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IMPROVEMENT OF METACOGNITIVE THINKING SKILLS IN TEACHER-STUDENT SCIENTIFIC ASSIGNMENTS THROUGH THE USE OF ONLINE PLATFORMS

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Abstract

Scientific problem-solving, starting with simple tasks and growing in difficulty until reaching the task with the climax level of difficulty, can be used as a training tool for developing metacognitive thinking abilities. Teachers and lecturers can make the most of scaffolding from online platforms by demonstrating how to complete a task in a systematic way. This study uses a participatory action research/PAR design with a class of students from the Islamic Religious Education study program at the University of Muhammadiyah Jakarta to examine how students learn metacognitive thinking abilities from completing scientific assignments in research methods courses employing interviews, documents, and observation to gather data. One of the study's most significant findings is that lecturers can use a number of strategies to help students develop their metacognitive thinking skills. These strategies are as follows: 1) Students can be trained in learning metacognitive thinking skills as early as the first semester through English resources introduced by lecturers from reputable online search engines; 2) Lecturers can offer a focus on research methodology assignments that require students to access various online platforms in their work; 3) It is recommended that research methodology courses be spread out in the early, middle, and final semesters; 4) Lecturers can improve the metacognitive thinking skills and self-efficacy of more advanced students by using various approaches, strategies and learning resources. If necessary, a reward and punishment system can be applied, especially to motivate male students and students who lack discipline.

Keywords: scientific problem-solving; online platforms; scaffolding; metacognitive thinking abilities

Abstrak

Pemecahan masalah ilmiah, mulai dari tugas-tugas sederhana dan berkembang dalam tingkat kesulitan hingga mencapai tugas dengan tingkat kesulitan klimaks, dapat digunakan sebagai sarana latihan untuk mengembangkan kemampuan berpikir metakognitif. Guru dan dosen dapat memanfaatkan scaffolding dari platform online dengan mendemonstrasikan cara menyelesaikan tugas secara sistematis. Penelitian ini menggunakan desain penelitian tindakan/PAR partisipatif dengan melibatkan sekelompok mahasiswa program studi Pendidikan Agama Islam Universitas Muhammadiyah Jakarta untuk mengkaji bagaimana mahasiswa mempelajari kemampuan berpikir metakognitif dari menyelesaikan tugas ilmiah dalam mata kuliah metode penelitian dengan menggunakan wawancara, dokumen, dan observasi untuk mengumpulkan data. Salah satu temuan studi yang paling signifikan adalah bahwa dosen dapat menggunakan sejumlah strategi untuk membantu mahasiswa mengembangkan kemampuan berpikir metakognitif mereka. Strategi-strategi tersebut adalah sebagai berikut: 1) Mahasiswa dapat dilatih untuk mempelajari keterampilan berpikir metakognitif sejak semester pertama melalui sumber bahasa Inggris yang diperkenalkan oleh dosen dari mesin pencari online; 2) Dosen menawarkan fokus pada tugas metodologi penelitian yang mengharuskan mahasiswa untuk mengakses berbagai platform online dalam pekerjaannya; 3) Disarankan mata kuliah metodologi penelitian disebarluaskan pada semester awal, tengah, dan akhir; 4) Dosen dapat meningkatkan kemampuan berpikir metakognitif dan efikasi diri mahasiswa yang lebih maju dengan menggunakan berbagai pendekatan, strategi dan sumber belajar. Jika perlu dapat diterapkan sistem reward and punishment terutama untuk memotivasi siswa laki-laki dan siswa yang kurang disiplin.

***Kata kunci**: pemecahan masalah ilmiah; platform online; perancah; kemampuan berpikir metakognitif*

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Introduction

During the recent Covid-19 pandemic, using online platforms for teaching and learning activities has been the standard for both teachers and students. Reciprocal teaching is a strategy that teachers use to create engaging online learning and teaching activities for their students (Lee & Yeong, 2020). According to Glover's study and those of his colleagues, online platforms are related to coaching activities, the use of teacher interventions, closing of instructional gaps, and student accomplishment. This is due to the fact that an online platform framework may offer technical support, such as the usage of video tutorials, which aids in managing course resources and improving users' (students') learning experiences (Xu & Zhou, 2020), these activities can be enhanced by employing online platform scaffolding linked to literacy and critical literacy (Rosfiani et al. 2021; Sutisnawati et al. 2022). Coaches may also employ direct instruction as a method of instruction, in which coaches (lecturers) present new information or skills that coachees can then practice (students) (Hermawan, et al. 2022). The usage of online platforms can boost student academic success and satisfaction, which can aid decision-making at universities, colleges, and other higher learning institutions in planning, evaluating, and implementing online platforms at their establishments (Abuhassna et al, 2020).

