



Developing Undergraduates' Awareness of Metacognitive Knowledge in Writing Through Problem-based Learning

Muhammad Mukhtar Aliyu

Department of English, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
E-mail: aliyumuhammadmukhtar39@gmail.com

Yong Mei Fung (Corresponding author)

Department of English, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
E-mail: yong@upm.edu.my

Mardziah H. Abdullah

Department of English, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
E-mail: mazha@upm.edu.my

Tan Bee Hoon

UCSI University, Malaysia
E-mail: tanbh99@yahoo.com

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Abstract

Metacognitive awareness can improve students' writing proficiency. Engaging and supporting students in the writing process can increase their metacognitive awareness. This study investigates the effects of a problem-based learning approach on the awareness of metacognitive knowledge of Nigerian undergraduates in writing. An intact class of second-year students in an English composition course participated in the study. The study was conducted over a period of 12 weeks. Quantitative and qualitative methods were used in data collection. A metacognitive questionnaire was administered before and after the PBL treatment. Semi-structured interview was also carried out at the end of the treatment. The results showed significant effects of the PBL approach on the participants' awareness of metacognitive knowledge of task requirements, personal learning process, strategy use, text and accuracy, problem solving and discourse features. The findings from the interview revealed that the nature of the ill-structured problem, which is related to their real life, and the interactions during the PBL process increased the participants' awareness of metacognitive knowledge. The findings further showed that PBL approach could be adopted by ESL instructors and teachers to increase students' awareness of metacognitive knowledge which in turn can enhance their writing proficiency.

Keywords: ESL writing, metacognitive awareness, metacognitive knowledge, undergraduates, PBL approach

1. Introduction

Acquiring writing proficiency has been a difficult task for undergraduate students especially in a second (L2) or foreign language (FL) context (Barkaoui, 2007). Over the years, researchers have been analysing students' writing processes and strategies in order to provide solutions to the students' writing problems (Bitchener & Basturkmen, 2006; Crossley, Kyle & McNamara, 2016; Paltridge, 2004; Raoofi, Chan, Mukundan & Rashid, 2014). Various factors that influence students' writing skills have been identified by different scholars (Mu, 2005; Xiao, 2007). One of the contributing factors is awareness of metacognitive knowledge. In a writing process, awareness of metacognitive knowledge allows writers to be aware of the attributes, structures and demands of the different genres (Harris, Santangelo & Graham, 2010). It also allows writers to be aware of how to regulate their cognitive process in writing, their knowledge of writing process and the demands of different writing genres (Wong, 1999) through conscious use of strategies, namely planning, monitoring and evaluating.

Scholars suggest that metacognitive awareness is the main factor that separates high-level writers from low-level ones (Tsai, 2009; Wei, Shang & Briody, 2012). Many studies have been carried out to investigate the relationship between awareness of metacognitive knowledge and the writing proficiency of students and discovered positive relationships between the two (Kasper, 1997; Yanyan, 2010). Yanyan (2010) investigated the relationship between metacognitive knowledge and writing proficiency of Chinese freshmen. She found that students with a higher metacognitive knowledge base performed better in their writing than those with lower metacognitive knowledge. Similarly, Wei et al. (2012) found out that high-level writers employ metacognitive skills effectively in their writing process especially

during planning and reviewing than low-level writers. The former generates complete ideas and is more concerned with the needs of the audience and the demands of specific genres.

Therefore, to develop students' writing ability, the scholars emphasise the need to develop students' awareness of metacognitive knowledge. Students need to be aware of their writing purpose and processes and learn to actively set and regulate their own cognitive goals associated with writing in order to become good writers (Kasper, 1997). Researchers also highlight the need to adopt instructional approach that would develop students' metacognition to enable them to become successful writers (Xinghua, 2010). Graham and Harris (2009) suggest that instructors should adopt approaches that engage students in the writing process and allow them to work together to learn strategies for planning, revising and editing their writing.

