

# Exploring Student and AI Generated Texts: Reflections on Reflection Texts

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<https://doi.org/10.34190/ejel.22.6.3473>

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**Abstract:** As pointed out by many scholars, Artificial Intelligence (AI) provides both opportunities and challenges in regard to assignments and examination in higher education. The accessibility and use of AI in regard to student assignments, examinations and assessments places demands on teachers' work in course design and formats of assignments and examination. For teachers, this work is a constant and continuous process, in line with the Scholarship of Teaching and Learning (SoTL) according to Boyer (1991). In order to meet these new demands, teachers need to reflect upon design, as reflective practitioners (Schön, 1987). Reflective design may alleviate the challenges with AI as well as make use of the opportunities with the use of AI. In this paper there are two sets of data. This study aspires to contribute to the current state of AI (ChatGPT) as it is applied in higher education through an empirical study of authentic reflection texts by students in comparison to AI (ChatGPT) generated texts. The first set of data is authentic reflection texts (N=20) written by students. The second set of data is texts generated by AI (ChatGPT). The texts are analysed using reflective thematic analysis (Braun & Clarke, 2019). The themes in the two sets of texts are described, analysed and compared. The two sets of data are then explored, analysed and compared to highlight similarities and differences between the authentic texts and the texts generated by AI. These insights may provide support for teachers in regard to the design of assignments and examinations as well as the practical use of AI (ChatGPT) in higher education.

**Keywords:** Assignments, Examination, Higher education, Reflection, Teachers

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## 1. Introduction

The many uses of Artificial Intelligence (AI) have been in focus as of late. This has been especially true in the area of higher education, where teachers debate the possibilities and challenges in using AI in education to support student learning. The issue, for example, has involved to use or not to use AI (ChatGPT) in education (Strzelecki, 2023). Policies and easy-to-understand guidelines for the use of language models in learning and teaching have been put in the forefront in order to support proper use of these tools and to limit the consequences for cheating (Rudolph, Tan & Tan, 2023). Neumann, Rauschenberger and Schön (2023) report five challenges and three opportunities for the use of AI in education. Challenges involve not knowing how students employ AI, different ways in which teachers evaluate AI, ideas on what is considered to be acceptable or unacceptable use, more time-consuming assessments and the uncertainty regarding the unknown potential of AI. However, Neumann, Rauschenberger and Schön (2023) also see possibilities such as increased virtual support for students, engaged creativity for teachers and students and potential for innovation.

Nevertheless, there is the need for teachers to critically evaluate AI resources and adapt it to their specific context. This places the focus on the importance of teacher's expertise, experience, and understanding of their students (Cooper, 2023) in order to support the use of AI. Thus, it is most likely that training in these tools is necessary, i. e. there is a need to conduct training for faculty and to make students aware of academic integrity (Rudolph, Tan & Tan, 2023). Thus, there is a need for further research on how AI tools can be adopted in teaching and learning (Strzelecki, 2023). In reflection, many of these studies provide important insights into the challenges of using AI in education, while some note possibilities. Nevertheless, beyond recommendations for training and the need to acknowledge critical issues, few studies delve deeper in the use of AI in practice in teaching and learning activities to support teachers' work with AI with students.

In higher education, the use of critical reflection is of importance for teachers as reflective practitioners (Bie, 2014; Schön, 1987). The importance of practicing reflection is necessary in order to develop in one's role as an educator, as an individual and as a member of a work group or group of colleagues, according to Bie (2014). Moreover, the use of reflection as learning tool is important to so see oneself (Bie, 2014). The idea of reflection as a tool for learning (Bie, 2014; Schön, 1987) is also important for teachers and students in order to continually

reflect upon in order to develop practice. The constant strife to develop teaching and learning is described as an exploratory approach to the role of teacher in line with Scholarship of Teaching and Learning (SoTL) according to Boyer (1991). As a reflective practitioner, the use of reflection as a tool for learning can also be seen as a tool for development of teaching and learning practices. However, for students, reflection as a tool for learning is sometimes difficult (Bie, 2014). Students may need support in learning to use reflection as a tool for learning as well as to achieve higher levels of reflection (Bie, 2014).