A Scaffolding Using Online Platforms

In the presence of scaffolding, students do better academically (Kim & Ryu, 2013; Endurur & Yildirim, 2019). When compared to students who did not receive any scaffolding, learners who received an online-based internet search scaffold during an internet search significantly improved their metacognitive abilities (Raes, et al. 2012). The results also support the notion of a dual scaffold, one that is reinforced by both teachers and technology (Zion & Mevarech, 2015). Additionally, while social metacognitive support enhances student involvement in their peers' learning processes and enables collaboration, individual metacognitive assistance has a major impact on students' online metacognitive performance. As a result, students who received pedagogical agents along with metacognitive scaffolding were found to have a higher level of self-regulation abilities than students who did not receive pedagogical agents (Jumaat & Tasir, 2016).

Enhanced Metacognitive Thinking Skills via Scientific Problem-Solving

A concept and practice known as metacognition, which is frequently referred to as "thinking about thinking," helps explain how students can enhance and manage their thinking and learning (Smith, 2017). In the creative process, metacognitive thinking is crucial and plays a significant role. When instructors aim to enhance procedures and student outcomes, the metacognitive component interacts and can offer insight (Kavousi, 2019; Rosfiani et al. 2022). Students engage in extensive metacognition along the learning route for creative thinking, beginning with evaluation, planning, action, formation of initial knowledge, and selection of creative ideas (Fauzi, 2019). Metacognitive evaluation can be used as a teaching tool to promote higher-order thinking (Hostetler, 2018). The sub-dimensions of "thinking skills, reflective thinking skills directed at problem-solving, decision-making skills, and appraisal of alternatives" are also at a higher level in learners (Coşkun, 2018; Adadan, 2018; Kozikolu, 2019; Muhali, 2019; Azmy, 2020; Toraman, 2020). As a result, the metacognitive instruction provided to pupils has benefited their propensity for critical thought (Akyüz, 2018; Gotoh, 2016). Additionally, by using ePortfolios, university professors can encourage their students to become autonomous learners (Jager, 2019).

As a result, it is desirable to incorporate metacognition into the learning environment to improve instructional strategies that encourage students to engage in reflective thinking (Antonio, 2020), which can be assisted by modeling and cognitive scaffolding (Wynn, 2019). According to

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Thienngam, Hashmi, and Gotoh (2017), even teachers who participate in the Metacognitive Skills program had greater metacognitive skill scores than others for both regulation and cognition knowledge. This indicates that metacognitive awareness directly influences cognition (Pantiwati, 2017). Giving feedback instructions hence frequently demonstrates various metacognitive regulation processes, exhibits high-level task perceptions, and fosters awareness of and use of metacognitive techniques (Teng, 2019).

There is a dearth of empirical research on the topic of employing online platforms to help students develop their metacognitive thinking skills while completing research methods course tasks. The purpose of this study is to describe how students' metacognitive thinking abilities develop as a result of working on scientific assignments for research methodology classes. The findings of this study will guide techniques for acquiring metacognitive skills amidst a variety of very demanding study-related challenges.

Method

This research was conducted in the Islamic Religious Education program at Muhammadiyah University in Jakarta. Stringer's Participatory Action Research (PAR) design was utilized in this study (2007). According to (Stringer, 2007), the purpose of PAR is to encourage participation and community cooperation. The steps of Stringer's (2007) PAR Model are observing, considering, and acting (Stringer, 2007). The issue has been identified, and researchers have come up with a plan to solve it. A summary of the research procedure and success metrics is provided below.

Procedure

Sampling. According to Creswell (2012), researchers in this study purposefully choose persons and locations to examine or comprehend the central phenomenon. *Participants.* The teacher-student groups who enroll in research methods courses have been identified by the researchers. A total of 32 teacher-students made up the participants. In a research technique class, 32 participants were required to create a scientific study. *Interview, Observation and Document.* By monitoring how students developed their metacognitive thinking skills during the teaching and learning process and noting the outcomes of student work from various assignment documents gathered, the researcher gathered open-ended information. Interviews were also performed by researchers to gather comprehensive data. *Trustworthiness.* The triangulation method was used by the researcher to validate the results. In this context, triangulation refers to a process of bolstering evidence from students and lecturers for data types in the form of assignment documents and observation notes on the development of metacognitive thinking skills over the course of one semester of research methodology courses.

Results and Discussion

The discussion of the findings begins with the following observing:

Step 1: Search the web for journals, proceedings, and e-books. Students are taught by lecturer to use several web search engines to find journals, proceedings, and electronic books. You can access Eric at https://eric.ed.gov/, Google Scholar at https://scholar.google.com/, and Garuda at https://garuda.ristekbrin.go.id/ for specialized journals in education. You can access the e-book at https://www.libgen.is/.

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Followed by considering:

Step 2: Download journals, proceedings, and electronic books that are pertinent to the study. The lecturer gives the students instructions on how to download journals, proceedings, and any electronic books they may have found.

Step 3: Save the downloaded files into a folder. The lecturer instructs the class to make two folders for the downloaded files. To make things simpler to organize in the references manager (Mendeley), one special folder is named journal and proceedings, while the other folder is named book.

And ends by acting on the following steps:

Step 4: Write scientific assignments using each research methodology. Students submit their scientific assignments using the methods of the research that were used, including quantitative, qualitative, and class action research.