The term metacognitive knowledge is described as the knowledge a learner has about him/herself, the learning task or the learning process. Wenden (1998) classified metacognitive knowledge into three different but related knowledge: person knowledge (general knowledge that learners have acquired about themselves as learners, which may facilitate or hinder their learning such as age, language aptitude, motivation); task knowledge (knowledge about the purpose of a task. It also includes knowledge about the nature of a particular task and information about a task's demands, such as the knowledge and skills needed to complete a task); and strategy knowledge (strategies to employ in order to manage, direct and regulate learning).

In relation to writing, Kim (2013) subcategorises metacognitive knowledge into six components: metacognitive knowledge of task, personal learning process, strategy, text and accuracy, problem solving, and discourse features. Metacognitive knowledge of task is the awareness of various aspects relevant to a writing task, such as the purpose of the writing task and the characteristics of the genre of writing. She describes metacognitive knowledge of personal learning process as the awareness of various aspects of learning to write in English, such as individual ways to improve L2 writing proficiency by oneself or through instruction. For metacognitive knowledge of strategy, she describes it in general as the awareness of effective strategies in L2 writing; for example, strategy to compensate for lack of vocabulary knowledge. Metacognitive knowledge of text and accuracy involves the awareness of the use of discourse markers and accurate textual features in writing. Metacognitive knowledge of problem solving is the awareness of means of problem solving when confronted with difficulty in writing, for instance, sentence formation, and management of time limitations. For the final subcomponent, metacognitive knowledge of discourse features is the awareness of the characteristics of discourse of English and L1 in writing and speaking. Based on the suggestions of Graham and Harris (2009), the present study adopts a problem-based learning approach in order to improve the students' awareness of metacognitive knowledge in writing.

Problem-based learning approach (PBL) is a student-centred approach (Wilkerson & Gijsselaers 1996) where students assume the major responsibility for their learning by deciding and discovering for themselves what they will learn and how they will learn. In the PBL approach, a problem that is related to students' real life is given as a trigger for the students' inquiry. This leads the students to discovery of relevant knowledge and skills required to solve or understand the problem. Working in groups to discuss the problem, the students eventually develop their collaborative and cooperative learning skills (Mardziah H. Abdullah & Tan, 2008).

Many studies have employed the PBL approach in developing students' metacognitive awareness in science related fields. For example, Downing, Kwong, Chan, Lam, and Downing (2009) investigated the effect of the PBL approach on metacognitive skills of students in China and found that it is effective in developing the students' metacognition. Similarly, Tosun and Senocak (2013) revealed the effectiveness of the approach in increasing metacognitive awareness of chemistry students. Numerous other studies have been conducted using the PBL approach and found it effective in developing students' learning skills such as critical thinking skills (Yuan et. al, 2008), problem-solving skills (Bigelow, 2004), language skills (Norzaini Azman & Shin, 2012) and motivation to learning (Barrows, 2002; Tasoglu & Bakaç, 2010).

Although studies have shown the importance of engaging and supporting students in developing their metacognition in a writing process, many of the instructional methods adopted in Nigerian classrooms do not engage or support students in this way (Muodumogu & Unwaha, 2013). Researchers have identified various problems in the writing of Nigerian undergraduate students. Most of these problems are attributed to the students' lack of awareness of metacognitive knowledge. For example, many students are not aware of the skills required for them to achieve their writing goals, such as grammar and rhetoric (Bodunde & Sotiloye, 2013). Despite the importance of metacognitive knowledge in the development of writing proficiency, there is lack of research that aims to develop students' awareness of metacognitive knowledge in the Nigerian context through problem-based learning approach.

Therefore, the objective of the study is to investigate the effect of a problem-based learning approach (PBL) in developing students' awareness of metacognitive knowledge in writing. The following research questions are formulated to guide the study:

- a) What are the effects of PBL on undergraduates' awareness of metacognitive knowledge?
- b) How does the PBL approach improve undergraduates' awareness of metacognitive knowledge?

