

TECHNOLOGICAL KNOWLEDGE APPLICATION ON ACADEMIC WRITING ENGLISH EDUCATION STUDY PROGRAM STUDENTS

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Abstract: Technological knowledge plays a role in academic writing such as assisting in finding suitable references, checking plagiarism, and publishing the article. However, technological knowledge does not always provide benefits in academic writing. Technological knowledge may affect the writers' mentality to take shortcut in finishing and checking their writing. The objectives of this study were: (1) to find out the technological knowledge level of English education study program students, (2) to find out how English education study program students applied their technological knowledge in academic writing, and (3) to find out the problems English education study program students encountered in applying their technological knowledge in academic writing. The study's participant was 13 students from class B 2016 Palembang of English Education Undergraduate Program along with the latest lecturer that teaches them writing. This research used descriptive qualitative design. The data were collected by questionnaire, observation, interview, and document gathering. Percentage calculation, transcribing, and triangulation were used to analyze data. The findings showed that (1) The technological knowledge level of the participants is level two Technical Maxim, (2) the participants applied technological knowledge on academic particularly in finding references and structuring idea, and (3) the participants have several problems in applying technological knowledge in academic writing, such as in citing references correctly, avoiding tendency to copy-and-paste, structural error due to using automatic correction, and paper formatting.

Keywords: *technological knowledge; academic writing; article writing*

INTRODUCTION

In the 21st century, technology moves along with the humanity and becomes part of human's daily life. This includes in the world of education, in which the terminology "Education Technology" is created. Grinager (2006) defined education technology as the use of hardware, software, and other digital technologies to advance learning, teaching and administration in K-12 and post-secondary education settings. The education technology is related to the Technological Knowledge (TK) in which technological knowledge ensures that the education technology can be applied effectively. Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009) define Technological Knowledge (TK) as

knowledge about various technologies which include low-tech technologies from pencil and paper up to digital technologies such as computer and Internet. However, Koehler and Mishra (2009) explained that since technological knowledge is evolving over a lifetime, TK is directed more toward the information communication technology (ICT) as the current form of technology.

Vincenti (1984) stated that there are three forms of technological knowledge, which are descriptive knowledge, prescriptive knowledge, and tacit knowledge. Descriptive knowledge is a knowledge focused on the truth or fact. It is used to describe things as they are and cannot be adjusted easily to suit the needs (Vincenti, 1984).

Prescriptive knowledge is a form of knowledge used to find out whether something could be accepted as fact through the process of trial-and-error (Houkes, 2009). Prescriptive knowledge is a knowledge that can be altered depending on the situation in order to ensure the effectiveness (Vincenti, 1984). These two knowledges compose explicit technological knowledge. On the other hand, tacit knowledge composes implicit technological knowledge. Tacit knowledge is a special type of knowledge that is possessed by individual upon the process of

learning something, which cannot be easily shared and will only expand into facts upon time (Dampney, Busch, & Richards, 2002). This knowledge comes from individual practice and experience, thus making tacit knowledge rather inexpressible. Vincenti (1984) explains that prescriptive knowledge and tacit knowledge are similar as both focus on procedures.

These knowledges form the four levels of technological knowledge (Herschbach, 1995). The following table describes the levels and the forms of knowledge they focus on:

Table 1. Levels of technological knowledge

No.	Level	Details
1	Artisan Skills	Focuses on tacit knowledge with little prescriptive and descriptive knowledge involved.
2	Technical Maxims	Focuses on prescriptive knowledge with little tacit knowledge. There is generalization of skills applied in making or using technology.
3	Descriptive Laws	Focuses on prescriptive knowledge with little descriptive knowledge, which addresses experience-based formulations through try-out and observation. Scientific-like.
4.	Technological Theories	Focuses on descriptive knowledge and prescriptive knowledge, which gives the user capability to apply scientific knowledge in real situations.

In the world of education, 2030 Education dictates that education process should contain Technological Pedagogical Content Knowledge (TPACK), where aside from improving the content and pedagogy of education, information and communication technologies have to be used to strengthen education (UNESCO, 2016). This means that technology should be applied in teaching and learning process, including in English Education. English Education ensures that the students of said study program should have good English skills and one of the skills that can coordinates with technology is the writing skill.

