



Experiential Learning in Vocational Apprenticeships among Students of Civil Engineering Program in Indonesia

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Abstract: This research explores how experiential learning works in vocational apprenticeships for civil engineering students in Indonesia. We use qualitative research methods to get a detailed understanding of how these apprenticeships help students learn. Our study is based on Experiential Learning Theory by David A. Kolb, which explains how people learn from their experiences. Kolb's theory has four main ideas. Concrete Experience means students learn by doing real tasks and working on projects. Reflective Observation involves thinking about what happened during these tasks and considering what went well or could be improved. Abstract Conceptualization is about making sense of these experiences by connecting them to theories or concepts learned in school. Active Experimentation involves trying out new ideas and solutions based on what was learned. In this study, we look at how steps of Kolb's theory are used in apprenticeships. We focus on how students get hands-on experience in their work, reflect on their actions, understand how their experiences fit with what they've learned, and experiment with new ways of doing things. By examining these aspects, we aim to show how apprenticeships help students apply their classroom knowledge to real-world problems and develop their skills effectively. This research highlights the importance of experiential learning in shaping the professional growth of civil engineering students.

Keywords: vocational apprenticeship, civil engineering, experiential learning, professional growth.

1. Introduction

1.1. Background and Research Problem

Experiential learning involves the direct involvement of learners, whereby practical material and reflection on experience can be present to develop a deeper understanding and also develop practical skills, which helps learners to be able to relate theoretical concepts to applications in the field [1]. The topic of experiential learning has been raised in many previous studies in the Indonesia context. The experiential learning model is discussed in terms of its contribution to developing student activity and especially in terms of actively asking questions [2] [3]. Other research underlines that experiential learning is a strategy that is quite influential on

the problem of self-regulated learning among students [4]. Experiential learning is also seen as a learning model that affects problem-solving skills among students [5]. In addition, there is also research that puts forward the argument that experiential learning can improve students' multicultural competence [6].

Based on a review of some of the studies mentioned above in the Indonesia context, it can be seen that there is a research gap regarding experiential learning. The problem of experiential learning is still limited to the contribution of experiential learning in the activeness of students, contribution to self-regulated learning, contribution to problem-solving skills, and contribution to multicultural competence. So, this research can fill in the gaps in terms of the process or method or also how experiential learning is carried out or undertaken by students through an activity called an internship, among students from the Building Civil Engineering Study Program.

1.2. Research Aim Related to Theoretical Review

The aim of this research is to explore occurrence of learning through experience.

1.3. Literature Review

To answer the research question, this study relies on the theory of Experiential Learning presented by David A. Kolb. There are several things that are important to consider in the search for experiential learning, namely concrete experience, reflective observation, abstract conceptualization, and active experimentation. Concrete experience is about direct involvement with the environment and pursuing new activities or situations, which is the basis for experiential learning [7]. Involvement in concrete experiences allows learners to gather hands-on knowledge and develop practical skills through involvement in activities [8]. Reflective observation is a situation in which the individual takes a moment back (or withdraws) and thinks critically about the experience, examines what happened and analyzes his or her personal reaction to the experience [9]. Reflective observation can also be seen as a process in which students reflect, then most importantly, understand what has just happened to them [10]. Abstract conceptualization is the formation of a theory or concept based on reflection from previous experiences, which helps a person understand patterns and direct future actions [11]. Active experimentation is the application of new concepts and theories to real-world situations to test their validity and to improve or modify future behaviors and decisions [12]. In active experimentation, individuals use their new insights to experiment with different strategies, so that they can later apply the concept to future situations [13].

2. Method

2.1. Research Design

This study employs qualitative methods, with a focus on narrative investigation to discover the particulars of individual stories. Qualitative methods are intended to discover and comprehend individuals' subjective experiences and social phenomena

through rich, comprehensive, and contextualized data, while narrative investigation exactly focuses on the stories and personal experiences of individuals as a way to gain perceptions into their lived realities [14] [15].

2.2. Research Participant

This study encompasses selecting informants grounded on purposive sampling. In such, investigators purposefully select participants based on their capability to provide the most understanding and applicable material related to the study objectives, rather than choosing randomly, which guarantees a more targeted and meaningful collection of data that aligns with the study's exact focus [16].

2.3. Data Collection

This research employs interview, particularly semi-structured interview. Interviews, as a essential method in qualitative research, are intended to produce comprehensive and contextualized information from participants through direct dialogue, with semi-structured interviews offering a flexible outline that permits investigators to discover detailed topics while still adjusting to the flow of conversation to gain deeper insights into participants' perspectives [17] [18].

