



Cognitive Flexibility in Vocational Apprenticeships among Students of Civil Engineering Program in Indonesia

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Abstract. This research investigates how cognitive flexibility affects vocational apprenticeships for civil engineering students in Indonesia. We use qualitative research methods to explore how students adapt to various tasks and challenges during their apprenticeships. Our study is based on Cognitive Flexibility Theory, which explains how people manage and switch between different types of information and tasks. Cognitive Flexibility Theory includes several key concepts. Working Memory Capacity refers to how much information students can hold and use at one time. Inhibition involves the ability to ignore irrelevant information or distractions while focusing on important tasks. Switching is about changing from one task or idea to another smoothly and efficiently. Updating involves keeping information current and making changes to it as needed. In this research, we examine how these elements of cognitive flexibility impact students' experiences during their apprenticeships. We look at how students use their working memory to handle multiple pieces of information, how they manage distractions, how they switch between different tasks, and how they update their knowledge and skills. By exploring these aspects, we aim to show how cognitive flexibility helps students adapt to new situations and challenges. This study highlights the importance of cognitive flexibility in enhancing the learning and performance of civil engineering students during their vocational apprenticeships.

Keywords: vocational apprenticeship, civil engineering, cognitive flexibility, professional growth

1. Introduction

1.1. Background and Research Problem

Student internship is a topic that has been discussed in many previous studies in Indonesia. Student internships are one of the learning activities that are held outside the classroom and even outside the campus, and are usually carried out in companies or agencies that are directly related to a particular field of science or expertise. Some

previous research on internship activities discussed the effect of internships on increasing the competence of student interns in terms of skills and knowledge [1] [2] [3] [4.]. Some other previous research, on student internships, discussed the effect of internships on interest and professional career development among student interns [5] [6] [7]. Based on a brief review of some previous research on the topic of internships, it can be seen that many of these studies focus on issues that will occur or will result from internships. This research does not focus on such issues. This research focuses on issues related to the process of internship activities or implementation and specifically discusses cognitive flexibility. Cognitive flexibility refers to human mental abilities that allow us to adjust to changing tasks and/or environmental demands, change cognitive strategies, consider various aspects in complex situations, and adjust our behavioural strategies [8].

1.2. Research Aim Related to Theoretical Review

This research aims to investigate the contribution of cognitive flexibility to learning outcomes and professional development among students participating in vocational apprenticeships

1.3. Literatur Review

To achieve the research aim, this study is grounded in Cognitive Flexibility Theory. This theory encompasses several critical elements to consider, including working memory capacity, inhibition, task switching, and the process of updating information. Cognitive Flexibility Theory highlights the capacity to adjust cognitive processing strategies when individuals encounter new and unexpected situations [8]. Essentially, cognitive flexibility is the ability to shift attention and allocate cognitive resources effectively between different tasks, which is vital for managing diverse cognitive demands in various contexts [9]. Working memory capacity is particularly significant, as it enables individuals to hold and manipulate multiple pieces of information all together at once. Such is crucial for problem-solving [10]. Additionally, the concept of inhibition pertains to an individual's capacity to suppress distractions, thereby enhancing concentration or focus on important tasks. This focus is necessary for optimal performance in cognitive activities [11]. However, having the ability to focus does not indicate that individuals struggle with transitioning. Lastly, the process of updating information is essential for maintaining cognitive flexibility. Together, these components contribute significantly to our understanding of cognitive flexibility..

2. Method

1.4. Research Design

In conducting this research, a qualitative framework is applied, with narrative examination being the primary technique to discover and scrutinize individual stories. Qualitative study approaches aim to provide a nuanced understanding of human

experiences through comprehensive accounts and understandings, while narrative examination is dedicated to studying individuals' stories to discover how they construct sense from their life events [12] [13].

1.5. Research Participant

This examination relies on informants selected through a purposive method to confirm deepness and specificity. Through purposive sampling, researchers target individuals who are measured to be most appropriate for the study grounded on certain characteristics or experiences, thus ensuring that the data composed is highly relevant to the research purposes and contributes meaningfully to understanding the research problem [14].

1.6. Data Collection

This research employs interview, predominantly semi-structured interview. The interview process in qualitative investigate is projected to gather comprehensive, background data through conversations with participants, with semi-structured interviews permitting a researcher to track a set of guiding queries while also permitting flexibility to address additional topics that arise during the interview [15] [16].