Hatton and Smith (1995) describe four levels of reflection: *Descriptive writing*, *descriptive reflection*, *dialogic reflection* and *critical reflection*. On the first level, descriptive writing, events and behaviour in a situation are described. This level involves mainly description and does not involve reflection. On the second level, descriptive reflection, students describe, based on personal opinions, or write how they think, act and explain the reasons behind the behaviour. This level could be said to involve attempts to reflect. On the third level, dialogic reflection, there is an inner reflective dialogue, in which underlying causes as well as alternative solutions and possible consequences are reflected upon and discussed. On the fourth level, critical reflection, reflection involves reflection from a broader perspective, for example, interaction with other people, or from a societal perspective. The gaze is lifted and the issue is reflected upon in a larger context.

In the light of this short background the notion of reflection as a tool for learning and the study of students' reflection texts and AI (ChatGPT) generated text is in focus in order to gain a wider understanding of the opportunities which AI (ChatGPT) can provide in teaching and learning in practice. The aim of this study is to explore, analyse and compare authentic student reflection texts with AI (ChatGPT) generated texts based on an assigned reflection task. The following research questions were posed: 1) *How can the content of the student texts be described?* 2) *How can the content of AI (ChatGPT) generated texts be described?* and 3) *Which similarities and differences can be seen?* These insights may provide support for teachers in regard to the design of assignments and examination as well as the practical use of AI (ChatGPT) in higher education.

## 2. Method

In order to meet this aim and these research questions, authentic reflection texts written by students (N=20) were analysed. These texts were written during a course for behavioral science students studying a basic education course during 2017. The students were asked to write a reflection text based on the following assignment using the course literature on reflection for pedagogues, Bie (2014). Bie (2014) is a handbook for pedagogues which presents reflections on reflection as a tool for learning in different educational contexts. The reflection assignment was:

*This task is about reflecting on your own learning process during this stage, based on Bie (2014). Some issues to reflect on can be your reading and processing of the literature, your fellow students as resources for learning in your learning process and also reflections on what you will be able to use your new knowledge in future studies and work.*

The texts were short texts, at the longest some 1,000 words. The students were informed about the analysis of the texts and the use for teaching and learning purposes. The students replied individually by e-mail, giving their approval for the use of the texts for the use in the study. The students' texts were analysed using thematic analysis (Braun & Clarke, 2012). Thematic analysis was seen to provide the possibility to analyse the texts through reading and re-reading as a reflective process. In this process, themes were derived and coded. The analysis was done first individually by the authors and the discussed together. In the student texts, the following four themes emerged: *Reflection as a tool for learning*, *Study groups (fellow students) a resource for learning*, *Content and course literature* and *Continued studies and future work*. In the analysis of the AI(ChatGPT) texts six themes emerged: *Introduction*, *Reading and processing the literature*, *Fellow students as a resource for learning*, *Use of new knowledge in future studies and work*, *General reflections on the learning process* and *Concrete suggestions*. In the analysis, the themes that emerged in the texts are presented and exemplified using quotations from the text. The student texts are identified as Text 1-Text 20 (T1-T20).

The same reflection assignment was then put forth in AI (ChatGPT). This process was done five times. Thereafter, the AI generated reflection texts were also analysed using thematic analysis (Braun & Clarke, 2012) in the same manner as the students' texts were analysed. The AI (ChatGPT) generated texts (N=5) are identified as AI1-AI5. Thereafter, the themes which emerged in the authentic student texts were compared with responses to the same question from AI (ChatGPT) generated texts.

### **3. Results**

In this section the results are presented according to the themes which emerged in the analysis. First, the student texts are presented, and thereafter the AI (ChatGPT) generated texts are presented.

#### **3.1 Authentic Student Texts**

In the student texts, the following themes were seen Reflection as a tool for learning, Study groups (fellow students) a resource for learning, Content and course literature and Continued studies and future work.

