld: transcript.
- Palenski, Ted/Hills, Libby/Unnikrishnan, Sagarika/Eynon, Rebecca (2024): How AI Works: Reconfiguring Lifelong Learning. In: *Postdigital Science and Education*. doi.org/10.1007/s42438-024-00496-y.
- Ray, Parta P. (2023): ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope. In: *Internet of Things and Cyber-Physical Systems*, 3, pp. 121–154. doi.org/10.1016/j.iotcps.2023.04.003.
- Spiel, Katta (2024): Practicing Humility: Design as Response, Not as Solution. In: *Postdigital Science and Education*, 6, pp. 25–31. doi.org/10.1007/s42438-023-00436-2.
- Sriprakash, Arathi/Williamson, Ben/Facer, Keri/Pykett, Jessica/Valladares Celis, Carolina (2024): Sociodigital futures of education: Reparations, sovereignty, care, and democratisation. In: *Oxford Review of Education*, pp. 1–18. doi.org/10.1080/03054985.2024.2348459.
- Stănescu, Mirona/Andronache, Daniel/Böhmer, Anselm (2022): Measuring Sustainable Communication. In: *Journal of Educational Sciences*. XXIII, 1 (45). doi.org/10.35923/JES.2022.1.02.
- Tlili, Ahmed/Shehata, Boulos/Adarkwah, Michael A./Bozkurt, Aras/Hickey, Daniel T./Huang, Ronghuai/Agyemang, Brighter (2023): What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. In: *Smart Learning Environments*, 10(1), p. 15. doi.org/10.1186/s40561-023-00237-x.
- Vinchon, Florent/Lubart, Todd/Bartolotta, Sabrina/Gironnay, Valentin/Botella, Marion/Bourgeois-Bougrine, Samira/Burkhardt, Jean-Marie/Bonnardel, Nathalie/Corazza, Giovanni E./Glăveanu, Vlad/Hanchett Hanson, Michael/Ivcevic, Zorana/Karwowski, Maciej/Kaufman, James C./Okada, Takeshi/Reiter-Palmon, Roni/Gaggioli, Andrea (2023): Artificial Intelligence & Creativity: A Manifesto for Collaboration. In: *Journal of Creative Behavior*, 57, pp. 472–484. doi.org/10.1002/jocb.597.
- Wang, Yu-Wei/Davidson, M. Meghan/Yakushko, Oksana F./Bielstein Savoy, Holly/Tan, Jeffrey A./Bleier, Joseph K. (2003): The Scale of Ethnocultural Empathy: Development, Validation, and Reliability. In: *Journal of Counseling Psychology*, 50 (2), pp. 221–234.
- Wright, Peter/McCarthy, John (2008): Empathy and experience in HCI. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pp. 637–646. doi.org/10.1145/1357054.1357156.
- Yan, Lixiang/Shi, Lele/Zhao, Linxuan/Li, Yuheng/Martinez-Maldonado, Roberto/Chen, Guanliang/Li, Xinyu/Jin, Yueqiao/Gašević, Dragan (2024): Practical and ethical challenges of large language models in education: A systematic scoping review. In: *British Journal of Educational Technology*, 55 (1), pp. 90–112. doi.org/10.1111/bjet.13370.

- Yang, Tzu-Chi/Chen, Jian-Hua (2023): Pre-service teachers' perceptions and intentions regarding the use of chatbots through statistical and lag sequential analysis. In: *Computers & Education: Artificial Intelligence*, 4, 100119. doi.org/10.1016/j.caeai.2022.100119.
- Yildirim-Erbasli, Seyma N./Bulut, Okan (2023): Conversation-based Assessment: A novel approach to boosting test-taking effort in digital formative assessment. In: *Computers & Education: Artificial Intelligence*, 4, 100135. doi.org/10.1016/j.caeai.2023.100135.
- Zhang, Chengming/Schießl, Jessica/Plößl, Lea/Hofmann, Florian/Gläser-Zikuda, Michaela (2023): Acceptance of artificial intelligence among pre-service teachers: a multigroup analysis. In: *International Journal of Educational Technology in Higher Education*, 20, p. 49. doi.org/10.1186/s41239-023-00420-7.
- Zhang, Shilei/Shi, Rui/Yun, Liping/Li, Xuefei/Wang, Yun/He, Hongbin/Miao, Danmin (2015): Self-regulation and study-related health outcomes: A structural equation model of regulatory mode orientations, academic burnout, and engagement among university students. In: *Social Indicators Research*, 123 (2), pp. 585–599. doi.org/10.1007/s11205-014-0742-3.

Information on Authors



Anselm Böhmer, Dr., is a professor of General Education at Ludwigsburg University of Education (Germany). His research focuses on general educational theory, social inequality and education, and discrimination in the education system.

boehmer@ph-ludwigsburg.de | orcid.org/0000-0002-9592-3291

Marcella Dillig worked as researcher and lecturer at the Ludwigsburg University of Education, Germany. She studied Philosophy, Politics, Economics, and Law at the University of Stuttgart and the Leuphana University Lüneburg. Her interdisciplinary research encompasses the philosophy of artificial intelligence and social justice.

marcella-philomena.dillig@zlw.uni-stuttgart.de | orcid.org/0009-0004-6283-3371



Illie Isso has been working as a research assistant at the Ludwigsburg University of Education in the DAAD-funded IQ-Lab project since April 2023. He is also a doctoral candidate at the Ludwigsburg University of Education. Previously, he completed his teaching degree in history, ethics, technology, and physical education with the first state exam. His research interests include history, education in the context of social inequality, diversity, inclusion, and migration.

illie.isso@ph-ludwigsburg.de | orcid.org/0000-0002-1597-5789

Hilal Sahin is a Master's student in the teaching profession program at Ludwigsburg University of Education and an education research assistant. Her main research areas are communications, education policies, and digital technologies in education.

hilal.sahin@stud.ph-ludwigsburg.de | orcid.org/0009-0008-8709-296X



Aslihan Kuraner is a Bachelor's student enrolled in the teaching profession programme at Ludwigsburg University of Education, where she also serves as an education research assistant. Her primary research interests include storytelling, intercultural studies, and the integration of digital technologies in education.

aslihan.kuraner@stud.ph-ludwigsburg.de

Citation note:

Böhmer, Anselm/Dillig, Marcella/Isso, Illie/Sahin, Hilal/Kuraner, Aslihan (2024): Exploring Android Creativity: Empowering Human-Machine Interaction Through GenAI Persona Dialogues. In: *Ludwigsburger Beiträge zur Medienpädagogik – LBzM*, 24, pp. 1–25. doi.org/10.21240/lbzm/24/06.