

STUDENT PERCEPTIONS OF AI-POWERED WRITING TOOLS: TOWARDS INDIVIDUALIZED TEACHING STRATEGIES

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ABSTRACT

Due to the advances of artificial intelligence (AI) and natural language processing, new kinds of Internet-based writing tools have emerged. Among other things, these AI-powered writing tools can be used by students for text translation, to improve spelling or for rewriting and summarizing texts. On the one hand, they can provide detailed recommendations for the adaptation of text elements within seconds. On the other hand, they also produce inconsistencies and errors, that students might not be aware of. How to deal with these tools in an educational context is a difficult question. Since writing tools are usually used unsupervised and without further instructions, students may need guidance from the teacher in interacting with those tools, to prevent the risk of misapplication. To better understand this underlying issue, the paper at hand uses survey data of 365 freshmen students to describe and analyze student perceptions of AI-powered writing tools. Regarding AI-powered writing tools, different student types were identified by using the k-means clustering method. The results suggest that students have different attitudes towards AI-powered writing tools. Some students may use them in an unreflective, non-sceptical way, which can lead to (un)voluntary plagiarism. Other students may not use writing tools at all, partly because they are sceptic, but also because they may lack meaningful learning strategies in general (course repeaters). Depending on the different student types, individualized teaching strategies might be helpful to promote or urge caution in the use of these tools.

KEYWORDS

Artificial Intelligence in Education, Writing Tools, Writing Competencies, Language Learning, Student-Centered Learning, K-Means Clustering

1. INTRODUCTION

The digital age is changing the way we learn and brings with it new tools that can support us in many ways. In the field of academic writing and language learning, students' writing habits are changing due to the rise of new technologies and the Internet (Moore et al., 2016; Peters & Cadieux, 2019). Advances in artificial intelligence (AI) and natural language processing lead to language and writing tools, that become increasingly powerful (Geitgey, 2018; Brown et al., 2020; Heaven, 2020). New kind of AI-powered writing tools have emerged (see e.g., Rogerson & McCarthy, 2017; Prentice & Kinden, 2018) that are often freely available on the Internet.

Among other things, these *AI-powered writing tools* can be used for *text translation* (e.g., www.deepl.com, <https://translate.google.com>), to *improve spelling* (e.g., <https://mentor.duden.de>), for *text analysis* (e.g., <https://hemingwayapp.com>), for *rewriting and summarizing texts* (e.g., <https://quillbot.com>) or for *plagiarism checks* (e.g., <https://www.grammarly.com/plagiarism-checker>). These tools can provide detailed suggestions and recommendations for the adaptation of text elements within seconds. However, they also produce inconsistencies and errors, that may not be obvious to all students (Rogerson & McCarthy, 2017).

People are raising their voices to warn about the dangers of these digital writing tools and their potential misuse, which could lead, among other things, to new types of plagiarism (see e.g., Rogerson & McCarthy, 2017; Prentice & Kinden, 2018). Since text content can be quickly and easily changed and reused, there is a danger that students will un-sceptically follow the recommendations of digital writing tools without critically

questioning them. An important function of *writing* is to construct one's own identity (e.g., Ivanic, 1998), but also to develop meaningful arguments and points of view (e.g., Van Eemeren & Grootendorst, 2016). Is there a risk of losing these competences, when we increasingly rely on AI-powered writing tools, who support us in our writing?

How to deal with these tools in an educational context is still largely an unexplored field. Given the fact that these tools are freely available on the Internet, a straight ban for these tools inside the classroom may not be effective, as students might use them anyway at home. Since AI-powered writing tools are usually used unsupervised and without further instructions (no possibility to ask questions), students may need guidance and support from the teacher in interacting with those tools. Otherwise, there is a risk of misapplication such as intentional, or unintentional plagiarism as well as the unreflective adoption of recommendations (see e.g., Rogerson & McCarthy, 2017; Prentice & Kinden, 2018). Kranzberg (1986, p. 545) said, that "technology is neither good nor bad; nor is it neutral". Depending on the circumstances and the context, a given technology may lead to different results (Kranzberg, 1986, pp. 545-548). Therefore, the goal should be to better understand student perceptions of AI-powered writing tools, to better grasp the circumstances in which the use of such tools may be appropriate, and to develop teaching methods that are more individually adapted to specific student needs. In light of the identified research desideratum, the following research question should be addressed:

What attitudes do freshmen students have towards AI-powered writing tools?