In the first theme, Reflection as a tool for learning, students wrote about study technique and study methods. The students also reflected on individual insights and reflections on how reflection can support learning. In this theme, students also reflected on own activities which they found to be important to support their own learning. One student reflected upon new study techniques:

*While reading, I try to "read with pen in hand", which is a piece of advice we received early in the course. It's often easier to remember and understand the most important and central parts of the course literature when I do this, but it sometimes feels difficult when I later try to understand my own notes. I need to work a bit on this technique, because I realize that it is probably the best for me as long as I get a bit more practice with it. (T11)*

Another student pointed out the importance of slowing down and taking time for reflection:

*Bie describes how it is important to reflect after an action and think through something that has happened. In my learning process I have realised how important it is to give myself time to reflect on what I have read to avoid "information cramming" (T2).*

In the second theme, students reflected upon *Study groups (fellow students) as a resource for learning*. This involved how students themselves contributed and took part in learning through the study group and with fellow students. Students also pointed out specific activities in the study group which they considered to support own learning and learning in the group. One student explained:

*Now the study group feels like one of the most important parts of the programme for me and I think we have reflected well together, maintained good ethical competence and thus increased the security of the group. We have begun to work more effectively together, and I really feel that I get a breadth in what I learn when I can read what my fellow students write and when we discuss the literature and different opinions together. (T8)*

Another student reflected upon working together in the study group in order to create a common understanding:

*My fellow students are incredibly important resources for my own learning and we talk a few times a week when we discuss different literature and what we have come up with. Sometimes we don't understand and then we can sort out and understand the meaning of the literature together. (T5)*

In the third theme students reflected upon the *Content and course literature*: This involved taking on the literature, course design and evaluations of the course literature. One student reflected on taking on the course literature:

*Thanks to the generous amount of time set aside for reading, I have had the pleasure of reading each chapter as thoroughly as I wish without having to prioritize and jump around the texts according to estimated relevance. I appreciate this because it gives me a better sense of coherence and overall picture of the literature (T14).*

By developing own study techniques, it was easier to have a comprehensive view of the course and the course literature. Progress in working with the literature was also noted by one student:

*I find this stage very rewarding and I notice how the processing of the literature goes more and more smoothly as time goes by. I have developed a working strategy for processing the literature that works well for me. It consists of taking notes while reading. I then use this when writing assignments and exams. Then I just go through the various documents on the computer to get a quick overview of what the literature is about. (T12).*

In this reflection, this student expresses an interesting aspect regarding own negotiation concerning own resistance concerning reading and reflection and the process in the transition in understanding, from sometimes very clear and sometimes quite obscure.

The fourth theme, *Continued studies and future work*, comprised reflections concerning how students reflected on how to use the new knowledge gained in future work. This also involved how new knowledge in continued studies as well as the importance of the new knowledge for studies and work:

*What I take with me as a future behavioral scientist when it comes to assessment, selection and recruitment is that self-awareness, knowledge of how knowledge and competences can be assessed but also how I can use this knowledge in practice in, for example, assessment and selection in a recruitment process. Knowledge, understanding in the main field of pedagogy and self-awareness are important to be able to make fair and reliable assessments. Another understanding that the course component has contributed to is the importance of lifelong learning in today's knowledge society and how individuals must increasingly take responsibility for their own employability. (T13)*

Another student reflected upon gaining a holistic view of processes and concepts that may be of importance in future studies and work through collaboration:

*After this part, I have reflected on the importance of a thorough and well-designed recruitment process when a company is looking for new employees. I have also learnt about the concept of employability and its importance in today's society. Without any major experience in the field, I now have a completely different knowledge about assessment, recruitment and selection. I have also reflected on the importance of co-operation and reflective discussions and how instructive it is. Furthermore, I believe that the knowledge I have acquired during the module can be very useful for future studies/work (T6).*

In summary, the reflection assignments written by the students provided in-depth insights into new knowledge regarding their learning in reflection. Here, students reflected upon new learning for themselves as individuals as well as in their study groups and fellow students. Students also reflected on how the course content and literature had been beneficial in their own learning and how the new knowledge they had attained would have impact on their learning in their future studies and work.