2.4. Data Analysis

Method of data analysis in this study is descriptive analysis. Such, in qualitative research, involves systematically summarizing data to highlight its main features and trends, focusing on presenting a straightforward overview of the data's surface content without delving into deeper interpretive insights [19].

3. Result and Discussion”

Students participating in internships are quite directly involved in activities/tasks during internships. These activities/tasks are as follows:

1. Measurement of the bowplank point before the implementation of the sloof work and the placement of the anchor position on the pedestal column using a Theodolite measuring instrument and a Prism Stick.
2. Calculate the casting volume.
3. Mapping.
4. Taking care of administrative documents such as shop drawing submission forms and shop drawing schedules.
5. Conducting regular inspections in various parts of the project such as concrete casting, steel structure installation and finishing work.
6. Attend coordination meetings to discuss daily work plans and get updates from other teams.
7. Record all daily developments and create reports that include achievements, problems faced and steps taken to address them.

8. Assist in all needs carried out by the surveyor.
9. Become an assistant field supervisor who is responsible for the checklist for the ironing of columns, beams, and plates before casting.
10. Assist in monitoring progress.
11. Check your daily to-do list.
12. Assist surveyors in marking the area to be cast and the position of the column formwork.
13. Revise image items, such as façade color.
14. Prepare progress presentation materials to be presented to the owner
15. Create an execution method with sketchup software and render the file.
16. Calculating scaffolding/scaffolding needs.
17. Analyze the structure using software.
18. Calculate backup volume for a building

Internship students have a general impression of internship activities, namely that students have gained very valuable practical experience, gained knowledge that was not obtained in lecture classes, improved technical skills and can apply the knowledge gained in lecture classes in the real world. In addition, students also feel a positive impression because they have been involved in various challenging projects/tasks, working with a professional team, and learning directly from experts in the field of Civil Engineering. The following is an excerpt from one of the interns. "The internship gave me the experience to experience both the work and the atmosphere of the project that happens during the day-to-day. In addition, I also improved my knowledge such as technical skills and practical knowledge that I did not get on campus. Overall, this internship activity for approximately 5 months is useful for me in the future."

Students participating in the internship gain special skills and knowledge from internship activities. These skills and knowledge are as follows:

1. Know how to operate theodolite equipment, waterpass and total station.
2. Gain knowledge in operating certain software, namely SketchUp and Autocad, which is better than before.
3. Gain knowledge while doing work such as mapping, checklists, supervising the field, knowing the preparation of administrative documents and experience in monitoring progress.
4. Experience as a Quantity Surveyor.

Students participating in the internship argue that these experiences contribute significantly to self-development in terms of increasing knowledge and skills. In addition, students also think that this knowledge and skills are useful for their future in the professional world.

Students participating in internships tend to reflect on things after experiencing events during internships. These students have felt disappointed and confused about themselves, so they evaluate and introspect themselves to be better. These students strive to improve their skills, so that, when in the field, theory and skills can be balanced. In addition, these students also adapt to conditions and problems in the field. However, there are also interns who never reflect on things after experiencing

an incident during an internship. They put pressure on themselves to complete tasks on time so they don't have time to reflect on these things.

Internship students gain new insights after reflecting on their internship experiences. These insights include the demand to be more thorough in doing a job, understand the directions given, conduct self-introspection, communicate well with each other and be ethical and polite to field workers. One of the students emphasized that how to communicate with workers in the field is something that he really just felt and got when undergoing an internship.

Students participating in the internship gain insights that contribute to the view of the future as professionals as well as the view of the field they are engaged in. This includes the following:

1. A deeper understanding of the field you are engaged in.
2. Development of new skills.
3. Awareness of ethics and responsibility for the work done.
4. Increased confidence to accept greater roles and responsibilities.
5. Increasing self-confidence so that they are better prepared to face the challenges of the world of work.
6. Strengthening commitment to the field.
7. Readiness to take the next step in a career with a broader outlook and a more purposeful strategy to achieve goals.
8. Practice good communication skills and ways in the field, involving interlocutors with diverse educational backgrounds.
9. Increased motivation.

