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The human and artificial perception of class. The role of avatars in the interpretation of heterogeneity.

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Abstract: During the laboratory of Educational Technology held in the second year of the Primary Education Science degree course at the University of Foggia (a.y. 23-24), an activity was proposed to understand the possibility of using Artificial Intelligence in an educational context. The activity involved the creation of avatars representative of classroom imagery by future teachers. The aim of this contribution is to correlate the perception of heterogeneity possessed by the future teachers and the perception manifested by the AI tool used to create the avatars. The prompts constructed by the student teams and, subsequently, the avatars created were analysed in order to understand what representations of heterogeneity are perceived by the students and the AI. Typologies of teachers and students in the imaginary of future teachers were defined in order to better understand the dynamics of the representation of diversity in education.

Keywords: heterogeneity; Artificial Intelligence; avatar

1. Introduction

The advent of advanced technologies, such as Artificial Intelligence (AI), is radically reshaping the educational landscape, introducing new ways of teaching and learning that meet the needs of an increasingly diverse and technologically advanced educational environment (Chen, Chen & Lin, 2020). Integrating AI into teacher education not only enriches teaching through tools that improve engagement and learning effectiveness, but also offers innovative ways to personalize education according to students' individual needs (Celik et al., 2022). The use of AI systems can facilitate predictive analysis of learning needs, enabling teachers to adapt their instructional strategies in real time (Fissore et al., 2024). This personalization capability not only enhances the learning experience for students, but also prepares teachers to manage complex classroom dynamics more efficiently (Pratama, Sampelolo & Lura, 2023). A peculiar aspect of the teacher concerns the perception and management of classroom heterogeneity. Eden, Chisom and Adeniyi (2024) highlight how cultural competence has become indispensable in contemporary education. The authors propose concrete strategies for developing greater awareness of cultural diversity and for integrating inclusive approaches into the learning environment. Teacher training on these issues is essential to ensure that every student, regardless of cultural or social background, can feel valued and supported. Through the promotion of inclusiveness, a classroom environment is created that not only respects but celebrates diversity as

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an educational resource (Lindner et al.,2021). The implementation of avatars for personalization and inclusion in virtual reality platforms, as discussed in the research of Gualano et al. (2024), is useful in improving the self-representation of students, especially those with disabilities. This technology not only facilitates a greater degree of self-expression but can also improve students' accessibility and active participation in the digital learning environment. The use of personalized avatars helps overcome physical and psychological barriers, promoting a more inclusive and equitable educational experience for all (Alam & Mohanty, 2022).

This article aims to explore through a pilot study conducted at the University of Foggia of instances that emerge as fundamental in reformulating pedagogical approaches in the digital age, accentuating the importance of education that is technologically informed, culturally competent, and deeply inclusive. The opportunity to investigate this area of research allows for testing how the integration of advanced technologies, along with a conscious approach to cultural diversity and inclusion, can significantly improve teacher education.

2. Digital literacy and innovative classroom teaching. A pilot study

The present study aimed to investigate prospective teachers' perceptions of the concept of heterogeneity through the use of Artificial Intelligence (AI). This investigation took the form of an experiment conducted at the University of Foggia in the first semester of the 2023-2024 academic year. The objective was to critically examine in detail how through the use of Artificial Intelligence avatars representative of the differences that characterize a classroom can be made.

The context chosen for this investigation was the "Educational Technology" laboratory (3 CFUs - 36 hours), integrated into the Primary Education Science (LM-85a) curriculum. The lab recorded significant participation, involving 186 students out of a total cohort of potential 230 participants. There were 29 working groups. The workshop was entirely in-person, in six meetings lasting six hours each, without a final exam. During the different meetings, activities were proposed to the students to be carried out in groups, collected in an individual e-portfolio of multimedia products based on the course content and the activities carried out. This work allowed students to immerse themselves in cutting-edge and current topics:

1. DigiCompEdu and Google Education: In the first lesson, students explored the world of Google intended for education, with constant reference to the digital competencies provided for the profile of the modern teacher.