The objectives of the paper at hand are therefore twofold:

- describing and analyzing student perceptions of AI-powered writing tools, to obtain a nuanced picture and evaluate underlying assumptions;
- identifying different student stereotypes regarding AI-powered writing tools, to reflect on meaningful, individualized teaching strategies for these tools.

For this purpose, survey data from 365 freshmen students at the University of St.Gallen in Switzerland are analyzed. The survey data was collected in September 2021 during the first-semester course "Introduction to Academic Writing" via the survey tool Unipark (<https://www.unipark.com/en>). To identify meaningful student types, the k-means cluster analysis was used.

From a theoretical point of view, the paper at hand can serve as a starting point for future research as it categorizes student perceptions in a systematic way and highlights important variables related to AI-powered writing tools. From a practical standpoint, the paper at hand may be valuable for (language) teachers, who are interested in the implications of AI-powered writing tools and look for ways, how to address and deal with them. The identified student clusters may help to better understand the individual student standpoints, when teaching with or about AI-powered writing tools.

To this end, section 2 further elaborates on the method used in this paper and describes the survey and the setting in which it was conducted. Section 3 shows the survey results. While section 3.1 describes and analyzes the stated student perceptions of AI-powered writing tools, section 3.2 uses the k-means clustering method to identify different student types. Section 4 wraps up the previous findings and discusses them critically. Section 5 concludes with some final remarks.

2. METHOD

The survey was conducted in fall term 2021 in the first-semester course "Introduction to academic writing" (IAW), which is mandatory for all 1615 freshmen at the University of St.Gallen. The course has an English track (510 students) and a German one (1105 students). In the course, students learn necessary skills for writing their own scientific paper (e.g., finding and narrowing down a topic, conducting literature research). During the on-site kick-off lecture, students were introduced to different projects in the field of artificial intelligence (e.g., IBM Project Debater). In addition, several videos gave an overview of different writing tools that can be used amongst other things for text translation, spelling, text analysis, summarizing or plagiarism checks (one of the videos shown was: <https://www.youtube.com/watch?v=4I-F-mj2014>).

After the initial kick-off lecture, students were asked to complete the voluntary 20 minutes online survey. In total, 370 of 1615 students participated (23%). 5 entries had to be removed because of missing values but for 365 participants all necessary information could be gathered. Table 1 gives an overview over the student participants.

Table 1. Participant Description: Summary of Features

Feature	Mean	St. Dev.	Min	Max	Scale
Age (number of years)	19.68	1.489	17	27	Integer (0-99)
Gender (1=female)	0.375	-	0	1	Binary (0 / 1)
Language track (1= English)	0.362	-	0	1	Binary (0 / 1)
Course attendance (1= first try)	0.901	-	0	1	Binary (0 / 1)
Socioeconomic status	0.833	0.237	0	1	Decimal (0-1)
Attitude towards writing	2.749	0.847	1	5	5-point Likert scale (1-5)
Self-efficacy in relation to studying	3.756	0.719	1.33	5	5-point Likert scale (1-5)
Big-5-Openness	3.433	0.768	1	5	5-point Likert scale (1-5)
Big-5-Conscientiousness	3.474	0.820	1	5	5-point Likert scale (1-5)

Number of observations = 365.

On average student participants were 19.68 years old. 37.5% of the participants were female (62.5% male), and 36.2% of the participants were enlisted in the English track (63.8% in the German track). Most of the participants attended the course for the first time (90.1%), as only 9.9% of the participants had to repeat the course. An instrument for the *socioeconomic status* was created by using the *numbers of books in the parents' household* as well as the *highest educational level of either mother or father*. Four questions related to writing (e.g., writing is a hobby of mine) were used to build the instrument *attitude towards writing*, which was measured on a 5-point Likert scale (Disagree strongly, Disagree a little, Neutral, Agree a little, Agree strongly). Six questions related to self-efficacy (e.g., I am confident that I can use the time available for exam preparation productively for learning) were used to build the instrument *self-efficacy in relation to studying*. In addition, the big five inventory (BFI-10) was used to capture personality traits (see Rammstedt et al., 2014).