2. Methodology

2.1 Design of the Study

The study employed a quasi-experimental research design. The independent variable in this study was the PBL treatment which was incorporated in the participants' writing process. The dependent variable of the study was the participants' awareness of metacognitive knowledge in writing. The participants' awareness of metacognitive knowledge was measured twice, before the PBL treatment, and at the end of the treatment. The PBL treatment was given to the participants in two cycles. In each cycle, the participants were given an ill-structured problem to work collaboratively and propose viable solutions within three weeks. With tutor facilitation, the participants generated possible solutions, brainstormed and identified available information related to the problem. They also identified learning issues, namely things they needed to find out more information about. Thereafter, they divided the learning issues among them and identified resources to look up or consult. They gathered the information through self-directed learning and finally proposed viable solutions. A debriefing session was conducted by the tutor to discuss writing and PBL-related issues with the participants at the end of each cycle.

2.2 Participants of the Study

This study was conducted at a college in North-Eastern Nigeria. An intact class of 18 second-year undergraduates taking a compulsory course of English Composition for one semester participated in the study. Before enrolling in the course, the participants studied an Introduction to Composition course where they acquired the basic knowledge of writing in English. The participants were of mixed-gender and their ages ranged from 24-38 years old. They had no experience of collaborative learning as it was not practised in the institution. The participants shared the same first language and culture. They were assigned into three groups to carry out the PBL activities.

2.3 Instruments

Two instruments were used in data collection of the study: a metacognitive questionnaire and semi-structured interview. The metacognitive questionnaire used in the study was adapted from Kim (2013). It comprised 29 closed-ended items designed in a 5-point Likert scale. The questionnaire elicits information regarding the participants' metacognitive knowledge of task requirements, personal learning process, strategy use, text and accuracy, problem solving, discourse features (see Appendix). To test the reliability of the questionnaire, a pilot study was conducted prior to the actual study. Cronbach's alpha coefficient was calculated for the pilot and actual studies. The reliability levels were 0.96 and 0.97 respectively.

To triangulate the data collected from the questionnaire, a semi-structured interview was conducted with all the participants at the end of the PBL treatment. The interview enabled the participants to express and share their experiences of PBL in relation to their awareness of metacognitive knowledge of their writing. The interview was audio-recorded, transcribed and categorised based on emerging themes.

3. Results and Discussion

To analyse the quantitative data obtained from pre- and post-treatment questionnaire scores, SPSS Version 22.0 was used to calculate descriptive statistics. To address the first research question, the means of the pre- and post-treatment scores were compared using Wilcoxon signed-rank test because the data were not normally distributed due to the small number of sample (Mayers, 2013).

The results of the descriptive analysis of the metacognitive questionnaire showed that the participants' awareness of metacognitive knowledge increased after going through the PBL approach. It revealed an increase in the mean scores of all the aspects of metacognitive knowledge tested in the questionnaire as shown in Table 1. The mean score for metacognitive knowledge of task requirements in post-treatment ($M = 40.16$) is bigger than that of the pre-treatment ($M = 31.83$). The mean score for personal learning process is also bigger in the post-treatment ($M = 22.16$) compared to the pre-treatment score ($M = 17.33$). Metacognitive knowledge of strategy use has a low mean score ($M = 7.33$) in the pre-treatment but higher in the post-treatment ($M = 10.11$). The mean score of metacognitive text and accuracy in the pre-treatment is 11.88 and it shows an increase in the post-treatment ($M = 17.00$). For metacognitive knowledge of problem solving, its mean score is lower in the pre-treatment ($M = 14.38$) but higher in the post-treatment ($M = 17.44$). Finally, the mean score for discourse features is ($M = 15.33$) in the pre-treatment, and it shows an increase in the post-treatment ($M = 17.66$).

In order to answer the first research question about the effect of the PBL approach on the participants' awareness of metacognitive knowledge, Wilcoxon signed-rank test was run. The results showed that there were significant differences between all the components of metacognitive knowledge before and after the PBL sessions. The results are as follows: task requirements ($z = -3.73$, $p = .000$), personal learning process ($z = -3.73$, $p = .000$), strategy use ($z = -3.55$, $p = .000$); text and accuracy ($z = -3.59$, $p = .000$), problem solving ($z = -3.63$, $p = .000$), and discourse features ($z = -3.42$, $p = .001$). Table 1 shows the summary result.

