

The Self-Aware, Reflective Learner: Fostering Metacognitive Awareness and Reflexivity in Undergraduates through Service-Learning

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ABSTRACT

This article explores how service-learning in higher education fosters metacognitive awareness and reflexivity among students by positioning education, methodology, and research as a mutually reinforcing triad. It defines metacognitive awareness as students' ability to regulate their own thinking, and reflexivity as critical self-examination shaped by social contexts, both seen as essential twenty-first century skills. Service-learning is presented as a high-impact educational practice that challenges students to apply academic knowledge in real-world settings, confront ill-structured problems, and reflect deeply on their experiences of community engagement. This discussion emphasizes the central role of reflection in cultivating metacognitive awareness and reflexivity by using various strategies. This article also highlights how artificial intelligence can support reflection by offering personalized feedback while underscoring irreplaceable aspects of learning. Finally, it examines how service-learning must be culturally contextualized through transdisciplinary communication, especially in Asian settings, to resonate with local values and facilitate collective sense-making. Together, these aspects illustrate how thoughtfully designed service-learning can nurture self-aware, reflective learners.

Keywords: Metacognitive Awareness; Reflexivity; Service-Learning; Higher Education; Artificial Intelligence

1. INTRODUCTION

Education, methodology, and research form a synergistic triad wherein each domain influences, supports, and transforms others. While educational settings provide a real-world context in which new methods are implemented and research is conducted, teaching, in turn, is informed by empirical evidence and clear design. Methodology mediates between education and research, bridging educational aims with the systematic pursuit of knowledge. Meanwhile, research provides evidence and theoretical insights that guide both educational practice and methodological choices [1, 2]. This triadic relationship is regenerative as new ideas, meanings, and questions

constantly emerge rather than reaching a fixed endpoint [2].

Viewing education, methodology, and research as a mutually reinforcing triad offers a framework for a deeper understanding of metacognitive awareness (the ability to think about one's own thinking and learning processes) and reflexivity (the habit of critically examining one's assumptions, biases, and identity), particularly in experiential learning contexts, such as service-learning [3, 4]. By recognizing the interdependence of these domains, educators can develop more effective strategies for enhancing the overall educational experience in fostering metacognitive awareness and reflexivity in learners, particularly within the context of service-learning.

This article outlines how metacognitive awareness and reflexivity are essential student outcomes that enable learners to critically reflect on their thinking and social positioning. It presents service-learning as an experiential approach that immerses students in real-world contexts, where learning is deepened through reflection. This article then discusses various strategies for integrating reflection into service-learning. It also explores the evolving role of artificial intelligence (AI) in enhancing reflective practices while cautioning against overreliance. Finally, it addresses the need for transdisciplinary communication to adapt service-learning to non-Western cultural contexts. These discussions frame service-learning as a powerful pedagogical approach that integrates education, methodology, and research to foster self-aware, reflective learners.

2. METACOGNITIVE AWARENESS AND REFLEXIVITY

Metacognitive awareness and reflexivity are increasingly recognized as key outcomes in quality higher education. They are considered essential skills in the twenty-first century because they contribute to personal and professional development in the ever-evolving global landscape [5, 6].

Metacognitive awareness involves knowledge and regulation of one's own cognitive processes. It plays a

critical role in self-directed and lifelong learning by enabling students to plan, monitor, and assess their conceptual understanding and academic performance effectively [7, 8]. Such self-regulation is necessary to adapt to the rapidly changing knowledge and skills required in today's world [5]. Research has shown that educational strategies aimed at raising metacognitive awareness can improve comprehension and problem-solving skills by encouraging students to think critically and self-assess their knowledge and learning methods [9]. These skills are vital for strategic planning, monitoring ongoing tasks, and evaluating outcomes in professional settings [10].

Reflexivity, closely related to metacognitive awareness, involves a critical self-examination of one's beliefs, values, and actions to better understand how social and cultural contexts influence educational processes and outcomes. It refers to the ability of students to consider themselves in relation to their social setting and learning environment [11, 12]. Considered an advanced form of reflection, reflexivity helps students adapt to novel situations by fostering a deeper understanding of their thought processes and behaviors [11]. This ability to reflect upon and adapt one's cognitive strategies is crucial in problem-solving and decision-making, which are skills highly valued in today's workplaces [12, 13]. A longitudinal study revealed that students, who engage in reflexivity throughout their education, are better equipped to negotiate their professional identities over time [14].

