

What are the Perceptions of STEM Students Regarding Writing Practices in a University in Kazakhstan?

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ABSTRACT

Undergraduate students in STEM fields often lack writing experience as their majors usually do not require intensive writing courses. Therefore, many STEM students do not engage in writing as much as students in humanities and social sciences. In order to better understand and help STEM students writing, it is important to investigate STEM students' perceptions regarding their writing practices in the university. The research was conducted in a research university located in Central Asia, Kazakhstan. Two qualitative research methods were used in the study, namely, qualitative interview and paper observation. Five students from different majors in the STEM fields were interviewed, and five of their writing assignments were collected and analyzed. Findings demonstrated that students in the chosen university have similar struggles and opinions about writing as revealed in the literature. STEM students understand that writing is significant; however, due to the lack of experience, they do not always see the importance of writing in their own majors. It was also found that, in terms of building their perceptions, the roles of STEM faculties and the university Writing Center are crucial factors. They can contribute to students' writing in both positive and negative ways. The implications of the research can be beneficial for constructing and adjusting policies and regulations in the university curriculum to help STEM students build more positive perceptions about writing.

Introduction

There is no doubt that universities are concerned about their students' academic performance during their study years. In order to provide high quality of education, university staff and scholars consider a number of suggestions and ideas that can reinforce students' intellectual and professional development while studying in the university. One of the important learning challenges that most students are facing is writing. Some fields of study such as humanities and social sciences require more writing intensive courses, while majors in STEM fields usually do not have many writing assignments in their courses. Because of this feature, students in STEM fields have less experience and practice in writing than students in humanities and social sciences.

Personally speaking, I am a senior student studying political science in an English-medium research university in Kazakhstan. When I became a small part of the university Writing Center as a peer writing tutor, namely, a Writing Fellow, I witnessed how some students in STEM majors were struggling with their humanities and social sciences papers. Therefore, I would like to research, specifically, STEM students and their perceptions regarding writing practices that they encounter during their study years. It is interesting to observe how these students are confident and perform well in their disciplines but may develop negative perceptions about writing practices that they face.

Hence, in this research, I am interested in investigating STEM students' perceptions regarding writing: what they think and feel when they write. Using empirical research methods, I conducted qualitative interviews with STEM students and analyzed their writing assignments in humanities and social sciences courses. The data gathered will be

compared to the secondary studies as I would like to know to what extent the issue is relevant to the students in the chosen university. Moreover, there are suggestions I can obtain from the secondary research findings which can be applicable for the university. Therefore, I would like to look at the difficulties that STEM students can possibly face and at the suggestions that can be proposed to improve their writing experience during their studies.

Literature Review

Difficulties STEM Students Facing

To begin with, it is highly crucial for us to identify and emphasize the main problems that STEM students are facing in their studies. The most useful paper that will be greatly used compared to other sources is a tutor handbook that was written by Marshall University writing instructors (Diehl et al., 2016). The authors collected a number of issues that STEM students can face during the writing process and how these issues can be handled with the help of writing tutors. Firstly, authors discussed different types of assignments that can be given to the STEM students. At this point, STEM students are not different from other students in other disciplines because STEM students as well need to pay attention to the verbs and bullets given in a paper instruction. Thus, students can find it unnecessary to follow the basics of writing like formatting, the organization of sections, and formal and academic tone as they tend to believe that the information and analysis the paper contains are more significant than the accurately structured papers. Second, the students usually do not consider the audience as they used to write the papers for their professors who obviously will understand the discipline specific information, while the general audience is not able to figure the terms and scientific findings out. Thus, STEM students' intended audience is not always their professors, sometimes they need to present their work to general communities. Authors here recommend the STEM students to include tables that define their specific terminology in public meaning. Therefore, writing tutors should encourage the students to follow the basic needs of well-structured works and the general public. Third, the authors identify that STEM students, while writing their papers, are limited in their choice of words as the verbs that they use can be weak, so they are not making a strong paper to convince their readers. Thus, the author encourages the tutors to reinforce their vocabulary and replace weak verbs with stronger ones in order to make their paper more persuasive.