Table 1. Wilcoxon signed-rank test for pre- and post-treatment metacognitive scores (n=18)

Components	Pre-tr. Mean	Post-tr. Mean	Mean Diff.	Z value	Sig.(2 tailed)
Task Requirements	31.83	40.16	8.33	-3.73	.000
Personal Learning Process	17.33	22.16	4.83	-3.73	.000
Strategy Use	7.33	10.11	2.78	-3.55	.000
Text and Accuracy	11.88	17.00	5.12	-3.59	.000
Problem Solving	14.38	17.44	3.06	-3.63	.000
Discourse Features	15.33	17.66	2.33	-3.42	.001

p value= .05

The results of the analysis show that PBL significantly increased the participants' awareness of metacognitive knowledge in writing. It is shown that the PBL approach prompts participants to reflect and think about what they already know and motivates them to write. The findings are similar to those of Downing et al.'s (2009) study which showed the effectiveness of the PBL approach in improving students' metacognition. Furthermore, the findings confirm the findings of Yanyan (2010) which showed positive correlations between metacognitive awareness and writing proficiency.

In order to find out how the PBL approach improved the participants' awareness of metacognitive knowledge, to answer the second research question, a semi-structured interview was conducted with all the participants at the end of the PBL treatment. From the responses of the interview, three themes were identified. The themes revealed that the group interactions during the PBL process encouraged the participants to retrieve task knowledge. It also allowed the participants to be aware of their knowledge of personal learning process. Finally, PBL gives the participants a new perspective to writing stages.

3.1 The PBL Approach Encourages Thinking and Retrieval of Task Knowledge

It was revealed from the findings of the interview that the participants were used to writing alone. None of them had experience of PBL approach or any writing class where students collaboratively write with the help of a teacher. Whenever a writing activity was given, the majority of them relied on their own ability. As the result, they faced some problems while writing alone which include limited knowledge required for the completion of the writing task, such as, ideas relevant to the topic, grammar and appropriate vocabulary. Having gone through the PBL approach, more than three-quarters of the participants reported that the approach encouraged them to think and retrieve knowledge which allowed them to develop and present their ideas clearly and logically.

A number of things helped the participants to acquire knowledge relevant to their writing activities, such as, the nature of the ill-structured problem and the support they received from their tutor and peers during the process. Because all the participants have first-hand experience of the ill-structured problem, it was easier for them to contribute and generate ideas to enrich the content of the writing. One of the participants, Yunus, explained that the ill-structured problems given to them during the PBL activities motivated him to think and generate many ideas to write about. This is because the ill-structured problems were related to their real-life situations. In addition, the complexity of the ill-structured problems, the extensive reading and self-directed learning involved in the PBL process allowed the participants to view the problems from various perspectives. This prompted their thinking and allowed them to expand on group member's idea.

Umami explained that the extensive reading and self-directed learning involved in the PBL approach helped her to acquire new knowledge relevant to their writing. Yunus also felt that after the PBL activities he could generate more ideas than he used to do. This is because he learned to improve the content of his writing through the interactions he had during the PBL session. He also learned to generate more ideas from their discussions and consulted other sources to gain new knowledge or ideas that would improve his writing.

As for the content, I think now I can write better because I would think of more ideas and I have learned to refer to others materials while I have to write about something not just what I already know alone. So it has improved the content of my writing.

Amina also believed that she learned a number of vocabularies from her group members. She gave an example of the word *dexterous* which she did not know its meaning before but learned it during their group discussion.

My vocabulary has increased. I heard a word from a group member, "dexterous" I didn't know the word before, but I heard it from a member in the group. You know you can't just take a dictionary and keep on reading the words inside it. But when you hear a word then you try to find out the meaning.

Amina also learned to think and generate new ideas relevant to her writing topic as the result of the support given by her group members. Whenever she was stuck in the process, her group members helped either through suggesting new ideas

or by explaining ideas mentioned previously. The interactions allowed Amina to look at various perspectives while writing on a topic. This helped her to improve her writing unlike the occasions when she was writing alone.

When you generate ideas yours alone, you may get stuck in an idea, so you can ask a member to help you by explaining more. If that person explains, you can put it down in your own words. So I think this PBL approach is an effective way of improving writing.