1.7. Data Analysis

This research uses an analysis method in the form of qualitative descriptive analysis. Descriptive analysis methods in qualitative research are related to summarizing data, by grouping data into thematic categories, so that researchers can present a clear and detailed picture of the characteristics of the data at the surface level [12].

3. Result and Discussion

To organize the tasks that are in front of students, students create a strategy in the form of a priority scale to assess the weight of a given task such as for example into 2 or 4 categories and then students work based on the order they give. in the first order for students is an important and urgent task, the task will be done immediately by students and the last order is a task that is not important and not urgent the task will be done after the previous order. quoted from one of the student interns, there are several categories regarding the priority scale.

1. Important and Urgent: Tasks that must be completed immediately.
2. Important but Not Urgent: Tasks that are important but can be scheduled for later.
3. Not Important but Urgent: Tasks that are urgent but not too important, perhaps can be delegated.
4. Not Important and Not Urgent: Tasks that can be postponed or eliminated if not needed.

So that the tasks assigned to students will be completed in a timely manner according to their respective portions.

During their internship, students have developed effective strategies for managing and remembering complex information. One method that has proven to be effective is to record important points in detail in a notebook. Not only does this help students record information accurately, but it also strengthens their understanding of the material being studied. In addition, by directly practicing the directions given, students can apply the theory they have learned into real work practices.

In addition to taking notes and practicing directly, students also utilize technology to assist them in managing information. The use of digital note applications allows students to keep notes more efficiently and easily accessible. In addition, by utilizing search engines such as Google, students can quickly find out additional information needed to understand a concept or term. The combination of these methods has proven to be very effective in helping students remember complex information and ensuring that they have a comprehensive understanding of the material being studied.

Internships are often a challenging experience, especially when it comes to maintaining focus and avoiding distractions. A new work environment with different dynamics can make one feel uncomfortable and struggle to adapt. In addition, the variety of tasks assigned can also be a source of confusion and uncertainty. The lack of practical work experience is often a barrier for students to complete tasks with confidence. Feelings of anxiety and doubt often arise due to a lack of understanding of the work to be done.

To overcome these challenges, students need to develop the ability to adapt quickly, manage time effectively, and learn from mistakes. By improving self-management skills and seeking support from mentors or colleagues, students can overcome anxiety and increase confidence. In addition, it is important for students to have a proactive attitude in finding solutions and not be afraid to ask questions if something is not understood. Thus, the internship period can be a valuable and useful experience for self-development.

In the world of work, especially during internships, students are often faced with various types of tasks with different levels of importance and urgency. Tasks can be categorized into four quadrants: important and urgent, important but not urgent, unimportant but urgent, and unimportant and not urgent. Being able to identify and prioritize these tasks is critical to improving productivity and achieving goals. Tasks that fall into the important and urgent category should be completed immediately as they have a significant impact on the final outcome. Meanwhile, tasks that are important but not urgent require long-term planning and thoughtful strategies. To ensure that student work priorities are in line with team goals, effective communication with field stakeholders and fellow students is essential. By communicating regularly, we can stay updated on project progress, identify potential obstacles, and get the necessary support. In addition, by comparing student priorities with team priorities, students can ensure that their efforts directly contribute to the overall success of the project. Thus, students can avoid wasting time and energy on less important tasks.

Internship is a period where students are often faced with challenging situations, including tasks that are outside their comfort zone. Emotions such as nervousness, doubt, and anxiety are natural to feel in these situations. When given complex or challenging tasks, feelings of uncertainty about one's abilities can hinder performance and make it difficult for students to focus. Fear of failure can cause students to be overly cautious and hesitant in making decisions.

The internship experience teaches students that emotions can greatly affect performance and productivity. However, it is important to remember that feelings of anxiety and doubt are normal and can be overcome. By effectively managing emotions, such as by seeking support from mentors or coworkers, and developing a more positive attitude, students can overcome challenges and achieve desired goals. In addition, the experience of facing challenging tasks can help boost confidence and coping skills.

The experience of making mistakes in work, such as when marking pedestal columns, is a natural thing to happen. This mistake can be a momentum for students to grow and learn. After getting input and assistance from stakeholders, students then conduct introspection and self-evaluation. This process of reflection is very important to understand the root cause of the mistakes made. By understanding these mistakes, students can take steps to improve themselves and prevent similar mistakes from recurring in the future.

Reflection and self-evaluation are key to improving performance and achieving goals.

Through this process, students can identify areas for improvement, develop more effective strategies, and increase confidence. In addition, reflecting can also help students to develop a more positive and proactive attitude in facing challenges. Thus, the experience of making mistakes can be a valuable lesson that can be utilized to achieve success in the future.