3. RESULTS

3.1 Student Perceptions of AI-Powered Writing Tools

The 365 participants were asked on a 5-point scale (ranging from *Completely useless*, *Somewhat useless*, *Neutral*, *Somewhat useful*, *Very Useful*), how useful they find AI-powered writing tools with regard to *text translation* (e.g., DeepL, Google Translate), *spelling* (e.g., Duden-Mentor), *text analysis* (e.g., Hemmingwayapp), *summarizing* (e.g., Quillbot) and *plagiarism checking* (e.g., Grammarly). For each category, an example of a writing tool was given that the students had learned about in the kick-off lecture. Table 2 gives an overview over the stated student perceptions.

Table 2. Variables related to AI-powered writing tools

Feature	Mean	Median	St. Dev.	Min	Max
Perceived usefulness text translation	4.573	5	0.762	1	5
Perceived usefulness spelling	4.162	4	0.895	1	5
Perceived usefulness text analysis	3.879	4	0.915	1	5
Perceived usefulness summarizing	3.748	4	0.942	1	5
Perceived usefulness plagiarism check	4.359	5	0.858	1	5

Number of observations = 365. 5-point scale used.

The overall perception of students regarding the usefulness of writing tools is positive. *Text translation tools* are rated the most useful, followed by tools for *plagiarism checking* and tools to *improve spelling*. Writing tools for *text analysis* or tools for *summarizing texts* are considered comparatively less useful.

In addition, all participants were asked the following three open-ended questions:

- 1) "In your opinion, what are the advantages of AI-powered writing tools?"
- 2) "In your opinion, what are the disadvantages of AI-powered writing tools?"
- 3) "What ethical concerns do you have regarding the use of AI-powered writing tools?"

268 of 365 students (73.4%) answered these voluntary questions and Table 3 shows examples of different student responses. Based on the information provided in the open-ended questions, each student was assigned into one of five attitude levels towards AI-powered writing tools (*positive, rather positive, differentiated/nuanced, rather negative, negative*). 76 participants (28.4%) had a clearly *positive* attitude towards AI-powered writing tools, as they mentioned only advantages but no disadvantages or ethical concerns with regard to these tools (see Table 3). 59 participants (22%) had a *rather positive* attitude as they mentioned advantages together with only few minor concerns. 108 participants (40.3%) had a *differentiated/nuanced* attitude towards AI-powered writing tools, as they mentioned advantages as well as disadvantages and ethical concerns in a differentiated way. 21 participants (7.8%) had a *rather negative* attitude towards AI-powered writing tools, as they explicitly stated disadvantages or ethical concerns combined with only minor perceived advantages (e.g., fast, second view). 4 participants (1.5%) had a *negative* attitude towards these tools, as they stated only disadvantages or ethical concerns.

Overall, 135 participants (50.4%) had a *positive* or *rather positive* attitude, 108 participants (40.3%) a *differentiated/nuanced* attitude and only 25 participants (9.3%) a *rather negative* or *negative* attitude towards AI-powered writing tools.

Table 3. Student perceptions of AI-powered writing tools: examples of student responses

Assigned attitude level	Perceived advantages	Perceived disadvantages	Ethical concerns	(#n)	(%)
5 = Positive	"No spelling mistakes."	"Can't think of any."	"None."	76	28.4
4 = Rather positive	"Fast, cheap and available 24/7."	"Not always as accurate as specialists."	"I do not know yet."	59	22
3 = Differentiated/ Nuanced	"Assisting: Spelling, Translation etc."	"Can be misleading, if one does not know the exact meaning or context of certain words, e.g., synonyms can have different meaning and context."	"Makes certain jobs redundant."	108	40.3
2 = Rather negative	"Fast, second view."	"You shouldn't just let the AI write your text."	-	21	7.8
1 = Negative	-	"I really don't like so therefore no advantages for me."	-	4	1.5

Number of observations = 268.