Technological knowledge plays a role in finding the suitable references, in which through browsing computer and internet, references can be gathered by specifying the correct keywords of what the writer wants to find. Aside from that, academic writing is also structured using academic language, which is concise and clear, possessing formal language as well as having clear, straightforward toward the point style of writing. Technology supports academic writing in this writing process where the language can be checked by spelling-checker as well as paragraph reviewer applications. Moreover, technology can also be used for checking plagiarism, sharing the articles, and publishing article in journal. Such

kind of technologies makes the process of writing academic paper easier than ever if the proper technological knowledge is mastered and used effectively. Mohamed and Ayeche (2011) explain that using modern technology such as computer allows a whole new way of interaction in the process of writing that removes psychological obstacle that tamper students' writing skill, such as fear and lack of confidence, if the technology is utilized correctly by the teacher and used appropriately by the students. Similarly, Inderawati (2017) emphasizes that technology must be become the important key element of the 21st century learning in sophisticated classroom.

However, technological knowledge does not always provide benefits in terms of writing. Alhusban (2016) explains that technological knowledge affects the student writers' mentality in which the students believe that technology will provide them shortcuts of making a good and acceptable writing. The students can just find everything in the internet, copy it and use the computer application to check the writing automatically, truly believing that digital technology is flawless. This misuse of technology, rather than improving the students' skill in academic writing, causes the writing skill to deteriorate since the students do not think critically in forming the ideas and set aside

cohesion and coherence of the paragraphs by copying what probably is suitable to the topic written without appropriate connection to the previous idea.

It is worth saying that technological knowledge affects academic writing skills of the students as academic writers. The effects of technological knowledge can be either positive or negative. In the academic writing class, specifically the article writing class of English Education study program Sriwijaya University in academic year 2019, technological knowledge was applied in the writing activities, resulting students personal blog where the student posted his/her articles. This result shows that the implementation of technological knowledge in the academic writing of English Education study program of Faculty of Teacher Training and Education of Sriwijaya University is beneficial.

The writer of this study was curious on how the students apply technological knowledge in the class as well as finding the possible challenges faced in applying technological knowledge in academic writing. Thus, this study intended to (1) to find out the technological knowledge level of English education study program students, (2) to find out how English education study program students applied their technological knowledge in academic writing, and (3) to find out the problems English education study program students encountered in applying their technological knowledge in academic writing.

METHOD

Method of the study

This research was a descriptive qualitative research. This research acquired the qualitative data through observing, interviewing, and gathering documents and quantitative data in the form of questionnaire is used to support the qualitative data. This research focused on matching the questionnaire result with data gained from observation, theory, and interview. The data were also gathered by getting the relevant documents to further support the results. The collected data were later analyzed to answer the research questions.

Site and participants

The site of this study was the Faculty of Teacher Training and Education Sriwijaya University in Palembang. The participants were 17 students from class B 2016 Palembang of English Education Undergraduate Program (They will be

referred as participants) along with the latest lecturer that teaches them writing. Purposive sampling is used to pick the participants. The participants were chosen as they are the class that according to the syllabus has completed all writing class required in their study as well as the fact that prior information from lecturer tells that they used modern technology in their writing class. From the 17 students, four of them did not return the questionnaire. Thus, they are not taken into account in the results.

Technique for collecting the data

This research collected data by using observation, interview, and document gathering as quantitative data and questionnaire as quantitative data. The observation was done by using a check-list based on Kirkwood and Price's (2016) Questionnaire on Learner Use of Technology as well as TPACK Assessment Questionnaire by Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009), which is also used as the basis for the interview questions and questionnaire. Interview was given to the lecturer as the students were given the same questions in the form of questionnaire. The interview questions were adapted from Kirkwood and Price's (2016) Questionnaire on Learner Use of Technology as well as TPACK Assessment Questionnaire by Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009). As for the documents gathered, the documents were the students' writing results as well as the open-ended questions in the questionnaire which address the problems of the students in academic writing. The students' writing results were checked by using the Transparent Academic Writing Rubric (TAWR) developed by Razi (2015), which combines several essential components of academic writing including in-text citation. The following table is the item distribution of the TAWR by Razi (2015):

Table 2. *Transparent Academic Writing Rubric (TAWR) by Razi (2015) item distribution*

No.	Writing Evaluation Criteria	Items
1	Introduction	1-8
2	Citation	9-24
3	Academic Writing	25-31
4	Idea Presentation	33-43
5	Mechanics	44-50

The questionnaire used was adapted from Kirkwood and Price’s (2016) questionnaire on Learner Use of Technology as well as TPACK Assessment Questionnaire by Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009). The questionnaire consisted of questions related to tacit, prescriptive, and descriptive knowledges which constitutes the levels of technological knowledge by Herschbach (1995), which are artisan, technical maxim, descriptive laws, and

technological theories. The adapted questionnaire items were divided into the three types according of the types of technological knowledge in the form of five-level Likert scale. The following tables are the specifications of the questionnaire item distribution and the interval for the technological knowledge according to Likert scale. As each knowledge is distinct to the other, the interval for the technological knowledge levels represent their importance in each level.