2. Google Classroom and assessment rubrics: During the second lesson, they focused on the creation and use of assessment rubrics through the functionality provided by Classroom, to simplify complex processes such as creating student assessment tools.

3. Assessment and E-portfolios: The third lesson concluded the discussion of the topic of assessment through the guided creation of an e-portfolio with Google Sites, which would meet the specific needs of the course through the acquisition of a general competence.

4. Game-based Learning and Responders - Kahoot!: Game-based learning through the use of digital devices, including responders, was explored in the fourth lesson. Kahoot! was explored in depth with a hands-on exercise.

5. Instructional use of Podcasts: The fifth lesson introduced the use of podcasts as a teaching tool. This topic allowed students to develop skills in creating and editing audio content, an increasingly relevant skill in today's educational landscape.

6. Avatars and Artificial Intelligence: In the sixth lesson, students addressed the topic of artificial intelligence, exploring its applications and implications in education through the creation of avatars.

The adoption of these innovative themes within the lab followed that emerging trend in higher education, in which the integration of digital technologies becomes critical to effective and engaging learning (Lacka, Wong, & Haddoud, 2021). The active, digital approach adopted in the course tried to provide a direct response to the needs of a generation of students accustomed to interacting with a variety of digital media, offering a more dynamic and interactive learning environment. In addition, the structure of the final delivery reflects a commitment to a more holistic assessment of students' skills, including critical thinking skills and practical application of knowledge. The e-portfolio, with its focus on topics such as responders, podcasts and artificial intelligence, not only sought to provide students with practical opportunities to develop digital skills, but also tried to stimulate critical thinking about the role of media in society and education. In this way, students were able to explore digital media not only as entertainment tools, but also as powerful platforms for learning, communication and creative expression.

3. Research questions

Beginning with the delivery of the sixth lesson, "Dividing into groups you are to create, with Artificial Intelligence, the avatars of a heterogeneous elementary school class, consisting of nine pupils and one teacher. Therefore, in each e-portfolio you will include, on the project page, the images created (by LensGo AI) and the corresponding textual description and prompt used (by ChatGpt)," this study begins to investigate the following objectives:

1. To analyze the representations of perceived heterogeneity
2. To examine discrepancies or convergences between human and artificial perceptions
3. Identify trends in the representation of heterogeneity among work groups

The main purpose is to analyze students' perceptions of perceived heterogeneity within an idealized class group. The analysis of artificial perceptions is outside the scope of this paper. The analysis of this aspect will be pursued next.

Therefore, the following research questions result:

RQ1: With respect to the identified perceptions, is there a typical teacher model?
RQ2: Can a type preference for idealized students be detected?

4. Materials and methods

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The data presented in this study were collected in the first stage of the analysis. Two corpora were created: a file with all the prompts used to make teacher images and a file with the prompts used for students. Next, the two files were analyzed with Voyant tools software (available for free at: https://voyant-tools.org/). Voyant Tools is an open-source program created for text analysis and interpretation. It supports a variety of file formats and allows individual documents to be analyzed and text corpora to be constructed, providing details on the structure of the corpus and the most recurrent words. The first file consists of 30 prompts intended to describe 30 teachers, totaling 890 words and with 295 unique word forms. The number of descriptions is greater than the number of groups because group No. 24 also included the support teacher. The second file consists of 262 prompts intended for the description of as many students divided into 29 classes, with a total of 7,021 total words and with 891 unique word forms.

After loading the two corpora independently, we open the five default windows (Cirrus, Reader, Trends, Summary and Contexts) for whose analysis we begin by excluding the stop word lists. We then proceed with lemmatization, which allows the different word forms to be brought under a single lemma to reconstruct a dictionary of the text from which frequency, distribution and concordance analysis can be carried out.

5. Results and discussion

From the analysis of the first corpus (teacher profile), the following word wall (Figure 1), was derived, which highlights the higher frequency of words used in the descriptions.