Besides these significant findings, the authors also found that unlike humanities and social science majors, in STEM fields, many professors does not practice the draft assignments; thus, the authors argue that the drafting process is highly important for the students to have better papers as they will have an opportunity to revise their papers with writing tutors and receive an effective practice of drafting.

At the same time, it was discussed by Harris (2015), in *Strategies for Teaching One-to-One*, where the author argues about the method of teaching the students and assigning the tasks. In this sense, the author suggests asking specific questions that can lead and motivate students to generate their own essay questions. For example, professors can ask questions like "If I were to write a biographical sketch of you, what would you like me to write?" or, "Suppose I were interviewing you for the newspaper and wanted to question you on one of your favorite topics. What would I ask questions about?" or, " If we were going to meet at a party and I asked a friend of yours what you liked to talk about, what would your friend suggest?" or, "What have you been thinking or reading about lately?" which can encourage students to listen to themselves and come up with the questions that can motivate them to write.

In the same vein, Narendra (2018, p. 84) argues that STEM students that were taking courses in social sciences for the first time had limited knowledge about social issues and public concerns beyond their disciplines that created obstacles to understand general social concepts. However, the author showed that this issue can be solved by introducing special courses that integrate social science theories and practices in technological fields. Thus, such courses seek to connect their, as STEM students, professional careers with social institutions in order to boost their understanding about the world and social issues going on around them and their specialties. The authors conducted an observation on students who took this social science course and revealed that, in the beginning, the students had had

difficulties to understand social issues due to their lack of knowledge and practices; however, after finishing this course, the students had positive responses as they increased their awareness about the social problems by discussing and writing about this during the course. Thus, STEM students lack faculty support for their curriculum as they do not practice social science courses where writing and discussing these social issues are required.

These findings were also supported by Mathison (2019) where she studied the experience of writing tutors who were teaching STEM students. The author views and identifies faculty members as a main reason STEM students come across difficulties during the writing process. It is important to consider as these findings can cause universities to change their system of teaching and curriculum as STEM students are not properly educated to meet their requirements. For example, the author claims some engineering professors failed to integrate writing feedback and writing to learn practices in their studies as they are not persuaded that it is necessary for them to teach writing strategies and rhetorical features for their STEM students. The students are victims of the circumstances as their professors find that writing and their disciplines overlap and cause tensions with each other; thus, they are convinced that these two fields are distinct from each other. Secondly, Mathison points out the trust issues that STEM students experience during their writing consultations. The students are convinced that writing instructors are not subject-matter experts; thus, they can undermine the feedback given by writing tutors as they lack knowledge in engineering matters. According to the author, the solution for such tensions can be succeeded by acquiring “a level of ideological literacy of the other disciplines”. In order to increase the productiveness of the session, both sides need to be introduced to the basics of each other’s disciplines to achieve mutual reciprocity and respect.

The next important article that identifies STEM students’ difficulties is Sharma’s (2018) paper regarding the lack of writing practice that is serving as one of the main reasons why STEM students have difficulties with the writing process. The author identifies the problems that STEM students are facing nowadays are connected to globalization, cross-cultural communication, and a multilingual environment where students do not feel comfortable enough. The author believes that current STEM studies create a monolingual ideologies and environment when students are poorly engaged in the writing process. The author made extensive research on this study as she wanted to switch from STEM ideologies to practices where writing and their technical studies are highly interconnected. The author brought a number of scholarly debates over this issue as there are still professors who do not see the effectiveness of writing practices within their curriculum. Their ideology does not allow them to accept the needs of globalization and cultural communication practices that STEM students need in their professional life. The author gives a great example of a student and an advisor. The adviser asked her engineering student to be engaged in general writing practices for some time in order to observe the student’s perception changes. As a result, when the student was asked what kind of struggles the student met and what her perception of writing is now, she responded that the practice of communicating with other people was encouraging when the general public could understand her. Secondly, the author provides examples of other engineering students who started to develop their rhetorical awareness about the subject and how writing practices helped them to find their professional voice and identity within their own disciplines. Their results were obtained through WAC/WID programs that aim to increase students’ competencies in the global world. The author as well provides other examples when faculty professors started to change their perceptions and include writing practices in their curriculum. For example, some professors, in order to increase students’ professional abilities as writers, asked them to write work progress so that they can track the successful and important ideas and perspectives, while others encouraged them to analyze and explain their findings in papers. In order to improve their language proficiency, some professors started to provide feedback on their writings, while others asked them to attend special writing centers that can check and improve their papers in terms of proficiency. Hence, we can see that there are universities that have taken seriously the issues with STEM students and their writing practices which encourages us to consider our STEM students’ case and possibly apply changes if they need some help to develop positive perceptions.