Different advantages were mentioned by the students with regard to AI-powered writing tools. Most students mentioned just one advantage (n=184) of using AI-powered writing tools, but some also stated two (n=59) or three (n=11). The mentioned advantages were grouped into four broad categories, which are depicted in Table 4. Most students mentioned either *quality* (47.8%) or *efficiency* (43.7%) as an advantage of using AI-powered writing tools (see Table 4). The aspect that these tools are always *available* on the Internet and can provide "quick support anytime and anywhere" was mentioned by 25.7% of the participants. Roughly 9% of the participants also stated advantages that relate to the complementary skill set between humans and smart machines (*human augmentation*). For example, AI-powered writing tools might be helpful for "finding things humans might overlook", because they provide a "chance to double-check" or because they may serve as a "back-up and self-control".

Table 4. Perceived advantages with regard to AI-powered writing tools

Advantage	Example 1	Example 2	(#n)	(%)
Quality	"Precise and correct"	"Improve writing skills"	128	47.8
Efficiency	"fast & efficient"	"efficient feedback"	117	43.7
Availability	"Quick support anytime and anywhere"	"Easy to use and always available"	69	25.7
Human augmentation	"Finding things humans might overlook"	"Chance to double-check"	23	8.6
No advantages mentioned	-	-	2	0.7

Number of observations = 268. Students have sometimes expressed zero or more than just one concern. Therefore, the sum of the partial percentages is higher than 100 percent.

Different disadvantages and concerns were mentioned by the students with regard to AI-powered writing tools. Most students mentioned just one disadvantage or concern (n=154) of using AI-powered writing tools, but some also stated two (n=65), three (n=3) or five (n=1). The mentioned disadvantages and concerns were grouped into six categories, which are depicted in Table 5.

Table 5. Perceived disadvantages and concerns with regard to AI-powered writing tools

Concern	Example 1	Example 2	(#n)	(%)
Accuracy	"Not always as accurate as specialists."	"Sometimes wrong translation/words: not fully developed sometimes."	139	51.9
Influence on own writing	"Humans getting lazy and loosing basic writing skills."	"My big question is: is it really still your text or the text of the tool?"	62	23.1
Human replacement	"Take away human jobs."	"Lecturers could be made redundant."	49	18.3
Data abuse	"How data is processed and stored, and who might have access to and what might be done with it."	"Misuse of the data."	35	13.1
Plagiarism	"Will it start fostering plagiarism?"	"Sometimes it is like cheating".	12	4.4
Fairness	"it's rather unfair, no access -> disadvantage."	"Easier to get good grades."	5	1.9
No Concerns at all	"None."	-	43	16

Number of observations = 268. Students have sometimes expressed zero or more than just one concern. Therefore, the sum of the partial percentages is higher than 100 percent.

The limited *accuracy* is seen by most students (51.9%) as a major disadvantage and concern of today's AI-powered writing tools. 23.1% of the students stated, that using AI-powered writing tools have *influence on their own writing*. For example, students said that these tools make them lazy, that they hinder their learning of how to write good texts, that they take away the individual writing style or that they become dependent from these tools. 18.3% of the students stated reasons addressing *human replacement*, such as the loss of jobs or the replacement of teachers, lecturers and translators due to these writing tools. 13.1% of the students mentioned concerns in relation to *data abuse*, such as data leaks, privacy breaches or espionage. 4.4% of the students stated *plagiarism* concerns as these tools can support the act of writing in so many aspects. 1.9% of the participants also argued, that such tools raise *fairness* considerations, as it may be easier to get good grades using such tools. In addition, not all the tools are available for free which may be unfair for the students who cannot afford paid subscription plans.