Although metacognitive awareness and reflexivity are essential for fostering independent learners, some students struggle to achieve these key outcomes. Factors, such as learning styles and support systems, can affect the effectiveness of metacognitive strategies in educational settings [5]. Some students encounter difficulties in critically examining how identity and power structures affect their perspectives and actions [15]. Engaging in reflexivity can also unsettle students, as it requires them to confront uncomfortable truths about themselves and their environment [16]. Additionally, excessive focus on introspection can cause paralysis by analysis, leading to indecision and inaction [17].

Addressing these challenges to facilitate metacognitive awareness and reflexivity among students requires educators to carefully construct learning environments that encourage and support the development of key student outcomes. Compared with classroom instruction, an experiential learning approach can create a conducive environment by immersing students in real-world, complex situations that demand thoughtful action and reflection [18, 19, 20]. By empowering students to take responsibility for their learning process, they become better equipped to monitor, regulate, and critique their thinking and understand how their perspectives shape and are shaped by experience [19, 20].

3. SERVICE-LEARNING AS AN EXPERIENTIAL APPROACH

Service-learning is a pedagogical approach that combines learning objectives with community services to provide pragmatic and progressive learning experiences while meeting societal needs. It is poised to foster metacognitive awareness and reflexivity, as it situates students in real-world contexts that challenge them to apply their learning to address community issues and reflect on their experiences of community engagement [21]. This form of experiential learning is widely recognized for its ability to enrich learning through reflection by linking experiences of community engagement with academic learning and connecting students to their communities [22, 23].

In experiential learning contexts, such as service-learning, education happens not only through traditional content delivery but also through students' active experiences in the community. Students learn by doing and reflecting on those experiences [24]. Effective learning involves a continuous process of concrete experience, followed by reflective observation, abstract conceptualization, and active experimentation based on Kolb's Experiential Learning Theory [25]. Specifically, community engagement in service-learning (concrete experience) becomes educational when followed by intentional reflection (reflective observation), connection to concepts (abstract conceptualization), and application of new insights to future situations (active experimentation). In effect, students constantly go through the stages of doing, reflecting, thinking, and adapting during service-learning [26].

Studies have reported several student outcomes of service-learning, including metacognitive awareness and reflexivity [27, 28]. Service-learning exposes students to ill-structured problems in real-world settings, which lack a single correct answer and challenge their preconceived notions [29]. This exposure, combined with critical reflection, prompts students to question their assumptions, analyze problems from multiple perspectives, and move beyond simple conclusions [29, 30]. By evaluating their own learning and critically examining their role in the community, students develop an awareness of their cognitive strategies and a habit of meaningful self-reflection [30]. Such metacognitive awareness and reflexivity tend to endure beyond the undergraduate years of students and extend into their civic and professional lives [31].

While service-learning has demonstrated many benefits for students, the nuances of how it facilitates metacognitive awareness and reflexivity are not yet fully understood. Specifically, the valuable contribution of reflection to the development of metacognitive awareness and reflexivity from service-learning is often taken for granted in studies investigating student outcomes [32]. Most studies tend to focus on describing immediate

outcomes without explaining how reflection leads to metacognitive awareness and reflexivity in the long term [32, 33]. The reflective process involved in making service-learning a high-impact practice in promoting deeper learning among students has been lacking in the literature [34].

4. THE CRITICAL ROLE OF REFLECTION

Reflection is the *hyphen* between service and learning [35]. It refers to the intentional consideration of one's experience of community engagement in view of learning objectives [36]. It transforms experience into insights by acknowledging differences in views, perspectives, and backgrounds, paying attention to personal dissonance in the experience, and confronting and resolving encountered contradictions [29]. In this way, reflection becomes a scaffold that challenges students to think about their thinking by anticipating challenges, adjusting to feedback, and synthesizing new understandings [30].

Rather than treating reflection as an add-on in service-learning, reflection activities should be woven throughout the course and aligned with the learning objectives [23]. Effective reflection activities are defined by five key elements: the connection between experience and course content, the continuity of reflection before, during, and after community engagement, the context of applying subject matter to students' real-life experiences, the challenge to students' perspectives, and the coaching of students throughout service-learning [35, 37].