In carrying out the task of marking the pedestal column, students had experienced problems in positioning the marking lines so that they looked unified. This difficulty then encouraged students to look for alternative solutions. After doing some experiments, students found a more effective way to overcome the problem. By using a waterpass ruler attached to the pedestal column, students managed to make longer and more precise marking lines.

This experience shows that in facing challenges at work, students need to think creatively and find alternative solutions. The ability to adapt and find new ways to solve problems is a very important skill, especially in a dynamic work environment. In addition, this experience also teaches students that with a little experimentation and innovation, students can find more efficient and effective ways to complete tasks.

'During their internship, students have developed effective task management strategies. One way is to prioritize tasks based on the level of urgency. Tasks that have urgent deadlines will be completed first to completion. In addition, good communication with the team is very important. Students always make sure to get clear instructions on each task and regularly provide updates on work progress. This aims to keep everyone on the same page and aware of the next steps that need to be taken.

Flexibility is key in carrying out various tasks. students learn to be ready to adapt to unexpected changes in situations.

When an urgent task arises, such as a framing inspection, students need to be able to shift their focus from the task at hand, such as compiling a daily report, and deal with the urgent issue immediately. The ability to switch quickly from one task to another is an invaluable skill in the dynamic world of work.

To maintain productivity and efficiency at work, students have implemented some good habits. One of them is making a daily to-do list. By recording all tasks assigned by the field and updating it regularly, students can easily track the progress of their work and ensure that no tasks are missed. This to-do list also helps students to stay focused on the goals they want to achieve and avoid confusion when facing many tasks at once.

In addition to creating a to-do list, students also place great importance on documentation. All work progress, problems encountered, and solutions applied are well recorded.

Not only does this documentation help students stay organized and remember important details, but it also makes it easier to transition from one task to another. Moreover, these notes can also serve as a useful reference in the future, both for oneself and for the team. By keeping good notes, students can learn from past experiences and improve their performance in the future.

During the internship, students realized how important feedback is in improving performance. Whenever receiving feedback from supervisors or coworkers, students always try to listen carefully and take notes on the key points raised. This helps students to gain a better understanding of the areas that need improvement in their work. In this way, students can clearly identify the aspects that need improvement. After receiving feedback, students should not only take notes, but also make a concrete follow-up plan. This plan contains the steps that students will take to overcome the shortcomings that have been identified. For example, if students receive feedback on inappropriate measurement techniques, they will look for additional references, discuss with more experienced colleagues, and try to apply the new techniques in their next work. By proactively applying the feedback received, students hope to continuously improve the quality of their work.

To ensure the students' work is always in line with project standards and objectives, the students always try to keep up to date. Whenever there are changes to project documentation, such as design drawings or technical specifications, students take the time to study them in depth. By understanding these changes, students can adjust their work to keep it relevant and in line with project developments.

In addition to studying documentation, students also often make direct observations in the field. This activity is very useful because students can see firsthand how the changes that occur in project documentation are implemented in the field. By seeing the project progress directly, students can better understand the challenges faced in the

field and the solutions implemented. This helps students to be more effective in carrying out their daily tasks and contribute better to the success of the project.

The internship period is a very valuable period for learning and developing. During the internship, it is undeniable that students have made some mistakes in completing tasks. However, these mistakes are actually an opportunity for students to learn and improve themselves. By reflecting deeply, students can identify the root causes of these mistakes and find solutions to prevent them from recurring in the future. This reflection process is very helpful for students to continue to improve the quality of work and become better.

In addition, reflection also allows students to identify areas that still need improvement. For example, if during the internship students find it difficult to operate certain design software, students can make a plan to develop these skills. By doing so, students can better prepare themselves to face future challenges. Self-reflection is the key to achieving continuous professional growth.

4. Conclusion

There are memorable events during the internship, which are considered as challenges. Students have their own thoughts and feelings about the internship, before the internship begins. Students have their own thoughts and feelings about the internship, while the internship is running. The thoughts and feelings of students have more or less influenced their daily lives in carrying out tasks/work during the internship. Students can assess the extent of the success of the internship activities that have been carried out. There are aspects of the internship that can be said to be successful. There are aspects of the internship that can be said to be unsuccessful. Students have an attitude to face challenges during the internship. Students have an evaluation of their attitude to face these challenges, including how to behave better than at that time. Students think about how their own skills can improve from previously being less skilled to being skilled. Students see a connection between internship experiences and future aspirations in terms of career/professionalism in the field of civil engineering.

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