

Embracing the future: the use of ChatGPT in Science Teacher Education

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Background and rationale

Our context is the master (and minor) in science education, a.k.a. STEM¹ teacher education. The student population consists of STEM people, who generally find it difficult to reflect on their learning as a teacher. Lately we found students had asked ChatGPT to write their reflection on teacher personal identity for them. Although this might be considered as fraud, it was also a smart thing to do and their question to ChatGPT also incorporated their reflection; it was the wordy writing part they left to the AI. This is just one example on how an AI can be both desirable and undesirable in STEM teacher education.

The versatile use of ChatGPT may have benefits in and for education (Trust, Whalen & Mouza 2023), but it comes with inherent drawbacks such as plagiarism since it is quite good at passing for instance engineering courses' assessments (Nicolic et al., 2023). This has caused the TU/e general examination committee to mark the use of ChatGPT specifically in exams as fraud.

Research so far has focused on seeing what the AI is capable of in terms of teaching, explaining physics or mathematics (Gregorcic & Pendrill, 2023; Kock, Salinas-Hernández, & Pepin, 2023) or writing papers (e.g. Kortemeyer, 2023; ACS, 2023). Initiatives have been taken on how to use a generative AI in writing academic papers including the proper way to reference to the use of it (ACS, 2023).

There are however also initiatives at TU/e and other universities to use ChatGPT in assignments and education rather than ban it outright (SURF, 2023). So far there has not been a study into the use ChatGPT in university science teacher education, although it has been advised to look into possibilities and to come to terms both in policy and practice on how the AI can be incorporated in teacher education and teaching (Trust, Whalen & Mouza, 2023). In this study we want to explore how ChatGPT could be used in university STEM teacher education within the 4TU teacher education institutes to come to balanced and well-considered suggestions for curriculum redesign in 4TU STEM teacher education courses and policy. Due to the nature of the master program, future high school science teachers practice will be innovated as a spin-off effect.

Research Question

What is the influence of a generative AI such as ChatGPT on science teacher education from student and teacher perspective?

Research Methodology

The research will be of qualitative nature, in that opinions and experience of people involved in STEM teacher education will be asked to participate. Data will be collected from each of the 4TU partners in STEM teacher education. Five teachers and 10 students in each STEM teacher education department will be asked to participate in sharing their experiences and views on using ChatGPT, based on their existing experience with this Generative AI, in or for

¹ Science, Technology, Engineering and Mathematics

their education or teaching. ChatGPT itself will also be asked for input on its use for STEM teacher education.

Respondents will be interviewed using a semi-structured interview format on the (possible) use of ChatGPT. A framework of predefined codes will be used to analyze the interviews. Codes are directly linked to the main questions: threats, possibilities and uncertainties; each per part of STEM teacher education (policy, internships - in the creative sense, pedagogic course content, assessment in all forms). Coded quotes will be transcribed in full. The results will be presented in the form of a practical framework for the use of ChatGPT in STEM teacher education policy and practice. The applicants hope to repeat the study three years hence, to compare the influence of Generative AI on STEM teacher education.

Ethics approval for this qualitative research has been obtained under number ERB2023ESoE7

KPI and dissemination

The research will provide a practical framework for the use of ChatGPT in STEM teacher education policy and practice.

The framework will be shared and implemented within the 4TU STEM teacher education departments.

Since these departments are all closely linked to secondary schools for the internships and research projects, it is expected the framework will also be shared and used within secondary education.

The applicants will host a 4TU seminar to explain the framework to other educational institutes (both universities of Applied Science as UNL) and teachers.

A paper will be written to share the results internationally, culminating in an international conference visit.

Risks

Possible risks are: a non-response of possible participants; the AI being taken off-line; the AI being banned from use all together by law or by universities.

Planning

Activities	Q4 - 22/23	Q1 23/24	Q2 23/24	Q3 23/24	Q4 23/24
Application project	█				
Ethics approval		█			
Participant acquiring			█		
Data collection				█	
Data analysis					█
Writing up results in paper					█
Preparing and presenting webinar					█
Publishing paper and webinar					█

Budget

The requested budget is meant for the entire project, all 4TU's together. All universities will add research time in kind, so 300h of the researcher's own time. To be able to afford an international conference, the budget for that is high, based on experience with for instance ESERA, budgeted here at 2,5k€ pp.

Expenses	TU/e	TU Delft	Utwente	WUR	estimation	cost
Projectmanagement	40	0	0	0	40	€ 3,000
Research time	100	50	0	0	150	€ 11,250
Research time in kind	100	50	0	0	150	€ 11,250
TA	70	45	45	0	160	€ 4,000
Travel cost (if online not possible)	4	0	0	0	4	€ 200
Webinar hosting	0.25	0.25	0.25	0.25	1	€ 0
International conference presentation (one repr. per ULO)	2500	2500	2500	0		€ 7,500
total	274h	145h	45h	0h		€ 25,950

References

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