Requiring students to keep reflection journals can facilitate metacognitive awareness and reflexivity, as the act of writing helps them articulate their thoughts and feelings. Over time, the students learn how to learn. By engaging in retrospective and prospective reflection, students can identify what they learned, how they learned it, and what they would do differently next. Research has shown that using reflection journals as an assessment method prompts students to ponder their experiences deeply and evaluate their progress toward learning objectives [38].

When students are asked to share their experiences in service-learning, they can validate their peers' insights, provide emotional support, influence each other to reflect more deeply, and offer new perspectives [23]. Studies have revealed that metacognitive awareness and reflexivity can arise when students reflect together [37, 39]. In addition to depth of insight, collaborative inquiry can yield more diverse reflections [40]. The social construction of knowledge occurs when students engage in collaborative inquiry, which involves considering each other's shared information, assertions, and supporting evidence within the context of meaningful learning tasks [41].

Educators need to carefully craft prompts and questions to guide students beyond superficial descriptions of their

community engagement in service-learning to a deeper reflection. To promote metacognitive awareness and reflexivity among students, they can adopt the widely used DEAL (Describe – Examine – Articulate Learning) Model as a framework, which entails students describing the experience objectively, examining their experience in depth using the guided prompts, and articulating their learning in light of course content [29, 30].

In crafting guided prompts and questions, educators can benefit from using transformative learning and critical pedagogy as lenses [42]. Given that service-learning often exposes students to unfamiliar challenges that can provoke disorienting dilemmas, educators can provide reflective prompts and questions that would allow students to examine discrepancies between prior expectations and new realities as well as confront previously held assumptions about themselves and others [29, 43]. Such guided reflection can lead students to a genuine change in understanding and profound shift in their perspectives [34, 42]. To help students make sense of the systemic issues and power dynamics that they encounter in the community, educators can pose reflective prompts and questions that challenge students beyond examining their personal experiences to explore broader social, economic, and political issues [30, 32]. The guided prompts and questions should ask students why things are the way they are, not just what happened [44]. These prompts and questions should be provocative enough for students to act and transform their social structures [34, 42].

Considering that not all students express themselves best through written entries, educators can explore alternative forms of reflection for their students, such as digital stories, photo journals, artwork, theatrical skits, and blogging [45, 46, 47]. Studies have shown that the use of multimedia for reflection can promote metacognitive awareness and reflexivity, as students are asked to chronicle, narrate, and synthesize their experiences and learning in a creative manner [48].

Additionally, educators can introduce community debriefing to facilitate reflection and enhance students' educational experience. Community debriefings can provide a platform for students to reflect on their experiences, discuss insights, and evaluate how their actions have helped the community. This debriefing ensures that students come away with a deeper, more meaningful learning experience that extends beyond academic achievement to include personal and professional development, such as metacognitive awareness and reflexivity. Most importantly, integrating the community into the reflective process ensures that their needs are indeed addressed [49, 50].

Best practices in service-learning recommend that educators provide timely feedback on reflective assignments [30, 34]. By reviewing student reflections, educators can gauge the clarity of reflective prompts and

identify concepts or skills that are difficult for students [30]. Their feedback is essential in promoting self-reflection, as it can validate students' reflective insights and encourage further exploration of their thought processes [51, 52]. When students see that their reflections are valued and considered important, it enhances their motivation and commitment to engaging in these practices, further enhancing their metacognitive awareness and reflexivity [53, 54].

Despite the wide adoption of service-learning in higher education, gaps in the implementation of this high-impact practice remain, as not all have embraced it equally or with the same depth of reflection [27]. Common challenges that result in the uneven implementation of service-learning across disciplines and education settings include difficulties in aligning service activities with course learning objectives, finding time for reflection amidst packed syllabi, and developing appropriate reflective assignments and assessments [55].

5. THE USE OF ARTIFICIAL INTELLIGENCE IN SERVICE-LEARNING

Notably, the role of AI in supporting metacognitive awareness and reflexivity is evolving rapidly in educational practice, including service-learning [56]. AI can help students self-monitor and evaluate by providing real-time feedback and data. Targeted prompts, feedback, and guidance can encourage students to reflect on the learning process, as studies have revealed [57, 58, 59]. For instance, large language models (LLM) can evaluate students' reflection for depth, give prompts as necessary, and even engage them in a dialogue about their writing [58, 59]. Research has shown that students using AI-assisted reflective writing tools demonstrated improved structures in their reflections, as they found interactive feedback helpful in uncovering insights [58].