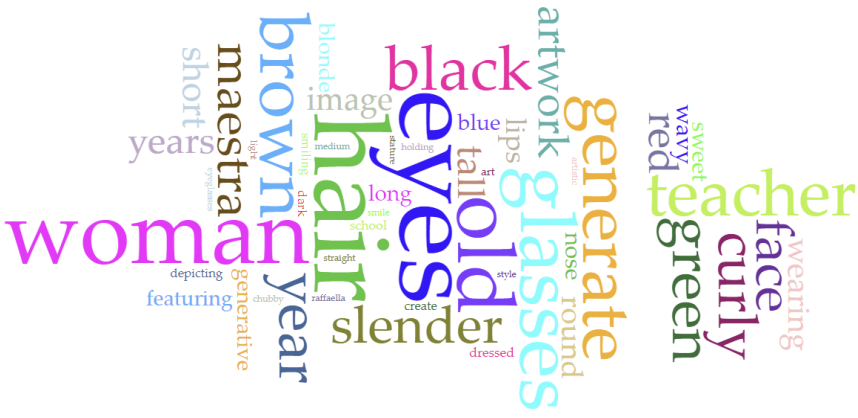


Figure 1. Wall of words teacher profile

It can be seen that in the imagery of prospective elementary school teachers there is a prevalence of the female gender (28 out of 30) and, from the descriptions, there is only one representation of the support teacher, which is of the male gender. Larger terms such as "woman," "hair," "teacher," "glasses," and "brown" suggest that the context could be that of a description of a woman teacher, with emphasis on brown eyes and hair and the presence of glasses. The combination of words such as "slender," "curly," and "dress" could indicate a detailed description of her physical ap-

pearance and style. At the same time, words such as "artwork," "create," and "generate" refer us to structural words in a prompt that impart the action to be performed by the AI.

As Figure 2 later show, the teacher profile is characterized by fairly similar traits that suggest a standardized model of the elementary school teacher, with few variations.

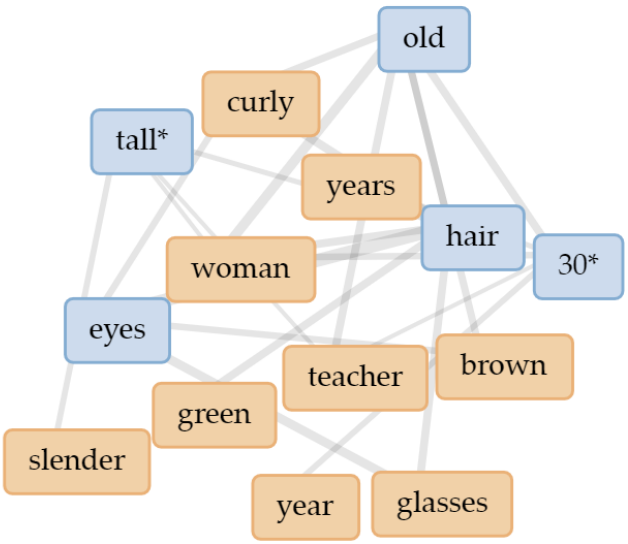


Figure 2. Teacher word frequency link

The idealized teacher is about 30 years old, tall and slender, with dark curly hair, and wears glasses. The match was immediately visible in the images made with AI (Figure 3)



Figure 3. Images of teachers made using AI

The pictures seem to represent a woman with features consistent with the terms highlighted in the word wall and tables. The teachers in the pictures have prominent eyes and wear glasses. At the same time, they have a style-curly hair, the use of glasses,

and elegant clothing-that ties in with terms such as "curly," "glasses," "tall," and "dress." The colors and style of the clothes and accessories they wear also relate to the terms "brown" and "green".

The analysis of the second corpus (student profile) yielded the following word wall (Figure 4), which highlights the higher frequency of words used in the descriptions.



Figure 4. Wall of words student profile

This word wall seems to represent a wide range of terms associated with students' physical characteristics and attributes. The largest words appear to be "eyes," "hair," "brown," "year," "boy," and "girl." There are, specifically, a preponderance of words that can be linked to physical appearance, such as "hair," "eyes," "nose," "lips", and descriptions such as "curly," "blonde," "dark," and "short." Several colors are present: "blue," "brown," "green," and "red," which can refer to both eyes and hair as well as other attributes such as clothing. Terms such as "slender," "tall," "wavy," "chubby," and "freckles" add additional physical details that enrich the depiction of the people described.