Table 3. *Technological knowledge questionnaire item distribution*

No.	Type of Knowledge	Items
1	Tacit Knowledge	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
2	Prescriptive Knowledge	11, 12, 13, 14, 15, 16, 17, 18, 19, 20
3	Descriptive Knowledge	21, 22, 23, 24, 25, 26, 27, 28, 29, 30

Table 4. *Interval score of technological knowledge questionnaire*

No.	Level of Technological Knowledge	Type of Knowledge		
		Tacit Knowledge	Prescriptive Knowledge	Descriptive Knowledge
1	Artisan	5-30	5-20	5-15
2	Technical Maxim	31-45	21-35	16-25
3	Descriptive Laws	46-50	36-40	26-35
4	Technological Theories	46-50	41-50	36-50

Technique for analyzing the data

The observation was analyzed by compiling the similarities found in each meeting. The result from the checklists based on Kirkwood and Price’s (2016) Questionnaire on Learner Use of Technology as well as TPACK Assessment Questionnaire by Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009) was calculated by using percentage to get more concrete result.

The interview given to the lecturer was analyzed by comparing the result with the theories regarding the use of technological knowledge as well as the students’ questionnaire responses to find out whether there are any differences between the students’ claim with the lecturer’s observation during the class.

As for the documents gathered, the open-ended questions in the questionnaire were taken to be compiled to find the similarities between the students’ answer to get the general answer for

the third research question. The students’ writing results were checked by using the Transparent Academic Writing Rubric (TAWR) developed by Razi (2015), with the score range of 0 to 2. 0 represents poor, 1 represents acceptable, and 2 represents excellent.

The technological knowledge level questionnaire was analyzed quantitatively. The adapted questionnaire items were divided into the three types according of the types of technological knowledge in the form of five-level Likert scale, ranging from Strongly Agree (5) to Strongly Disagree (1). The results of the questionnaire were calculated to find out the percentage of each type of knowledges to be further analyzed to find out the students’ technological knowledge level. The calculation was done by using the Microsoft Excel 2016 to sum up the result and calculate the percentage.

RESULTS AND DISCUSSION

Students' technological knowledge level

Results of observations

The observations were done by monitoring the class as non-participant. The observations of the participants were done starting from January

25th, 2019 to April 11th, 2019, with the total of seven meetings observed during the period, which is treated as N. The following table and chart are the summary of the checklists for all of the observations done.

Table 5. *Participants' technological knowledge observation results summary*

N*	Knowledge Result Average		
	Tacit Knowledge	Prescriptive Knowledge	Descriptive Knowledge
7	31	20	19

*N refers to the number of observations

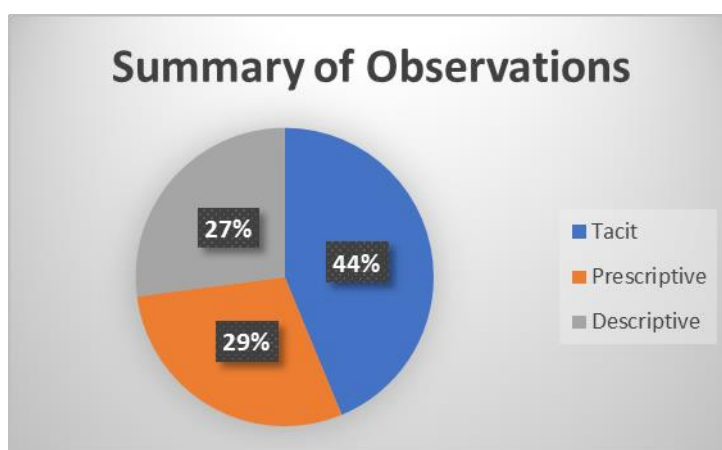


Chart 1. *The percentage of observations' results summary*

Table 5 shows that the average scores of the participants' tacit knowledge, prescriptive knowledge, and descriptive knowledge are 31, 20, and 19 respectively. Based on the interval score for Technological Knowledge Level, the participants' level can be categorized in the second level which is Technical Maxim. According to the Herschbach (1995) Technical Maxim shows that students possess higher tacit knowledge with a moderate level of prescriptive knowledge. This is further supported by the chart which shows that the average percentage of participants' knowledge is toward the tacit knowledge with 44%, followed by prescriptive knowledge with 29%, and descriptive knowledge with 27%.