There are other findings where the authors are highly concerned about STEM students’ performances as writers. Lawrence and Zawacki (2019), in their book, tried to point out the importance of writing centers and sessions’ approach towards students from other disciplines that are struggling with the writing process. Thus, the focus group that they were observing was STEM and how they need to deal with their papers. The authors here explained the main

concern of STEM students and how this can be solved. There is a possibility that a student can bring highly technical and subject-matter papers which writing consultants can have difficulty to understand. In such cases, the author indicates the importance of training writing tutors so that they will be able to handle such difficulties and give valuable feedback on their papers. Additionally, the authors suggest STEM students need to explain their papers' important moments and have a brainstorming process so that they can come up with newer ideas that will build their papers. These all findings above highlight the difficulties and struggles with the writing process that STEM students are facing in their studies. Even though these issues are different, all of them are highly important to be considered and solved as these difficulties can negatively shape STEM students' perceptions regarding writing practices. Thus, the next section evaluates two different approaches used in writing centers (generalist and specialist) in order to find out to what extent they will be useful in their aims to help STEM students.

Different Approaches in Solving STEM Students' Writing Difficulties

The section reviewed literature that is focused on the solutions proposed by the scholars when it comes to STEM students' writing struggles. The first paper that will be considered is the role of disciplinary expertise during the sessions by Dinitz and Harrington (2014). Even though the disciplines used here are not STEM subjects, the research is applicable to use as it creates a common ground for students whose writing consultant is not specialized in their discipline. Based on the findings, the authors identify the main problems that generalist writing tutor can face. These issues are connected with lack of discipline-specific knowledge as observed tutors were not able to give comprehensive feedback or discussion on global issues, lead to interpretation of the ideas of a student, and provide with valuable information or strategies that can reinforce the student's paper. According to the authors, being familiar with discipline-specific knowledge can contribute positively to the student's performance by identifying their issue-related mistakes and strong arguments. These findings are important to keep in mind when you teach STEM students as it was already identified by previous authors that STEM students do not tend to trust generalist writing tutors who can simply not understand the context of the paper. Therefore, STEM students can ask only for a specialist tutor or, as Lawrence and Zawacki (2019) proposed, generalist tutors can be trained and educated for some discipline-specific strategies or STEM basics. Based on the findings of my interviews, STEM students suggested including STEM writing instructors in the writing center so they can sign up not only for humanities and social sciences professors.

Contrary to this finding, Okuda's (2017) research focuses on generalist tutors and their effectiveness during the writing center sessions. The author conducted an observation of a writing consultation and interviewed both a tutor and a tutee after the session. According to the observation findings, the author revealed several limitations of being specialist as the feelings of the tutee after the session were not satisfied and she made a remark that the tutor did not have a brainstorming process with her about the paper. Thus, when a discipline-focused tutor leads the session, the tutee can always feel directed and does not share his own ideas and perspectives. In the same vein, she had a consultation with a generalist tutor where she felt more comfortable as they had an opportunity to discuss several points and express her own arguments. This is an important thing to take into account as generalist tutors are trained to work with different types of students from various majors, while specialist professors can impose their own thinking and knowledge on the papers of the students so they can lose their own ideas and voice. It is important to consider as both Tebeaux (2016) and Sharma (2018) already mentioned the importance of a student's own voice in his papers.