Step 5: Arrange references manager. The lecturer discusses methods for creating reference managers, demonstrates how to add journal and conference files to Mendeley, and demonstrates how to add book files.

Step 6: Gather scientific research in accordance with the proposed journal/proceeding template.

Step 7: The lecturer demonstrates how to use the Grammarly website at https://app.grammarly.com/ to check your English grammar.

Step 8: Checking the similarity index. The lecturer demonstrates how to use a plagiarism detector at https://plagiarismdetector.net/ or a simple SEO tool at https://smallseotools.com/ to examine the similarity index of student scientific work.

Initial Task Report

The findings of the first task observation of 32 teacher-students revealed that 30 papers were turned in for assignments, while the other two were not. This finding shows that student work is still of low quality in terms of research methodology and low quality in terms of publishing eligibility. Almost all students have not completed Steps 1, 2, and 3, as evidenced by the references that are missing from their search results on the online platform. The findings of observation step 4 indicate that while most students struggle to describe the methodology, however, they are able to differentiate between qualitative and quantitative research approaches and can also name the type of study design used. For instance, students can identify case studies or ethnographic research as qualitative approaches. According to the findings of the interviews, the majority of the students, however, were unable to determine what type of literature review belongs to what research approach. This may be the result of the lack of a systematic methodological sequence, such as that used in quantitative and qualitative research, which begins with the identification of research problems, setting research objectives, questions, or hypotheses, followed by the collection of quantitative data, analysis as well as data collection and interpretation of quantitative and qualitative data. The majority of students understood steps 5 and 6 based on the documents of task 1. Steps 7 and 8 have not been taught by the lecturer.

Challenges In Acquiring Metacognitive Thinking Skills

Document evidence from assignment 2 shows that as many as 26 students submitted assignment 2, and six students did not. This study shows that for steps 1 and 2, as well as for step 3, the number of students who have been able to find, access, and download journals and proceedings as well as electronic books from various online platforms that have been taught

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increases significantly. Students complete their scientific assignment in step 4 using an action research approach, quantitative or qualitative. Title, abstract, keywords, introduction, literature review, methodology, results and discussion, conclusions, and references are the starting points for the paper the students created in step four.

Based on assignment document 2, the findings suggest that students are becoming more adept at metacognitive thinking, particularly when it comes to constructing introductions and methodology, but very few of them are willing to incorporate references in their assignment papers in the references section. These findings support Antonio's (2020) research, which found no appreciable differences between students' metacognitive thinking abilities prior to and following exposure to a metacognitive learning environment for four weeks. Even yet, virtually all of the students have mastered step 5, but only one of them wants to edit and elegantly arrange it.

Furthermore, our research found that almost all students used one journal template source in step 6, and only one female student followed the lecturer's instructions and used a template from her own search results, without copying other students' templates. This finding is consistent with other studies, such as that of Adiansyah et al. (2021), who found that female high school students had a higher level of metacognitive awareness and contributed more to metacognitive skills than male students (Akbayir & Topçul, 2002). These findings support Han's hypothesis (2021), according to which students value challenging assignments, innovative materials, and the combination of content, materials, and activities more than teacher-led practice and exam preparation lessons, reflecting participant-centered and therefore immature students. In our study, this occurs for a number of reasons, including low self-efficacy that is not well constructed from past experiences, the effect of a less challenging past task leading to shock at the current task resulting in a refusal to follow directions and feeling overwhelmed by having to leave the comfort zone during this time, and students underestimate this assignment because they feel that this assignment does not need to be done optimally because the research methodology assignment is actually a graduation requirement that must be completed towards the end of the semester.

Step 7 Almost every student has mastered using Grammarly. Step 8 Almost all students can use a free online platform to check the similarity index, but they don't yet understand the technical aspects of applying to proofreading. Scientific problem solving, ranging from tasks with easy, moderate, to difficult levels of difficulty, can be used as a means of training to develop metacognitive thinking skills.

Conclusion

There is a dearth of empirical research on the topic of using online platforms to help students develop their metacognitive thinking skills while completing research methodology coursework. The purpose of this study was to describe how students' metacognitive thinking skills developed as a result of doing scientific assignments for research methodology class. The findings of this study will inform strategies for acquiring metacognitive skills among the most challenging difficulties for future studies.

This study aims to describe how students' metacognitive thinking skills develop after taking a research methodology course for one semester and learning how to make scientific publications. The important findings of this research finally highlight various strategies that instructors might use in overcoming difficult obstacles to improve students' metacognitive thinking skills, including 1) from the beginning of the semester, students need to be introduced to English literary sources in the context of education and global issues; (2) it is very important to set independent tasks which involve accessing literature resources from various available online platforms, reading them, translating them if the sources are in English, and then presenting and discussing them; 3) it is

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suggested that research methodology classes are spread out in the first, middle, and final semesters; 4) to generate motivation, especially among male students, to improve metacognitive thinking skills and more advanced self-efficacy, lecturers need to think about new approaches and strategies.

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