The observations also showed the progress of the students during their writing class. On the first meeting on January 25th, 2019, the students were gathering ideas for their topic. In this meeting, the students use Microsoft Word to type short drafts to be peer-checked later by posting in the group. The students checked each other drafts by giving very short comment. The lecturer explained the process of writing article by making thesis statement followed by monitoring

the students' activity and giving feedbacks when the students asked.

On the second meeting on February 1st, 2019, the lecturer introduced the students to Mendeley System, which was used to check the references the students gathered and learn how to write references correctly. The lecturer started by giving tutorial on how to use the Mendeley System effectively and various functions in the application. In this meeting, some students can be seen to have certain confusion in using Mendeley System. However, they assisted each other in learning the System and by the end of the meeting, some students are capable of using the Mendeley System effectively while others keep practicing independently or with supports from both peer and lecturer.

On the third meeting on February 15th, 2019, the students were introduced to Grammarly application to assist them in writing their draft. The lecturer explained how to use and analyze the result given by Grammarly in order to find out the structural error. The drafts produced were then posted to the Facebook group to be peer-checked. The peer-checking once again is given in a very short comment. The drafts produced in

this meeting were rough and unpolished. Some students still wrote the topic in an unclear manner or redundant. However, the peer-checking pointed these problems to be fixed in the next draft.

The next observation was on the sixth meeting on February 21th, 2019. The students continued working on the second draft of their article, specifically the body. The students used Microsoft Word and Grammarly to assist their writing process in order to utilize the grammar checker feature. The results were posted in the Facebook group. The students' writing improved in this meeting although they did not put the references as well as having some mechanic problem such as the formatting and punctuation. The lecturer gave the students some feedbacks afterward based on their writing in the form of comments in the Facebook posts about which parts should be improved.

The fifth observation was done on the seventh meeting on March 8th, 2019. The students were learning to create a blog for them to post their articles for free access. The students spent time more in this meeting to understand the way to set-up the blog instead of writing. The students enjoyed the blog although some students were distracted which consequently made them neglect the article checking. The lecturer monitored this meeting and constantly reminded the students to also work on their articles.

On March 11th, 2019, the lecturer instructed the students to post their article drafts in their blog. The students used Microsoft Word to write and revise their draft. Some of them also used Grammarly to further check their grammar. However, very few students used the Mendeley System to check their references. Moreover, almost all students did not write references in their drafts, despite citing some experts. Some students still copied the references without paraphrasing or quoting as well. The lecturer reminded the students to use the Mendeley System whenever possible as well as reviewed the way to utilize the applications briefly.

The last observation was done on the 14th meeting on 11th April, 2019. The students were tasked to post their revised article drafts, which include background and literature review, in the Facebook group as well as in their blogs. The drafts the students wrote were improved in academic writing and idea presentation aspects. However, the students still had problems in citing articles. Many of them still neglect referencing and did not use the Mendeley System. The

application of Grammarly improved although not all students utilize this as few students still had grammatical mistakes. The lecturer provided feedbacks in the form of comments for the students to revise before writing and submitting their final draft.

Result of the interview

According to the lecturer, the students were capable of learning and using the technology introduced during the Writing IV class. The lecturer states the students practiced using the applications given to support their academic writing, although some students struggled in using the application effectively. The lecturer also states that the students did not use the application actively during writing process after they learned how to use the application, which implies that the students were more comfortable in writing without constantly opening and closing different applications. However, the lecturer explained that the students have more positive view in writing academic writing as they shifted their opinion that writing academically is not as difficult as they predicted as there are many technologies that can assist their writing process in both mechanical aspect and referencing aspect. The lecturer explained:

“After practicing using the technology and applications, my students come to an end that article writing is easy because I really showed them how to do it. They easily get information for their writing from Google and know how to quote directly and indirectly.”