If these two papers argue about the different approaches, Walker's (1998) paper is focused on both teaching approaches that he finds are crucial for writing center practices. The paper is highly significant to include in my studies as the author includes both teaching approaches with their drawbacks and benefits. For example, the author conducted an observation on his own practices with engineering students in discipline-specific writing centers. Even though this specialist approach helped him to direct the students in a right direction and give discipline-focused questions and recommendations, the author noticed that, during the sessions, they did not take into consideration some important features of writing practices such as the structure and organization of the paper, the flow and cohesion, and how well the transitions were used. Therefore, the author concluded that it is difficult to choose only one approach in

teaching the students so writing centers can mix both of these approaches and pay more attention to the specific cases where a generalist or a specialist tutor is needed. The finding is highly significant as different STEM students can face different issues that cannot be handled by universal tools; therefore, writing centers and tutors need to consider such cases and use both approaches in order to achieve better results for the students. The effectiveness of writing centers depends on the students' satisfaction and how their problems were solved.

Methodology

In this research, I used qualitative research methods as they are the most suitable choice to answer the main research question. In order to find out the perceptions of STEM students regarding their writing practices, I needed to rely on data that was derived from their opinion, understanding, and individual cases. In the same vein, I did not need to rely on numbers or statistics as the perceptions that people build are personal and depend on different aspects. Therefore, qualitative methods were more useful to understand students and, most importantly, answer the research question.

I used two qualitative methods, qualitative interview and paper observation, to collect data for my research. According to Duck and McMahan (2011), interviewing is effective for being "goal-driven, question-answer, structured, controlled, and unbalanced" and these exact features of interviews outweighed other possible qualitative methods (p.369). Among all, interviewing the STEM respondents will be the most necessary step in finding out and understanding their perceptions and perspectives regarding writing practices. Interviews allow me to focus on what my respondents say and work directly with them in order to have personal data about each respondent. The interviewing process will help me to encourage the students to talk freely and express their opinions and impressions. Compared to other methods, it also allows me to ask additional or probe questions if it is necessary for the research. The answers that I have obtained were valuable for the research as I had an opportunity to compare the results with secondary data that I had already evaluated.

In addition to the interviews, paper observation provided additional information that was significant for the research as I was able to check STEM students' papers by myself. For instance, based on interviews, I checked common patterns and places in the paper, mentioned by my respondents. Even though I was not able to engage the students in a discussion process, I could still obtain answers in a practical way through checking their papers as, during the interviews, students were just sharing their thoughts and opinions regarding their writing experiences. Paper observation was necessary to witness their writing in terms of basic writing conventions, structuring, organization of papers and paragraphs, coherence and cohesion, and overall flow of the piece. It also gave me an opportunity not only to compare their interview answers and papers, but also to find the similarities and differences that STEM students share with each other. Therefore, paper observations will be used in order to increase the credibility of the results.

Interviews

The main data collection for this research was obtained from interviews. First, I chose to interview 3rd and 4th Year STEM students as they have more experience in writing compared to freshmen and sophomores and are more familiar with various types of writing assignments. Second, the recruitment process was based on the social media platform that all university students use. I wrote a post that STEM students are needed for the research interviews regarding their writing experience, and I chose the first five students who volunteered to participate in my project. In my research, I had STEM students who are studying Electrical Engineering, Mathematics, Physics, Mechanical and Aerospace Engineering, and Computer Science. I interviewed five students, and the length of each interview was about 20-30 minutes in order to understand their writing practices and experience. The interviews took place in the Zoom platform due to pandemic measures. Nevertheless, I had an opportunity to record the sessions as I would do if it was face-to-face.

Paper Observations

Similar to interviews, paper observation was through collecting one writing piece from each respondent; hence, five papers were collected. The papers were written for different university courses. Four of them were from a 100-level first-year composition course and one from 200-level technical writing. Both papers were argumentative pieces that focus on constructing their own arguments and using supporting evidence. In addition, all students including STEM students are obliged to take rhetoric and composition and one 200-level writing course till the end of their bachelor's degree. Among all 200-level writing courses offered to students, STEM students tend to take technical writing as it is closer to their field of study, while other courses are usually taken by humanities and social sciences students.