Another factor that helped the participants to share their ideas freely and acquire new knowledge from one another was the support given by tutors in the process. Habib explained that their tutor encouraged them to speak their minds during the PBL sessions reminding them that there was nothing like a wrong or right answer in PBL. Habib further explained that because he was not used to speak English in public, he sometimes felt nervous during the sessions. However, their tutor encouraged him to speak which helped him to express his ideas and improve his speaking skills.

This theme shows that PBL allowed the participants to retrieve knowledge required for them to achieve their writing goals such as the knowledge of the writing topic, grammatical knowledge and vocabulary. This knowledge includes Kim's (2013) metacognitive knowledge of task, discourse features and discourse markers and accurate textual features. The findings are in line with those of Downing et al.'s (2009) study which showed the effectiveness of the PBL approach in helping their students to identify and select important information in the learning situation.

3.2 PBL Increases Awareness of Personal Knowledge

Kim's (2013) describes metacognitive knowledge of personal learning process as the awareness of various aspects of learning to write. The findings from the interview revealed that PBL helped the participants to identify factors that may positively influence their writing, such as their motivation and attitude in writing. The PBL approach increased the participants' motivation and changed their attitude towards writing in English. It is further found out that the approach stimulated their interest and increased their confidence in writing. These are as the results of many factors. For example, the participants' different expertise allowed them to help one another in the process. In addition, the ill-structured problems given were related to the participants' real-life situations. They could easily generate as many ideas as possible. Another reason is that the participants worked in groups where they were all familiar with one another. One other factor that encouraged and motivated the participants is the fact that there is no right or wrong answer in the PBL process. Therefore, they could easily share their views and support one another without anxiety. All these helped the participants to overcome their writing difficulties and change their attitudes towards writing. For example, Khadija explained the PBL approach motivated and changed her attitude towards writing in English. Before she participated in the study, she did not like writing at all. One of the reasons was that she used to write in English only for academic purposes such as assignment, test or examination. However, after going through the PBL process, her motivation and attitude towards writing in English increased. This is because during the PBL sessions, she was supported by her group members which made her realise how interesting writing is. As the result, she even started writing on her own at her leisure not only for academic purposes.

Before I don't like writing at all; I don't use to write anyhow. The only thing I used to write is when it comes to exams or test, they give us something to write and I write. But now I like it. My attitude towards writing has changed. Now I write my diary every day. At my leisure time I will just pick up my jotter form a topic and start writing on it so that I see if I can develop my writing skills.

Ishaq explained that the PBL approach increased his motivation towards writing in English. Before this, he had no interest in writing because he considered it as a difficult activity as he lacked ideas. However, his attitude changed after going through the PBL process. He began to develop interest in writing in English. He also learned to generate more ideas to write about because the ill-structured problem was interesting. He even concluded that writing generating ideas was not as difficult as he thought. He explained:

Really, it motivates me to write because before I don't like writing because it is difficult but now I began to have interest and see the simplicity of writing. Especially, the second ill-structured problems, the one talking about students engagement with the social network, it was more interesting and motivated me to generate more ideas to write.

These findings also concur with those of Downing et al.'s (2009) study which showed the effectiveness of the PBL approach in improving students' development of students' confidence, motivation levels, and increased their attitudes and interest towards their academic activities.

3.3 The PBL approach gives a new perspective to writing stages

It was further revealed from the interview that the PBL approach gave the participants a new perspective to the writing stages: planning, drafting and editing. The participants explained that the PBL approach increased their awareness of the importance of the writing stages and how to carry out each of the stages. This includes their metacognitive knowledge of strategy, problem solving, text and accuracy, and metacognitive knowledge of discourse features. For example, for planning, more than half of the participants explained that they were taught that planning is one of the stages of writing. However, when writing alone they did not usually plan, brainstorm or outline ideas before writing. This is because they were not aware of the importance of planning in improving their writing quality. Nevertheless,

having gone through the PBL approach, their awareness of the need of planning to ensure successful writing increased. Abdul revealed that before he went through the PBL approach, he did not bother about brainstorming or organising his ideas. Through the PBL process, he learned how to outline his ideas and to make a rough draft before engaging in the actual writing. During the PBL session, they spent the two-hour session planning their essay and everyone contributed different ideas.