The lecturer finally stated that despite using technologies to assist their writing process, the students still needed guidance as well as constant feedbacks from the lecturer as relying on peer-comments was not effective due to the tendency of being given very brief comments by their peers.

Results of the questionnaire

The purpose of the questionnaire is to find out the technological knowledge of the students through measuring their Tacit Knowledge (TK), Prescriptive Knowledge (PK), and Descriptive Knowledge (DK) as well as to find out the students' way of applying the technological knowledge in academic writing and the problems they faced. The questionnaire consisted of two sections. The first section is a Five-Level Likert-

scale close-ended questions with 30 items and the second section is three items of open-ended questions. As there are four participants that did not return the questionnaire, only thirteen participants were taken into account. Both results are presented as follow.

Result of the first section of questionnaire

As stated before, the first section of the questionnaire is used to find out the students' Technological Knowledge level through their tacit knowledge, prescriptive knowledge, and descriptive knowledge. The following chart shows the percentage of the students' knowledges:

Table 6. *Participants' technological knowledge questionnaire results summary*

N*	Knowledge Result Average		
	Tacit Knowledge	Prescriptive Knowledge	Descriptive Knowledge
13	45	34	23

***N refers to the number of participants**

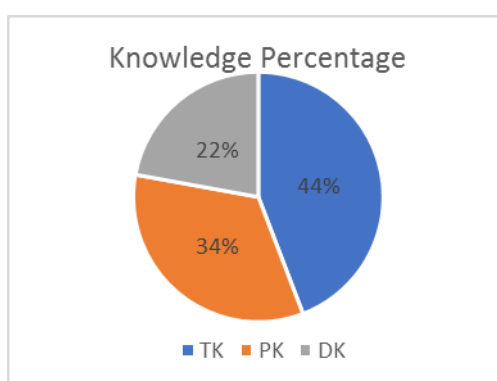


Chart 2. *The summary of participants' technological knowledge questionnaire results*

Table 6 shows that the students' expectation Table 6 shows that the average scores of the 13 participants' tacit knowledge, prescriptive knowledge, and descriptive knowledge based on their responses to the questionnaire are 45, 34, and 23 respectively. Based on the interval score for Technological Knowledge Level, the participants' level can be categorized in the second level which is Technical Maxim, which is in line with the observations' result. The chart further supports by showing that the average percentage of the participants is toward the tacit knowledge with 44%, followed by prescriptive knowledge with 34%, and descriptive knowledge with 22%.

Result of the second section of questionnaire

As for the second part of the questionnaire, which is the open-ended questions, the purpose of the three items asked is to find out the students' way of utilizing the technology using their technological knowledge and the difficulties they faced. The result of the questionnaire shows that the students use Mendeley System, which they were introduced to in this writing class, as the

technology mostly used during their Writing IV class and Facebook and Blogger as the place to post their writing. They also used Grammarly to assist them in writing their academic writing. Some of the students use several other supporting media such as Google Scholar and Plagiarism Checker to further help their writing process. As for the difficulties they faced, some of the students stated that it is difficult in finding the related studies for their reference, while some other tends to just copy directly from the references, which is an act of plagiarism if done incorrectly. Some other students also state that they face some difficulties in using the newly learned media in the beginning.

Statistical analysis

The statistical analysis is used to find out the students' Academic Writing Skills. As there were four participants that did not return the questionnaires, they were not accounted in the descriptive statistics result. The table below is the descriptive statistic of Razi's (2015) Transparent Academic Writing Rubric (TAWR) result.

Table 7. *Descriptive statistic of the students' academic writing skill*

Descriptive Statistics				
	N	Sum	Mean	Std. Deviation
Introduction	13	11.38	.8750	.27481
Citation	13	8.63	.6635	.22029
Academic_Writing	13	18.25	1.4038	.22909
Idea_Presentation	13	14.18	1.0909	.31272
Mechanics	13	6.86	.5275	.24317
Valid N (listwise)	13			

The table shows the mean of each category in the TAWR for 13 participants. The mean for both Academic Writing and Idea Presentation categories are the highest, meaning that the students are capable of presenting their idea and following rules of academic writing. However, the students have very low mean for both Citation and Mechanics, which shows that they had difficulties in citing and quoting experts and writing in correct structure and format. The mean for Introduction is also quite low which means that the students were having difficulties in explaining their article purposes.