Results

After all interviews and paper observation, I started collecting and sorting data in order to understand my respondents' perspective regarding writing and writing conventions. These are the findings derived from my empirical research. First, during the interviews, several students claimed that they pay more attention to the content of the paper than to any other writing conventions. They are highly convinced that the information and content their paper contains is the most significant part. They explained the pattern by the fact that whenever they write laboratory works and explanations of their theories and practices, they do not follow any writing rules. Most significantly, they need to be capable of explaining and proving the topic they are focused on without any regulations except dividing into different paragraphs like *Introduction*, *Equipment*, and *Conclusion*. Hence, this tendency in STEM writing affected their writing in humanities and social sciences as well. They sometimes tend to forget to keep in mind the organizational and structural moments of writing papers by, for example, having not proportional paragraphs, missing to include a thesis statement of their writing, confusing referencing styles, and providing arguments without strong evidence. As a result, all of these issues with organization and structuring affect the overall flow and quality of the paper.

In the same vein, students face the same organizational issues when they write papers. The issues are best seen in their papers. During the observation of their papers, I witnessed how students do not follow the basics of organization. First, while reading I could see how the student could focus on one argument more than on others which could distort the organization of the paragraphs as one paragraph could take a whole page, while others took only the half of the page. Having more support and discussion for one idea weakens the overall picture of the paper as these paragraphs look uneven. At the same time, some students wrote too much detailed information in the introduction part which is supposed to be in their body paragraphs; hence, it weakens the flow of the paper from the beginning as it is poorly organized for the reader to digest the information given. For example, one student was writing about the importance of Sustainable Consumption Education and, in the introduction part, instead of giving a brief information about the issue and stating the thesis statement, she started to talk about the environmental, economic, and social issues of consumption, various approaches that exist to deal with it, and participation of different group individuals in working on this issue; however, the student failed to provide a clear thesis statement that could show the main focus of the paper and what aspects specifically will be discussed throughout the paper. These kinds of organizational issues are crucial to consider as the same issue was present in another student's paper too.

Second, it was also revealed that students do not really understand the importance of writing for their field of study. As they take various courses that are based on their major, they do not spend plenty of time writing and learning how to write in these courses. When I asked a question about the importance of writing in their future career, 4 of them claimed that most probably they will work in an industry or in a company where they will not engage in writing; hence, they do not really understand why they have to write all of these academic papers. In the same vein, they expressed that their professors are not really concerned with their writing; hence, they do not feel any need or urgency to write good papers in humanities and social sciences subjects. However, there was one student who stated that she wants to become a researcher; hence, good writing skills are important for her future. Unlike other students,

she highlighted the importance of writing in terms of expressing her thoughts and ideas in an accurate and clear way and how it helps to write her own research in a precise manner. Overall, all of them understand that writing is something good and useful but not all understand deeper reasons for holding a positive perception regarding these writing practices.

Third, students expressed that their STEM professors do not really support them in writing good pieces of work. According to all of them, their professors do not really engage in giving feedback, checking their writing, conducting consultations regarding their work, or motivating them to write good quality papers. In the same vein, they do not blame their professors for not focusing on writing because they are convinced that their professors are highly busy with their work and research which is more important than writing. Their papers are mostly checked by professors' TAs (Teacher's Assistant) and these TAs usually grade their papers by looking at the final results of their findings and calculations; they do not focus on writing and how it was done. Moreover, most students said that they do not really write in their discipline; hence, there are usually no papers to check and work on. Only the Physics students stated that they write as they do some research in their field, while other majors do not really write papers, especially in upper years of study? Therefore, STEM students do not really interact with their STEM professors about their papers as they do not really write them.