3.2 Cluster Analysis: On the Lookout for Different Student Types

The previous section described overall student perceptions of AI-powered writing tools. However, students' perceptions of AI-powered writing tools may be quite heterogeneous. They may range from students who like the tools very much and at the same time critically reflect them, to students who do not like them and possibly do not use them at all. If we could identify specific types of students, students could be trained more individually and appropriately in dealing with AI-powered writing tools. Clustering could be used to identify homogenous groups of students with similar features and interests (Elia et al., 2019). Based on the clusters, teaching methods could be individualized and adapted.

To descriptively analyze and cluster student perceptions of AI-powered writing tools, the k-means clustering method was used (see Lantz, 2019, pp. 287-312). The k-means clustering method is well suited for interval-based (numerical) data, but not for the analysis of responses to open-ended questions (such as unstructured textual data in string format). Therefore, the responses to the open-ended questions were only used indirectly by generating two further numerical instruments from the students' comments (the *overall attitude level* as well as the *sum of concerns* mentioned by each student).

For all calculations the statistical software *R* (version 4.1.3) was used. To simplify the interpretation of our clusters, first a z-score standardized data frame was created. This new data frame with a mean of zero for each variable, included all five variables related to the *perceived usefulness of AI-powered writing tools* (text translation, spelling, text analysis, summarizing, plagiarism check), the *overall attitude level* of the three comments made as well as the *sum of concerns* an individual participant stated with regard to AI-powered writing tools.

As an initial value for k , sometimes the square root of $(n/2)$ is suggested (Lantz, 2019, p. 296). However in our case, this would be $k = \sqrt{266/2} \approx 12$, which is too high, as we hope to achieve a $k < 7$ in order to have a dimensionality reduction. Applying the elbow method (Lantz, 2019, p. 297), $k=2$ was taken as an initial value and then k was increased step by step until the additional cluster did not add anymore much additional value in separating students into meaningful groups. Through this approach, four meaningful clusters could be identified, whose cluster centers are shown in Table 6. Because a z-score standardized data frame is used with a mean of zero for each variable, positive numbers indicate values higher than the average, negative numbers indicate values below average.

Table 6. Cluster centers using a z-score standardized distribution

Cluster	Sceptical limited user (Cluster 1)	Not sceptical limited user (Cluster 2)	Not sceptical general user (Cluster 3)	Sceptical non-user (Cluster 4)
Size	76	72	89	29
Perceived usefulness text translation	0.252	0.012	0.405	-1.936
Perceived usefulness spelling	-0.252	-0.249	0.724	-0.942
Perceived usefulness text analysis	-0.197	-0.586	0.986	-1.053
Perceived usefulness summarizing	-0.312	-0.577	0.880	-0.448
Perceived usefulness plagiarism check	0.086	-0.048	0.449	-1.485
Overall attitude level of comment	-0.833	0.813	0.252	-0.609
Sum of concerns	0.686	-0.485	-0.393	0.610

Cluster 1 consists of *sceptical limited users* as the cluster is characterized by students who perceive only certain specific tools as useful (text translation and plagiarism checking) combined with a sceptical attitude and a lot of concerns when using these tools. Cluster 2 (*not sceptical limited user*) is characterized by students who think that only translation tools are useful and at the same time have a very positive attitude towards these tools and only few concerns. Cluster 3 (*not sceptical general user*) finds all kind of writing tools useful, has a positive attitude and only few concerns towards AI-powered writing tools. Cluster 4 consists of *sceptical non-users*. Within this group, the usefulness of writing tools in general is perceived relatively low, combined with an overall negative attitude and a lot of concerns when using these tools. Figure 1 summarizes the four derived clusters with regard to the attitude (*sceptical vs. not sceptical*) as well as the user type (*non-user, limited user, general user*).