Discussion

Based on the findings, several interpretations can be made. The first interpretation is that according to the result of the questionnaire, the participants technological knowledge level is on the second level, technical maxim. Herschbach (1995) explains that technical maxim is the level where the capability of the technology user to generalize the skills in using technology is applied internally with very general way of explaining the way to do it. In this level, the students were capable of applying their technological knowledge in academic writing. However, the students had problems if they want to share their knowledge to their peers. This level also shows that the students were more comfortable with technology that is relatable to them as they possess prescriptive knowledge, in which the students prefer to pick up technology such as Microsoft Word that they are familiar with instead of using the newly learned one such as Grammarly and Mendeley System in order to avoid the trial-and-error process as many times as possible. This answered the first research question.

The second interpretation focuses on the second research question. Based on the observation, interview with the lecturer, and the questionnaire result. The students apply their technological knowledge on academic writing

moderately. The observations showed that the students struggled when new technology is introduced to them and they tended to avoid using the new technology during writing, such as not using the Mendeley System for their referencing process. The questionnaire results also showed that the students were applying their technological knowledge to the internet-based technology such as Google Scholar and Plagiarism Checker, but tends to copy-and-paste what they found instead of paraphrasing and rechecking what they found, which is in line with what Razi (2015) found that university students have tendency to plagiarize. This indicates that the students were more comfortable if the technology is instantaneous in nature instead of having to be learned in a certain amount of time. This, in turn, impacted to the quality of their academic writing, in which the students were capable of composing ideas for their topic, but were incapable of explaining clearly what they intended to explain as well as backing up their writing with proper citation. As Whitaker (2009) states, there are 10 principles in academic writing, which are clear purpose, audience engagement, clear point of view, single focus, logical organization, strong support, clear and complete explanations, effective use of research, correct APA style, and writing style. The students writing result shows that some principles such as clear purpose, audience engagement, strong support, effective use of research, correct APA style, and the writing style were not fulfilled by the majority of the students.

The third interpretation focuses on the third research question. The main problem faced by the students in applying their technological knowledge in writing was their tendency to copy-and-paste. This tendency affected the quality of the students' academic writing as Alhusban (2016) explained that the students were used to getting everything fixed automatically and set their mind that what they copied is correct

without doubt. The observations and questionnaire results also found that the use of technology in finding references was tedious as the references were abundant and finding the suitable as well as credible reference takes lot of time that once the student found what they feel fit with their research, the student just copied the reference without proper citation. Another problem based on the observations and the students' academic writing is that the students were neglecting the Mechanics aspect of academic writing, indicated by the lowest mean in the academic writing rubric result. This matches with Alfaki's (2015) finding which states that mechanical problems are the most prominent writing problems faced by university students, followed by linguistic problems and cognitive problems. The students writing, as stated before, were fixed manually by the technology the students use. However, the technological knowledge of the students in using applications to assist their writing made the students neglected rechecking their own writing, resulting in persistence structural error in subsequent draft. Moreover, as Facebook and Blogger are the media where they posted their writing afterward, this resulted in the students did not follow the appropriate writing format such as spacing and paper format as both media are devoid of the feature. Despite the existence of peer-checking through commenting each other work, the peer-checking is not effective to improve the students' writing as the comments from peers tend to be very brief and very general. This is in line with what Pechenkina and Aeschliman (2017) states that group work is preferable and more effective in face-to-face settings instead of online. Further statements from Pechenkina and Aeschliman (2017) states that students prefer to use the technology as communication media between friends, thus they do not seek assistance from their instructor to assist them. On the other hand, it is also clear that students need guidance from instructor as explained by Inderawati, Sofendi, Purnomo, Vianty, and Suhendi (2019) that the roles of instructor in learning using technology are developing material, evaluating the result, and giving feedbacks in order to ensure the students do not neglect the writing process.

CONCLUSION

Based on the findings, the writer can conclude that: first, the technological knowledge level of the participants is at level two, which is

Technical Maxim where the students are capable of utilizing their technological knowledge personally but prefer in using the technology they are familiar with, second, the participants applied technological knowledge on academic writing moderately, particularly in finding references and structuring the idea of their topic, and third, the participants have several problems in applying technological knowledge in academic writing, such as in citing references correctly, avoiding tendency to copy-and-paste, structural error due to using automatic correction, and paper formatting.

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