Fourth, the last point made by the respondents is related to the process of coming up with writing topics and feedback given after submitting the paper. According to their words, when their professor assigns them a title of a paper, they struggle and spend a plenty of time writing a good piece. They explained it by the fact that they do not really have background knowledge in humanities and social science like politics, history, anthropology, or sociology which makes it challenging to write good quality papers. So, the lack of experience and discussion in these fields add pressure when they have to write on some non-STEM topics. Therefore, most of them explained that it is always better if they come up with topics by themselves rather than being assigned to certain topics where they have zero knowledge. Also, they expressed that the given word count (1500 words) makes the situation more stressful as they think that they cannot write on a topic that they do not really know for 1500 words. So, it would be less stressful if they were writing on topics that they came up with by themselves. The pattern was supported by their own experience when they saw their peers in the class struggling over the given word count.

Discussion

The literature provided in the literature review and the findings analyzed above implicate various patterns among STEM students. They also reflect valuable similarities and differences on university's STEM students. First, several authors highlighted that STEM students may skip the instructions regarding the organization and structure of the assignment which significantly hinder their papers (Diehl et al., 2016). The pattern was visible with students in the chosen university too. Most of the students mentioned that, when they write, they usually pay more attention to the content of their paper rather than to the instructions given to them. Therefore, according to my observation, STEM students, like humanities students, need to follow assignment instructions and writing conventions when they write; however, they tend to undermine or skip these parts. The same pattern was seen in papers I observed as they tend to write laboratory works or research based on their studies and only to their professors who understand their writing and evaluate the findings more than their writing style. So, as they are not engaged in different types of writing which can vary in terms of instructions and requirements, STEM students tend to undermine these conventions. In the same vein, their explanation for the concept seems to be more important than following these basics as they are trying to prove or show the results as they mostly do in their disciplines. These perceptions lead to confusing referencing styles, having not proportional paragraphs, or not providing enough support for their arguments. Overall, the organization and structure of their paper will be hindered as a result. Hence, Diehl and his colleagues' findings were relevant and applicable for my STEM students too.

Second, at the same time, as it was mentioned above, different writing pieces require different approaches as writers should consider the style, tone, and the voice they are using; however, STEM students are not focusing on these aspects because they are not sufficiently informed about these writing conventions by STEM faculties. So, not paying proper attention to the flow of writing, the connection between the sentences, coherence and cohesion, and style may become a huge issue for them. Failing to develop a good flow, cohesion, and coherence also restrict the students to take into consideration the audience. As I considered papers that were written for writing classes only, I did not take papers from their major courses for observation. However, one student, during the interview, shared that their STEM professor was really angry at students because of their research papers. According to the respondent's answers, the professor understood how the papers were poorly written and how it is not acceptable for publication. The students' inability to follow basic writing conventions and proper organization and structure led to undermining the audience which will not simply follow their ideas and findings, even though they are crucial for the scientific world. In contrast, other 2 students indicated that their STEM professors are not focused or concerned about their writing achievements because they are convinced that these are not their responsibilities. Mathison (2019), in her research, indicated that negative perceptions of STEM students regarding writing is derived from their STEM professors who do not understand the importance of writing in their field of study, therefore, do not even encourage them to write. As we can see, professors may vary, one believes that it is important for their future, while others, simply, do not give much difference to it. Overall, STEM professors' role to certain extent plays an important role in building their perception.

Third, the same authors indicated that STEM students have some issues with confusing and using some complex words or sentences in their papers. I decided to check it and found out that this is noticeable with my respondents too. While observing the papers, I have found that students were limited in their knowledge of knowing some complex and stronger words that they can use in their papers. For example, in one of the papers, "*In deficiency of funds, it might be hard to provide efficient education*", there the student is having difficulty to properly use the word, "deficiency", and confusing "efficient" with "effective" as based on the paper, the most suitable word there was "effective" instead of "efficient". The papers that I have checked, in general, are written in a simple way without any complex sentences and structures. The issue can be also explained from another perspective. Based on the work *Contrastive Rhetoric*, Leki (1992) highlighted the fact that non-native English writers have acquired different rhetorical conventions due to their cultural features; hence, native English speaking professors' expectations may be violated. STEM students are not familiar with writing conventions like humanities students due to their lack of experience in writing; therefore, professors should take into consideration that STEM students may be less introduced to the Western audience's writing requirements. Therefore, confusing some words, differently interpreting some structures, and misunderstanding may happen when they write because, first, it is not their first language, and second, they are limited in their experience of writing.