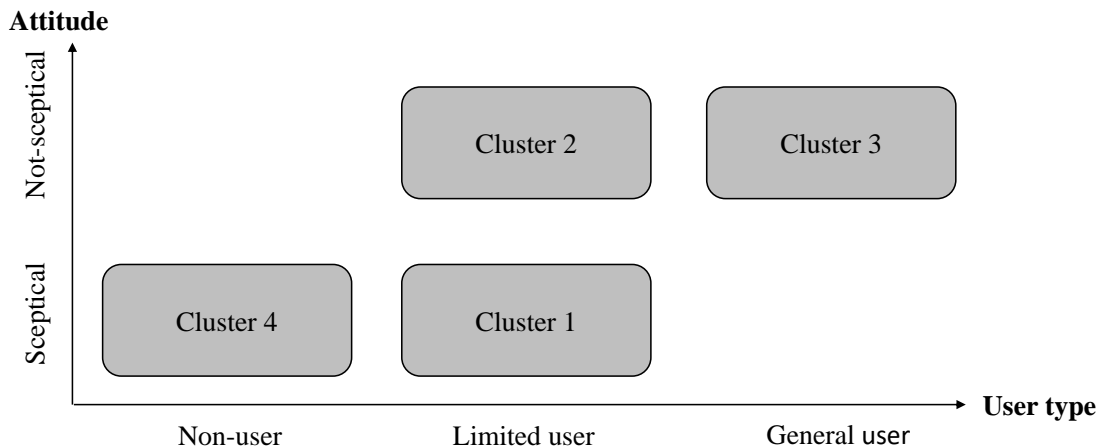


Figure 1. Overview over the derived student clusters

To describe and distinguish the different clusters, Table 7 gives an overview of important summary statistics. Note, that cluster 0 (*not answered*) was added, which consists of the 99 students, who did not answer the three voluntary open-ended questions. For these students, the *overall attitude* of the comments as well as the *sum of stated concerns* could not be calculated, which is why they had to be excluded from the cluster analysis in the first place. Nevertheless, they may serve as an interesting baseline in comparison to the other clusters.

Table 7. Summary of k-means cluster analysis: mean values for each cluster

Cluster	Not answered (Cluster 0)	Sceptical limited user (Cluster 1)	Not sceptical limited user (Cluster 2)	Not sceptical general user (Cluster 3)	Sceptical non-user (Cluster 4)
Size	99	76	72	89	29
Overall attitude of comment	-	2.84	4.51	3.94	3.07
Sum of concerns	-	1.61	0.78	0.84	1.55
Age (number of years)	19.79	19.74	19.58	19.45	20.1
Gender (1=female)	0.32	0.39	0.35	0.42	0.45
Language track (1= English)	0.29	0.51	0.24	0.46	0.21
Course attendance (1= first try)	0.90	0.89	0.93	0.93	0.75
Socioeconomic status	0.73	0.86	0.85	0.83	0.79
Attitude towards writing	2.68	2.80	2.67	2.81	2.87
Self-efficacy in relation to studying	3.58	3.76	3.79	3.95	3.66
Big-5-Openness	3.38	3.41	3.43	3.60	3.19
Big-5-Conscientiousness	3.31	3.48	3.49	3.65	3.45

Number of observations = 365.

As can be observed in Table 7, the student clusters are quite homogenous regarding certain criteria (e.g., age, socioeconomic status). However, regarding other criteria, the cluster also differ. Especially cluster 4 (*sceptical non-user*) separates itself from the other clusters. While in all other clusters the fraction of course repeaters (course attendance) lie between 7 and 11%, this number is much higher in cluster 4. 25% of the students in cluster 4 have failed their first year at the university and undertake a second attempt. As a result, the average age in cluster 4 is higher than in the other clusters. Compared to the other clusters, the typical *sceptical non-user* (cluster 4) has relatively low self-efficacy in relation to studying, low conscientiousness and a low openness to try out new things. In contrast, the typical *not sceptical general user* (cluster 3) has, compared to the other clusters, the highest self-efficacy in relation to studying, the highest conscientiousness and the highest openness.

Regarding the language track (English vs. German), the clusters also differ. 51% of the *sceptical limited users* (cluster 1) are enlisted in the English track. *Not sceptical limited users* (cluster 2) are mainly students from the German track (76%). *Not sceptical general users* (cluster 3) have again many students in the English track (46%) and *sceptical non-users* (cluster 4) consist mainly of students from the German track (79%).