Also present in this word wall are the prompt's constituent words such as "artwork," "generative," "create," and "depicting."

From Figure 5 it is possible to understand the gender distribution among the students.

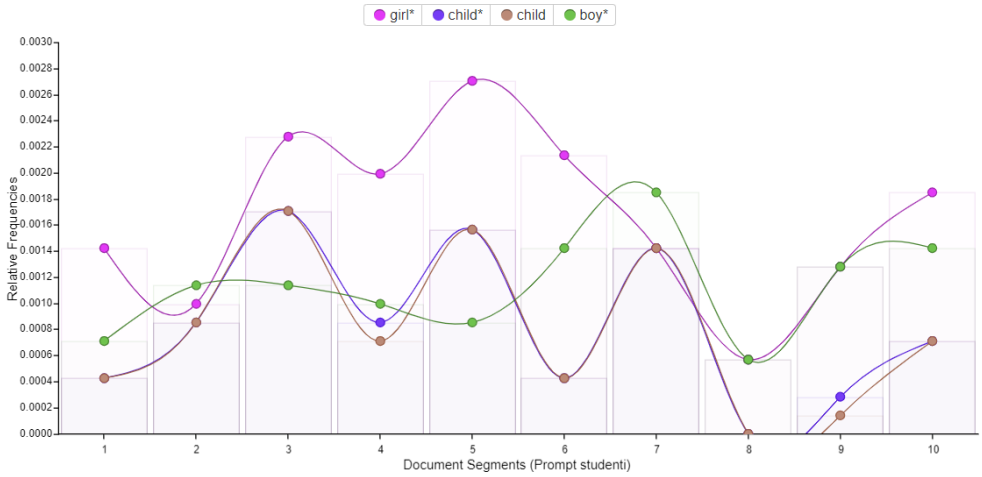


Figure 5. Gender definition term frequency diagram

The terms "girl" and "boy" show significant variation in their frequency patterns along the segments of the paper. In particular, "girl" tends to show a generally higher frequency in many segments than "boy." This suggests that the term "girl" is used more frequently or in more varied contexts in the document. The term "child" seems to maintain a lower and more consistent frequency than the terms "girl" and "boy." Looking at the graph and summing the frequencies of "child" with those of "girl" and "boy" for each document segment, however, we can examine how the overall use of terms referring to children is evenly distributed throughout the document, showing a more uniform representation of the two genders within the document.

As can be subsequently surmised from Figure 6, the student profile is characterized by two types with fairly characteristic traits that suggest a standardized model of the elementary school student for each gender, with some variations.