Fourth, it was found that students do not feel confident enough when professors assign topics for a paper by themselves. In the interview, two students mentioned that they do not like when their professors say the topic and the question on which they need to write as they feel that they do not have sufficient knowledge about the subject which adds pressure on them. However, generating their own paper titles motivates them to write and develop their writing skills as they will be at least interested. The observation discussed above was tested with STEM students too. The two papers that I have received were different in a way that one student wrote an essay on the topic of politics and it was provided by the professor, while another one focused on the topic of robots that he chose by himself. First student was writing for a 100-level politics class, while the second student wrote for a technical writing class. Observing and comparing these two papers, I can see some differences: it was clear that the first student who was writing on the topic related to politics was limited in his knowledge as he was struggling to explain accurately the political concepts that he was discussing. To some extent it was obvious that the student did not completely understand the topic and its specifics as the information given was poorly supported and developed. In contrast, the student who was working on his own topic showed a comprehensive knowledge and understanding of the matter as I could see that he was motivated to write about this topic and to argue his position as the arguments provided by the student were convincing and

well-supported by external sources. Hence, the remark made by Harris (2015), is justified as students are not motivated to write on topics where they have poor understanding and, therefore, professors need to encourage the students to generate their own questions in which they are interested.

Fifth, most students that I have interviewed claimed that they are not aware about the real importance of writing in their professional life. They are convinced that dealing with a number of writing practices is not going to help them to develop professionally as their majors do not require writing. The same issue was discussed in Narenda's paper (2018) where she found out that STEM students are not introduced to most global news and social issues that people are facing these days. She highlighted that STEM students, if they are not introduced to some social science and humanities courses, will have limited knowledge in world dynamics and social issues that surround them. After taking some classes and engaging in these humanities discussions, they start to see the importance and usefulness of these classes. The same idea was supported by Sharma (2018) who pointed out that STEM students do not see the significance of writing due to a lack of knowledge in these topics and experience. Working more on these humanities papers can help them to increase their writing skills and understand why they need writing in their life. As my respondents already had experience of studying and writing in humanities courses, some of them do understand the importance, while some still are struggling to find its implications in the future. Another reason for such perception can be the faculty who is not encouraging their students sufficiently. As students mentioned, some professors never explain or try to show the significance of writing in their future professional life. Nevertheless, based on the findings above, we understand that writing is important for STEM students to work and function in the world where everyone is needed to communicate and cooperate. In order to build good relationships with people, students need to learn how to express their thoughts and opinions and be able to communicate with others on the topics that are beyond their focus of study.

Lastly, students, in the interview, claimed that they do not usually use the Writing Center services. First of all, they were not encouraged or motivated by their faculty to attend the center as they do not usually write in their disciplines. Second, they doubt that their pieces will be understandable to them. Based on their answers, their papers usually are checked by TAs (Teaching Assistant) not professors as the latter do not have time to check papers and give feedback. The same pattern was discussed by Lawrence and Zawacki (2019) who highlighted the presence of trust issues between students and non-STEM professors. They stated that STEM students do not think that these writing tutors may help in improving their papers as they do not understand highly technical and subject-oriented papers. They would like to submit these papers to their real professors who can fully understand everything. Hence, students pay more attention to the context rather than to the writing quality as their checking professors and TAs pay a great attention to it. Hence, in this case, one student suggested training TAs to be more generalist as they basically focus on their writing performances as students. In the same vein, the faculty members need to remind their students to attend the writing center or workshops as it has generalist tutors who can contribute positively to their writing performance. Nevertheless, it is important for the university to consider the fact that STEM students may possibly face some difficulties and struggles when they write as, based on my experience, I have seen several students who were highly demotivated to write. We all know the importance of writing and what benefits it can bring to the professional and personal development of the students. Hence, by conducting interviews, checking and revising their paper, and comparing the results with the secondary findings, I achieved some conclusion remarks about STEM students' interpretations regarding writing practices in university and what can be done in order to help the students to overcome the issues they are facing.