Organisation is another challenging part of writing because it requires the participants to think of appropriate sequence to present and support their ideas logically. More than half of the participants did not think about organising their ideas or paragraphs when writing alone. Many of them did not know how or why they should organise their ideas. However, when they participated in the PBL activities, they learned that organisation is an important aspect of writing. They learned to take their time to organise their ideas. As there were many group members, it was easier for them to suggest better ways to present ideas in the writing. Binta explained that she learned from her group members how to organise ideas clearly.

Because, they say two heads are better than one. If you want to put down your points and you don't know how to do that, you have someone with you and that person can assist you present it clearly.

In the actual writing process, the participants revealed that the PBL approach helped them to keep track of the writing progress from one aspect to another and to identify any problem that hinders the writing process. Ishaq, explained that during the PBL process his group was cautious of time. They used to remind themselves whenever they were about to exceed the time allocated for a session, or when they unnecessarily spent too much time on a particular aspect of writing. The PBL process helped them to focus on the important things to do.

Editing process is another difficult and boring stage of writing for the participants. However, the findings showed that the PBL approach gave the participants a new perspective to editing. It allowed them to be aware of the need to edit and revise their writing, as well as to use punctuation marks and spellings. When writing alone, more than half of the participants did not edit their work after drafting. About one-quarter of the participants only read their essay and made minimal correction. One of the reasons was due to lack of time. Other participants explained that they did not see the need for editing because they thought that their writing was good. However, the interactions during the PBL sessions gave the participants a new perspective to editing. This is because during editing they could also improve the content and organisation of their writing not only spelling and punctuation mistakes.

Umami believed that the PBL approach helped her to improve her editing. She became more aware of the need to edit her work better than before. Before this, she only did minor corrections of grammatical mistakes. However, through the PBL sessions, she learned to plan her work and go through the first draft in order to make appropriate changes and rewrite when necessary.

Similarly, Ishaq, did not bother to check his spelling and punctuation after writing. He did not consider it important because he thought all his spellings and punctuations were correct. During the PBL sessions, he realised the importance of checking his spellings and punctuations because some mechanical errors can only be detected while proofreading.

You know, it also affects my spelling because I usually, before, I didn't mind to check my spellings after writing but with this approach I learned that spelling is of paramount importance as well.

The third theme includes metacognitive knowledge of strategy, problem solving, text and accuracy, and metacognitive knowledge of discourse features. It revealed how the participants learned to carry out their writing successfully following the writing stages. In general, the findings revealed that the PBL approach increase the participants' awareness of metacognitive knowledge in writing due to the nature of the ill-structured problem, tutor support and peer collaboration. The findings are in line with the Graham and Harris' (2009), and Xiao's (2007) propositions which emphasise the need for peer collaboration and teacher support throughout the planning, drafting and editing processes in order to develop students' metacognition in writing. Furthermore, the findings of this study concur with Ruan (2005) who showed that students' metacognitive knowledge could be developed through classroom instructions.

4. Conclusion

The findings of the study revealed that PBL could be used to increase students' awareness of metacognitive knowledge in writing. When metacognitive awareness increases, writing performance will also improve. This supports the view that engaging students in a writing process where they could be helped by both teachers and peers helps to improve the students' metacognitive awareness (Xiao, 2007).

There are some limitations in this study. The study is limited to a small number of participants and was conducted in a short period. To address the limitations of short time frame and small number of participants, further studies can be conducted with larger number of students particularly in public universities in Nigeria and for a longer period. Despite the limitations, various benefits could be derived from the findings. The study contributes to the field of ESL writing by providing an empirical evidence supporting the effectiveness of the PBL approach in developing students' awareness of metacognitive knowledge. Language instructors and teachers can adopt the approach in their writing classrooms to develop students' metacognition and writing performance. They should provide learners with some opportunities to engage actively with peers in the writing process. Eventually, students will change their attitude towards ESL writing,

realise their potentials as they take charge of their learning and appreciate learning through self-discovery and the use of real-life problem.

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