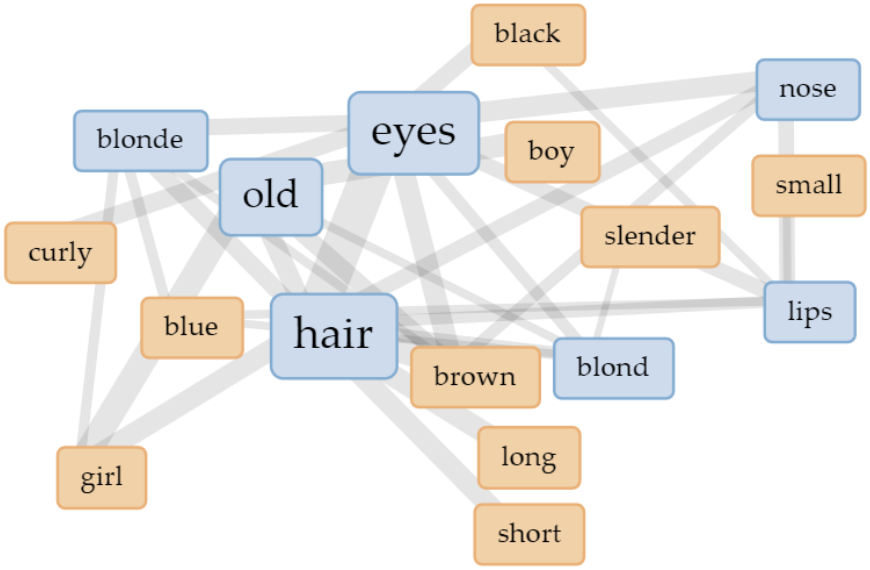


Figure 6. Teacher word frequency link

From the analysis of the diagram provided, two types of students can be inferred based on the connections between various physical and general attributes. One might hypothesize a child with blond, curly hair (which could be long or short), blue eyes with slimmer, smaller physical features, as indicated by the word "slender," with a "small" nose and lips. At the same time we infer a child with dark hair, preferably brown, long or short, dark eyes, again with slender physical features and small nose and lips. The match was immediately visible in the images made with AI (Figure 7):



Figure 7. Images of students made using AI

The images seem to represent just these two types of children. The little girl has long curly blond hair, very bright and well groomed. Her eyes are large and light blue, very expressive and bright. She shows a wide and genuine smile, conveying joy and lightheartedness. She wears a dress. He wears a blue suit that perfectly matches the color of his eyes, also suggesting attention to detail to enhance his features. The child has short, dark, straight hair that is neatly and traditionally cut, giving him a clean, reflective look. His eyes are very dark, possibly brown, and express an intensity and gravity, reflecting a perhaps more reserved character. His expression is more serious and thoughtful overall, much more restrained than the little girl on the left, which may suggest a more introspective or calm personality. She wears a black jacket with red details and a white T-shirt, which give an impression of understated simplicity and elegance.

In the realized images there is also the presence of students with Special Educational Needs and foreign students, as shown as examples in Figures 8 and 9. This choice was made by the prospective teachers to ensure heterogeneity within the idealized class group. Given the importance and complexity of the data, a dedicated study will be conducted for analysis.



Figure 8. Images of students with Special Educational Needs made using AI



Figure 9. Images of foreign students made using AI

At the end of the whole analysis, we will prepare an observation checklist with which to analyze the avatars made with AI through three steps:

STEP 1 - Quantify the distinctive characteristics of the prompts and the correspondence in the created avatars,

STEP 2 - Assess the correspondence between students' perceptions and AI-generated representations,

STEP 3 - Identify trends in the representation of diversity across teams.

6. Conclusions

The responses collected from the prompts suggest a significant variation in levels of awareness regarding diversity among prospective teachers. This indicates not only a disparity in their prior training experiences but also underscores the need to develop and implement more targeted and intensive training interventions. The integration of

these interventions is crucial to ensure that all teachers have the skills and sensitivity necessary to manage and value heterogeneity in classrooms (Larios & Zetlin, 2023).

The activity of confronting the concept of heterogeneity in an innovative context, such as the one proposed, has indeed fostered greater awareness of the role that technologies can play in representing and valuing diversity in educational settings (Kilag et al., 2023). Technologies, particularly artificial intelligence (AI), offer new opportunities to present and explore diversity in ways that can be more accessible and engaging for students. However, the use of AI must be guided by intense critical reflection to avoid the reproduction of stereotypes and to ensure that diversity is authentically represented and included in educational materials (Onesi-Ozigagun et al., 2024).

Despite the usefulness of AI as a teaching tool and as a means of exploring diversity, it is clear that this technology has significant limitations in contextualization. AI tends to standardize responses and may fail to capture the cultural and symbolic nuances that are central to human perceptions (Dimitriadou & Lanitis, 2023). This presents a major challenge in its educational use: while AI can effectively handle and analyze large amounts of data, its ability to understand and interpret cultural and individual complexities is still limited. Educators must therefore be mindful of these limitations when incorporating AI into their curricula, ensuring that the humanity and complexity of human interactions are not lost (Theophilou et al., 2023).

Even with the study's internal limitations, the research direction allows for the possibility of further investigation of potentially useful AI tools to improve diversity education, with careful consideration of its critical issues and guided by a conscious commitment to promoting authentic inclusion that respects all forms of human diversity.

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