Implications

In the framework of my empirical research, students were welcome to express their thoughts and ideas that can help them to be more motivated to write. So, in this section, possible changes and implications of the results are going to be discussed.

The findings of the research are highly useful and helpful for the Writing Center to implement the changes that can reinforce students' performance. First, writing instructors and STEM professors can work together and discuss what policies work for the students and what policies are not really helping; hence, we can make the center more focused and issue-specific for the students. The STEM faculty needs to decide on what kind of workshops and lectures may be highly effective for STEM students based on their struggles, and it is their faculty's responsibility to observe and inform the writing center about possible issues students are facing. Second, we need to train and motivate the Writing Center's generalist tutors to know more about STEM majors and their specifics along with their features. According to the students' responses and secondary research findings, STEM students may hold a perception that humanities generalist tutors lack proper knowledge in their field, so they will not be able to help them properly by creating further trust issues. At the same time, they understand that their STEM professors will not focus on their writing as they are highly busy with their research and lectures. Some students suggested working with generalist tutors as they will help to increase their overall writing skills as they are trained and more educated in writing. Third, if it is possible, more STEM professors may be integrated in the writing center. STEM professors have some authority over the STEM students as they understand that these professors are specialists; hence, their advice will be valuable. Additionally, STEM professors can conduct some workshops or seminars that focus specifically on STEM students where they can communicate their opinion freely. In the same vein, they highlighted the importance of TAs that usually check students' papers instead of professors. Training and preparing these STEM TAs to be more of a generalist writing tutor would be helpful for STEM students to become better writers, according to their assumptions. So, they can comment not only on the scientific findings of students and their results but also on their ability to write. Lastly, both the writing center and faculty professors need to ensure that STEM students are introduced to the importance of writing in their life and that they should not avoid registering social sciences or humanities courses as these courses will bring benefits for their personal and professional development. However, at the same time, it should not be expected that students will massively register writing courses as, according to them, they would not register writing-intensive courses due to their STEM workload which requires a vast amount of time which leaves no room for them to engage themselves in writing conventions.

Conclusion

The research's main goal is to identify STEM students' perceptions regarding the writing practices that they face during their university years. It is significant for students to know how to express their ideas and thoughts accurately through writing regardless of their field of study. To conclude, according to the results, it can be seen that the issues and struggles that STEM students facing in my study are to some extent prevalent to the STEM students studied in the previous research. It is commonly known that humanities and social sciences students engage in writing comparatively more than STEM students; therefore, perceptions of STEM students on writing is important to observe. As a result of interviews and paper observations, it was found out that students' perceptions of writing is not solely negative as they to some extent understand the importance of writing in their life and how it can help them to grow both personally and professionally. In the same vein, they may not always understand why they need to write various long argumentative papers as it is not connected to their field of study. As a result, they were motivated to improve their writing by suggesting some ideas that may help them when they approach writing, and it was connected to the STEM professors, TAs, humanities professors, and the Writing Center. All of these resources can work together in order to build more positive perceptions and contribute effectively to the improvement of their writing practices. Nevertheless, the perceptions that STEM students hold can vary from one student to another as they think and interpret writing practices differently.

Limitations

There are some limitations that need to be mentioned as well. First, the results found may not be applicable for other STEM students outside the university that I chose. As study curriculum and academic policies vary from one university to another, the implications of my results may not work for other universities. For example, most Kazakhstani universities do not have writing centers and any academic writing courses. Hence, my results may not be generalized for all STEM students in Kazakhstan based on different university policies and students' experiences.

Second, the research was conducted under the COVID-19 pandemic time which prevented me from conducting face-to-face interviews and observing Writing Center consultations. Initially, it was planned to observe conferences between STEM students and writing tutors in order to know their interactions and approaches when they talk about the writing assignments. However, due to distant learning, I could not implement this research method. Nevertheless, it is possible to adjust the observation through online consultations and manage face-to-face observation in the future for further studies.

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