4. DISCUSSION

The analysis in the previous section suggests, that there might exist different student types with regard to AI-powered writing tools. The *sceptical limited users* (cluster 1) are characterized by many students who are enlisted in the English-track (51%). In contrast, most of the *not sceptical limited users* (cluster 2) are students from the German track (76%). In academia but also in many other contexts, English has become the common language, the *lingua franca*, to communicate with each other (Ozdemir, 2014, Stephens, 2021). Therefore, many translation tools will be used to translate from or into the English language. Could it be that students of the English-language track are generally more aware of the limitations and weaknesses of translation tools due to their better proficiency in English?

Regarding learning with AI-driven writing tools in the digital age, a certain scepticism when using these tools is probably desirable. On the one hand, if students see only advantages but no disadvantages in using digital writing tools, there is a risk of using these tools carelessly, which can quickly lead to plagiarism. On the other hand, not using writing tools at all also entails certain risks, as they can support and improve the writing, as long as they are used in a responsible and appropriate way. Coping with difficult situations in life is part of the human experience (Straud et al., 2015). In education, the use of effective learning strategies is considered important for improving educational outcomes (e.g., learning success) and many students struggle in developing and implementing them (Hui et al., 2021). Higher performing students may have more effective learning strategies (Geller et al., 2018). Using digital writing tools under certain conditions might be part of an effective learning strategy.

This described field of tension is well reflected in clusters 3 and cluster 4. *Not sceptical general users* (cluster 3) are characterized by only few course repeaters (7%), a high self-efficacy in relation to studying, high conscientiousness and a high openness. On the contrast, *sceptical non-users* (cluster 4) have a high course repeater rate (25%), as well as a low self-efficacy in relation to studying, low conscientiousness and low openness. Students of cluster 4 may lack effective learning strategies.

The teacher could address the different student types with individualized teaching strategies. To the students of cluster 3, the teacher could point out potential disadvantages of digital writing tools in order to raise a healthy scepticism. To the students of cluster 4, the teacher could encourage them to try out writing tools together with him. Together with all students, a discussion could take place about the conditions under which writing tools can be used appropriately. In this way, teaching methods could be more individually adapted to specific student needs.

5. CONCLUSION

In this paper, based on survey data of 365 freshmen students, student perceptions of *AI-powered writing tools* were described and analyzed. Different student types with regard to AI-powered writing tools were identified by using the k-means clustering method. The results suggest that students have different attitudes towards AI-powered writing tools and that *individualized* teaching strategies might be helpful to promote (cluster 1 and 4) or urge caution (cluster 2 and 3) in the use of these tools. From the teacher's point of view, the aim should be to empower students to use writing tools in a meaningful way. Depending on the student type, some students may need to be encouraged by the teacher to use writing tools at all to enhance their learning strategies. For other students, it might be important to point out the limitations of writing tools in order to promote a healthy scepticism towards such tools and to counteract a possible unreflective use.

This study underlies several limitations. The data in our study represents only a snapshot at the beginning of the course. Student preferences may change over time, depending on personal characteristics and increased experience at the university. Furthermore, as the cluster differences regarding the language track (English vs. German) suggest, perceptions might be different for students with different language backgrounds (e.g., native vs. non-native English speakers).

From a theoretical point of view, the paper at hand can serve as a starting point for future research as it categorizes student perceptions in a systematic way and highlights important variables related to AI-powered writing tools. From a practical standpoint, the paper at hand may be valuable for (language) teachers, who are interested in the implications of AI-powered writing tools and look for ways, how to address and deal with them. The identified student clusters may help to better understand the individual student standpoints, when teaching with or about AI-powered writing tools.

In the future, the ability to write effectively will remain an important skill (Purcell et al., 2013, p. 21). However, to what extent and in which way this activity should or should not be supported by AI-powered writing tools is still an open question. Since these tools are freely available on the Internet and may be used by students even if it was forbidden, new approaches might be needed, that incorporate AI-powered writing tools in a meaningful way into the curriculum. Ideally, in this way, the disadvantages of these tools may be mostly avoided, and the advantages become even more apparent.

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