Students experience some interesting things and face complex challenges when they do internships. During the internship, students gain hands-on experience in technical measurements, such as using Teodolit measuring instruments and Prisma sticks to determine anchor positions, as well as utilizing advanced technologies such as BIM (Building Information Modeling) for 3D model visualization. The experience deepened the understanding of the application of theory in the field, especially in quality inspection and construction supervision. Students also face challenges such as work safety management and uncertain weather conditions. The problem has taught the importance of strict supervision and quick adjustment in work plans. In addition, the experience from the initial stages of the project to the end, as well as problem handling, has enriched technical knowledge and skills when it comes to project management. The overall experience prepares students for professional careers with valuable practical skills and an in-depth understanding of the dynamics in the world of building construction. The following is an excerpt from one of the interns. "During my internship in a construction project, I experienced some interesting things while also facing complex challenges that enriched my experience. One of the interesting things is the use of advanced technology such as BIM (Building Information Modeling) for project planning and visualization. BIM allows teams to view a 3D model of a building under construction, making it easier to identify potential problems before they occur in the field. Hands-On experience, directly involved in field activities, such as quality inspections and supervision of construction works, provides invaluable practical experience. Seeing how the theories learned in the classroom are

applied in real projects provides a deeper understanding. The complex challenges faced are safety management, workplace safety is a top priority and ensuring all safety procedures are followed can be challenging. I learned about the importance of strict supervision and continuous safety training to reduce the risk of accidents. Weather constraints, erratic weather conditions on the mountain are also a challenge. Construction work often had to be stopped or rescheduled due to bad weather. This requires quick adjustments in the work plan and sometimes affects the overall schedule of the project. Overall, this internship experience not only provided valuable technical knowledge and skills, but it also taught me a lot about project management, teamwork, and problem-solving. The challenges I faced helped me develop professionally and personally, preparing me for my future career."

Students try to relate theory to practice. Internships provide great advantages for students by connecting theoretical knowledge with practice. During the internship, students can apply the theories learned in the classroom, such as concrete structure design and strength calculations, as well as material volume calculations and work productivity. Student involvement in concrete casting supervision allows students to overcome challenges, such as unexpected quality issues, by using theoretical knowledge to find practical solutions. Experience in the field also shows that practice often differs from theory, such as in the case of project management where land acquisition is not fully completed but the project is still ongoing. Students learn that theoretical elements need to be adapted to real project conditions, so that they can refine and adjust the plan according to the needs of the field. Thus, internships help students develop practical skills, understand complex work dynamics, and adapt theory to practice to achieve optimal results. The following is an excerpt from one of the interns. "In the lecture class, I learned about the design of concrete structures, including the calculation of the strength and stability of concrete, as well as how to calculate the load that can be borne by concrete structures. During my internship, I was involved in supervising the casting of concrete for the columns and beams of a building. I used the knowledge from the class to understand the specifications of the concrete mix used and why the mixture was chosen based on the strength required. Challenges arise when there are problems with the quality of the casting, such as twisting them on the column head after a few days. Using theoretical knowledge of the cause of cracks in the column heads, I helped the team identify that the problem was due to improper formwork fitting techniques. We then worked together to meticulously improve the formwork fitting technique and ensure that the fitting checks were appropriate."

Internships provide many benefits to students, especially in terms of developing professional skills and understanding. Internships allow students to hear different perspectives from experts, users, and communities through collaboration. This allows students to understand different perspectives and find better solutions. The exchange of ideas and discussions helps students to see problems from different angles and understand aspects that may not have been thought of before. Discussions with others enrich understanding and help find better solutions to the challenges faced by students during internships. Collaboration with fellow group members during internships is very important because it produces various ideas or concepts that require ideal decisions to be implemented. In addition, the contribution of discussion activities is a motivation and encouragement for students in understanding the field of civil

engineering, because discussions with others provide a lot of knowledge that helps to continue to develop. The combination of various perspectives into personal understanding allows students to see problems more comprehensively and make more effective decisions. This is a valuable skill in professional development and problem solving in the workplace.

Internships provide many benefits for students. At the beginning of the internship, students' knowledge is limited to theoretical knowledge gained from lectures without practical field experience. When students are involved in internship activities, students see that there is a difference between the theoretical knowledge learned and what happens in the field. This often makes students feel confused. However, this situation encourages students to continue to develop ideas based on the theories they have learned. When given the task of creating an implementation method, students are directed to make it according to their point of view. Although confused because it was not taught in lectures, this experience enriches students' understanding of how theory is applied in practice, improves critical thinking skills, and provides an opportunity to contribute directly to real projects. The benefits of this internship are not only limited to increasing technical knowledge and skills, but also broadening professional insight and building self-confidence in facing challenges in the world of work.