### 3.2 AI (ChatGPT) Generated Texts

In this section, the analysis of the AI (ChatGPT) generated texts is presented. When the reflection assignment was posed to AI (ChatGPT), the first part of the text was an introduction to the reflection assignment and six themes emerged. Here, the themes included: *Introduction, Reading and processing the literature, Fellow students as a resource for learning, Use of new knowledge in future studies and work, General reflections on the learning process and Concrete suggestions.*

In the first theme, *Introduction*, the text included information as well as apology for not being able to provide specific answers in regard to course literature at hand, Bie (2014). In this sense, AI (ChatGPT) replied to the reflection assignment in line with answering that *unfortunately, I cannot help you with answers about specific literature* in different in several different ways:

*Unfortunately, I do not have any specific information on Bie (2014) or details on the particular sub-section you are referring to (A11).*

*I apologize for any confusion, but I have no specific information on Bie (2014). (A12).*

One interesting finding was that as the reflection assignment was posed to ChatGPT several times, what could be said to be impatience was noted in in the text:

*I still have no information about Bie (2014), but I can help you create reflection questions based on the general aspects of learning. (A15)*

Another finding was that ChatGPT offered several different methods of possibilities for further help, for example "I can help you with several reflection questions to help you work further .... general guidelines" (A11) as well as "general questions" (A13) "questions" (A14) and "some questions" (A15). In summary, the first part of the texts could be said to be a limitation of the possibilities to provide specific information regarding the specific course literature as well as providing questions to support further work.

In the second theme, *Reading and processing the literature*, the responses in the AI (ChatGPT) generated text provided reflection questions which supported reading and processing the course literature:

*How did you structure your reading of the literature? Did you use any special strategies or techniques? What challenges did you encounter during your reading, and how did you overcome them? (AI1)*

These reflection questions referred to the methods used to read and process the literature as well key concepts and theories in relation to understanding and learning through the work with the literature. In these questions the reference to the literature was included:

*What method did you use to read and process the material from Bie (2014)? Are there any key concepts or theories from the text that influenced your understanding of the topic? (AI3)*

*Which main ideas or concepts from Bie (2014) were particularly relevant for this sub-step (AI5)?*

The third theme was related to *Fellow students as a resource for learning*. Here, the texts provided responses which provided reflection questions for identifying and describing how fellow students were seen as a resource for learning. These responses provoked further reflection into methods of collaboration and interaction with fellow students as a resource or tool for learning and understanding:

*How did you use your fellow students as a resource for learning? Were there any specific collaboration methods that worked well? (AI1)*

*How has interaction with fellow students affected your understanding of the topic? (AI2)*

Other questions for support in reflection were providing specific examples which provided students with learning opportunities:

*Can you point to any specific examples where you have learned from your peers or vice versa? (AI5)*

In the fourth theme, *Use of new knowledge in future studies and work*, the AI generated texts provided responses with reflection questions regarding new knowledge, skills or insights which could be seen as important for future studies.

*How do you think the new knowledge you have acquired will be useful in your future studies? (AI1)*

*Can you identify specific skills or insights that you can apply in your future career? Are there any areas where you see opportunities to continue learning and developing your skills? (AI1)*

This also involved skills development for the future profession. Here, the AI generated texts and reflection questions pointed out the necessity to first identify and then reflect upon how these skills could be of use and of importance in future work:

*Can you identify specific skills or insights from this module that you think will be useful in your future work? (AI4)*

This theme also included more individual, or personal reflections on own learning. For example, these reflection questions noted the identification and further work with reflection as a tool for continued learning and development:

*What were the most meaningful parts of the learning process for you personally? Are there any aspects of the studies that you would like to improve or deepen further? (AI1)*

The fifth theme which emerged was *General reflections* on the learning process. In this theme the reflection questions in the AI (ChatGPT) generated texts were focused on reflection upon learning and changes in learning due to new knowledge attained in the learning process:

*Have your views on the topic changed or evolved during this stage? Is there anything you would do differently if you had the opportunity to go back and re-evaluate your approach? (AI4)*

*What were the most meaningful parts of the learning process for you personally? Are there any aspects of the studies that you would like to improve or deepen further? (AI1)*

*Have your views on the topic changed or evolved during this stage? Is there anything you would do differently if you had the opportunity to go back and re-evaluate your approach? (AI4)*

In summary, these reflection questions provided a base for meta-reflection regarding learning, learning processes and evaluation of these learning processes.