Practical experience during internship is important to continue to be developed in the world of lectures. In internship activities, when ideas emerge, it can be a positive encouragement. When the method proposed by students cannot be implemented, the internship supervisor always provides instructions for implementing the correct method and according to standards. The following is an excerpt from one of the interns. "After we proposed the use of precast walls, it turned out that the use of these walls was not suitable for use in our project because there would be many obstacles experienced when installing precast walls. One of them is that the cost of ordering precast by fabrication will cost a lot of money because of the factor of delivering the product to the project with inadequate road access (narrow roads and extreme inclines). In addition, the installation of precast walls will also be very difficult to do because of natural factors such as strong winds, because on high ground, the installation will actually take a long time, so it is not recommended to use precast walls."

To continue developing themselves, interns strive to expand their knowledge by reading books and journals and keeping up with the latest trends and innovations. Students observe how others (e.g., friends, family, etc.) overcome challenges and engage in constructive discussions that can provide new perspectives. This process involves continuous learning, self-reflection, and receiving feedback to refine ideas and views. In addition, collaborating with colleagues and receiving insights from various sources is key to continued personal and professional growth. The following is an excerpt from one of the interns. "With a combination of continuous learning, self-reflection, receiving feedback, collaboration, innovation, and leveraging technology, I strive to continuously refine my views and thoughts and produce personal ideas that meet expectations. Receiving feedback from various sources is essential in this process, as it helps me see from different perspectives and correct weaknesses in my ideas."

4. Conclusion

During the internship, students are directly involved in fieldwork. This is a very memorable experience and has an impact on student development. Through internships, students gain specific skills and knowledge that support their personal development. Students reflect on events during their internships, which encourages them to act on these thoughts, so that new insights are gained and this affects their views on their professional future and the field they are engaged in. They face complex and interesting challenges, applying theoretical knowledge from lectures to understand and overcome the problems they face. Discussions with others enrich their understanding by integrating different perspectives and forming personal ideas.

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References

- [1] J. Mezirow and E. W. Taylor, "Transformative learning in practice: Insights from community, workplace, and higher education," no. John Wiley & Sons, 2020.
- [2] P. Dhana, "Metode Experiential Learning dalam Meningkatkan Keaktifan Peserta Didik," *Jurnal Pendidikan Dasar dan Menengah (Dikdasmen)*, pp. 67-71, 2024.
- [3] M. Barida, "Model experiential learning dalam pembelajaran untuk meningkatkan keaktifan bertanya mahasiswa," *Jurnal Fokus Konseling*, vol. 4(2), pp. 153-161, 2018.
- [4] E. Latipah, "Pengaruh strategi experiential learning terhadap self regulated learning mahasiswa.," *Humanitas*, vol. 14(1), p. 41, 2017.
- [5] T. Y. Priyandari, I. K. Astina and D. H. Utomo, "Pengaruh Model Pembelajaran Experiential Learning Terhadap Kemampuan Pemecahan Masalah Mahasiswa Geografi (Doctoral dissertation, State University of Malang)," 2020.
- [6] M. Djamaluddin, B. B. Lasan and A. Atmoko, "Experiential learning untuk meningkatkan kompetensi multikultural mahasiswa," *Jurnal Kajian Bimbingan dan Konseling*, vol. 3(3), p. 12, 2024.
- [7] D. A. Kolb, *Experiential learning: Experience as the source of learning and development* (2nd ed.), Pearson Education, 2014.
- [8] P. Jarvis, *Adult education and lifelong learning: Theory and practice.*, Routledge, 2010.
- [9] M. Smith, *Understanding experiential learning: Theory and practice*, Routledge, 2021.
- [10] J. A. Moon, *Reflection and employability: Reflection on learning and its impact*, Routledge, 2021.
- [11] D. A. Kolb and A. Y. Kolb, *The experiential educator: Principles and practices*, Stylus Publishing, 2017.
- [12] H. Fry, S. Ketteridge and S. Marshall, *A handbook for teaching and learning in higher education: Enhancing academic practice* (5th ed.), Routledge, 2019.

- [13] S. B. Merriam, R. S. Caffarella and L. M. Baumgartner, *Learning in adulthood: A comprehensive guide* (4th ed.), Jossey-Bass, 2020.
- [14] J. W. Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (3rd ed.), Sage Publications, 2013.
- [15] C. K. Riessman, *Narrative Methods for the Human Sciences.*, Sage Publications, 2008.
- [16] M. Q. Patton, *Qualitative Research & Evaluation Methods: Integrating Theory and Practice*, 4th ed.: Sage Publications, 2015.
- [17] S. Kvale, *Doing Interviews*, Sage Publications, 2007.
- [18] S. Brinkmann and S. Kvale, *Interviews: Learning the Craft of Qualitative Research Interviewing*, 3rd ed.: Sage Publications, 2015.
- [19] U. Flick, *An introduction to qualitative research*, 6th ed: Sage Publications, 2018.

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