The sixth and final theme *Concrete examples* referred to reflection questions which asked specifically for concrete examples to provide in the reflection assignment. In the AI (ChatGPT) generated texts, concrete examples, or specific examples were suggested to provided examples of learning processes and new knowledge:

*Try to be as concrete as possible when reflecting on these questions. Link your answers to specific examples or events during the learning process to make your reflection more meaningful and useful for your further development. (AI2)*

*Use these questions as a basis and adapt them to your own experiences and learnings from the specific module. It is important to be as concrete as possible to gain deeper insights and use the reflection as a tool for personal and professional development (AI5). This theme could be said to connect reflection as a tool for learning in theory with concrete examples in practice as a base for reflection.*

In summary, the results of this study show that the content in the authentic student texts can be described as individual, personal, reflective texts related to study methods and study techniques for learning used both individually and in study groups with fellow students. Reflection as a tool for learning and knowledge is then extended and identified as a tool for learning in future studies and work. The content in the AI (ChatGPT) generated texts, which perhaps could be considered to be somewhat surprising, did not provide individual or personal reflections related to reflection as a tool for learning and new knowledge, but instead provided a battery of supportive and in-depth reflection questions as inspiration for writing the reflection assignment.

#### 4. Discussion

The aim of this study was to explore, analyse and compare authentic student reflection texts with AI (ChatGPT)generated texts based on an assigned reflection task. The following research questions were posed: 1) How can the content of the student texts be described? 2) How can the content of AI (ChatGPT) generated texts be described? and 3) Which similarities and differences can be seen?

The findings in this study show that the AI (ChatGPT) generated texts provided reflection questions which are of an in-depth nature. Thus, in this study the use of AI (ChatGPT) generated texts did not provided students with answers to the assignment which could be submitted for grading. Therefore, in this study, the realization of the use of AI (ChatGPT) could not be seen as a challenge in regard to cheating (Neumann, Rauschenberger & Schön, 2023; Rudolph, Tan & Tan, 2023). On the contrary, the AI (ChatGPT) responses to the reflection assignment in this study could instead be seen as an opportunity to support students' further work with the assignment.

Reflection as a tool for learning is not an easy task (Bie, 2014). Many students may have difficulties in writing reflection texts as well as achieving higher levels of reflection in reflection texts (Hatton & Smith, 1995). Here, it is possible that the reflection questions are concrete and can help students to expand and advance their use of reflection as a tool for learning. Further, the in-depth reflection questions are directed to the students themselves. The reflection questions target the identification and description of specific or concrete examples as evidence for learning through reflection. This can provide support for students when reviewing their own learning, reflecting upon their own study strategies and providing inspiration for further reflection regarding learning, both individually and in study groups with fellow students or peers.

In this study, reflection as a tool for learning, was explored related to future studies and work. In reflection, work with students could also involve important ethical implications regarding the use of AI educational contexts. Teachers' work with AI together with students could be directed toward other important issues such as academic integrity, privacy issues and data security. These issues could also be involved in tailored or model assignments for use in practice, for example for student teachers in their work with pupils in different education contexts. Here, both the teacher student perspective and the pupil perspective could provide insights from the tools from the learner perspective. These aspects would provide opportunities for teachers and students to both learn *about* AI and *with* AI to deepen teaching and learning, offering valuable insights in theory and practice.

As teachers in higher education, work in line with reflection as a tool for learning in teaching in higher education, the findings of this study warrant further reflection. As noted above, in this study, the AI (ChatGPT) generated texts did not provide students with texts that they could submit. Therefore, as teachers, concerns and apprehension regarding the use of AI (ChatGPT) as a tool for cheating were not relevant. Instead, the AI (ChatGPT) generated texts provide further support for students to achieve deeper reflection. This line of thought leads to the analysis of the critical levels of reflection in regard to AI and student generated texts. Reflective analysis may perhaps offer deeper insights in how AI can or cannot mimic complex human cognitive processes, such as deep levels of reflection and critical thinking. As reflective practitioners, one reflection is that these in-

depth reflection questions may support students in their individual work but would most likely provide even more support if used under the supervision of teachers. In regard to accessibility and inclusion, this may especially be true for students who lack the technical infrastructure for these tools. For students with disabilities, the integration of AI may provide extended opportunities for enhanced learning. Moreover, given the importance of AI in technology enhanced learning environments and e-learning environments, the findings of this study may also be applied to enhance learning in remote and online learning environments. Furthermore, used well, AI (ChatGPT) may support teachers' work through the formulation of assignments (Cooper, 2023). For example, it is possible that some the reflection questions generated by AI (ChatGPT) could be integrated into the reflection assignment in the future. However, this work will involve pedagogical discussion in teacher groups regarding the challenges and opportunities of AI in education (Neumann, Rauschenberger & Schön, 2023; Strzelecki, 2023). Beyond the challenges and opportunities for teaching and learning which AI provides at present, future technologies and advancement in AI will most likely have strong impact on educational contexts. This strong impact may have the potential to transform teaching and learning and therefore offering exciting and expansive venues for future research.

## **5. Future Research**

One of the limitations in this study is that the sample of both authentic student texts and AI (ChatGPT) generated texts is small. Thus, this study could be expanded to a larger sample and the study of different types of reflection questions. Continued work with AI (ChatGPT), as well as with other AI models, to support reflection as a tool for learning for students should involve students in order to gain important insights from the learner perspective. Case studies which involve students in the comparative analysis regarding the effectiveness of these different tools, could also provide insights from students as learners regarding how the current technologies in use enable and hinder collaborative learning. Therefore, future studies should involve students in questions concerning how AI (ChatGPT) can be used to support student learning as well as the study of what challenges and opportunities students see in this work. Practical applications in practice could take issues on academic integrity, privacy issues and data security where teachers integrate AI in teaching and learning activities and employ AI for deeper reflective questioning and discussion. Larger empirical studies which involve teachers in higher education, related to assignments and assessment and the use of AI (ChatGPT) would provide insights into the challenges, as well more balanced insights in the opportunities for the use of AI (ChatGPT) in higher education. Further, interdisciplinary studies involving cognitive science, ethics and technology enhanced learning could also provide a wider, richer and more nuanced analysis of the implications in practice and in theory of the use of AI in education to support teaching and learning.

### **Funding**

No funding was received for the work with this article.

### **Conflict of interest**

The authors declare no conflict of interest.

### **Ethics statement**

An ethics approval was not required for this study.

## **Acknowledgements**

We would like to acknowledge the students in this study, whose texts made this study possible.

## **References**

- Bie, K. (2014). *Reflektionsboken för pedagoger* [Reflection book for pedagogues]. Gleerups.
- Boyer, E. (1991). Highlights of the Carnegie report. The Scholarship of Teaching from "Scholarship reconsidered: Priorities of the Professoriate". *College Teaching*, 39(1), 11-13.
- Braun, V. & Clarke, V. (2012). Thematic analysis. In: H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Red.), *APA handbook of research methods in psychology, vol. 2: Research designs: Quantitative, qualitative, neuropsychological, and biological* (s. 57–71). American Psychological Association.
- Cooper, G. (2023). Examining science education in chatgpt: An exploratory study of generative artificial intelligence. *Journal of Science Education and Technology*, 32(3), 444-452.
- Hatton, S. & Smith, D. (1995). Reflection in teacher education: Towards definition and implementation. *Teaching & Teacher Education*, 11(1), 33-49.

- Neumann, M., Rauschenberger, M., & Schön, E. M. (2023). "We Need To Talk About ChatGPT": *The Future of AI and Higher Education. Hochschule Hannover, 2002*(1), 1–4.
- Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?. *Journal of Applied Learning and Teaching, 6*(1).
- Schön, D. (1987). *Educating the reflective practitioner. Toward a new design for teaching and learning in the profession.* Jossey Bass.
- Strzelecki, A. (2023). To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology. *Interactive Learning Environments, 1-14.*