Students can also benefit from AI by using it for lower-level tasks so that they can devote more time to higher-order tasks, such as reflection and critical analysis [60]. By offloading rote work to AI to focus on making connections and synthesizing information, they can spend less time on trivial tasks [61].

Rather than relying on one-size-fits-all reflective questions, educators can use AI, such as chatbots, to diversify and personalize reflective prompts given to students [62, 63]. The conversation logs in chatbots can provide rich data for educators to know when to intervene and adjust instruction based on identified common misconceptions or emotional hurdles [64].

However, students' reliance on AI to support their reflective writing calls for questions whose voices or insights are being expressed. To address this concern, students should openly disclose how AI helps (or does not)

their learning [65]. Being transparent about AI use involves clarifying its role in refining ideas and critically evaluating AI suggestions instead of accepting them at face value [65, 66]. To promote the ethical use of AI, educators should provide guidelines to students to emphasize AI's supportive rather than prescriptive role in their learning [67].

AI's capabilities in sentiment analysis for detecting students' emotional tones represent a significant advancement in educational technology. However, this technology still faces limitations in fully comprehending the complex emotional and social contexts that are integral to the learning process. The nuanced interplay of emotions, social dynamics, and individual experiences in educational settings remains challenging for AI to accurately grasp and interpret [57].

To maximize AI's potential in enriching student learning, essential human elements must be preserved. Empathy, ethical considerations, and student agency are fundamental aspects that AI cannot fully replicate or replace [68]. Educators must carefully navigate the integration of AI technologies, striking a delicate balance between leveraging innovative tools and maintaining irreplaceable human dimensions. This approach requires thoughtful implementation strategies that harness AI's strengths while acknowledging its limitations, ensuring that technological advancements complement rather than supplant the critical human aspects of the learning experience [69].

6. SERVICE-LEARNING AND TRANSDISCIPLINARY COMMUNICATION

In education, transdisciplinary communication plays a significant role in fostering environments in which students can develop the skills necessary for the twenty-first century, including metacognitive awareness and reflexivity. Service-learning can provide such an environment because this pedagogical approach allows students to integrate knowledge and methods from different disciplines to solve ill-structured problems [70]. Specifically, this high-impact practice prepares students to address multidimensional issues in society by challenging them to engage with real-world experiences and apply knowledge from different perspectives as part of fostering a culture of collaboration and inquiry [71].

However, much of the foundational theory of service-learning has been developed in Western contexts, which may have overlooked cultural factors. For instance, the concepts of individual reflection and self-expression may need adaptation in collectivist settings, such as Asia [72]. Many educational contexts in Asia are also characterized by hierarchical teacher-student relationships and respect for authority figures. Rather than criticizing systems or authority, Asian students tend to view teachers as a

primary source of knowledge and feel uncomfortable providing feedback to the community or asserting ideas in front of them. Additionally, educational systems in Asia are usually lecture-based and exam-oriented. Experiential learning, such as service-learning, is often met with skepticism, as several educators regard it as lacking academic rigor. Moreover, Asian students may not resonate deeply with the themes of social justice and civic engagement as understood in the Western democratic context. They are more familiar with moral or character education as an approach to values formation [73].

Therefore, service-learning as a teaching method must evolve to integrate diverse perspectives and enhance the reflective process through transdisciplinary communication [29]. One salient outcome of transdisciplinary communication in educational settings is collective sense-making. As students engage in dialogue and negotiation, they begin to think collectively and make their tacit knowledge, assumptions, and beliefs more explicit. When adapting service-learning to an Asian context, collective sense-making ensures that community engagement resonates with local cultural values. By bringing together multiple sources of knowledge through dialogue and negotiation, transdisciplinary communication can bridge Western pedagogical models to non-Western cultural realities [74].

To facilitate dialogue and negotiation amidst cultural and structural challenges, educators can integrate local cultural values and philosophies into service-learning [73]. They can ask students to reflect on and discuss how their actions in service-learning have contributed to collective well-being [75]. By framing service-learning within the local ethos of moral and character education, community engagement becomes a means to live out time-honored virtues instead of Western import [73]. Educators can also explore holding reflection activities in groups, which may feel more natural to students from collectivist cultures than engaging in solitary journaling [75]. They can also use open-ended questioning during group reflection to encourage students to voice their thoughts [73]. Research has shown that prompting students to recognize and manage uncomfortable feelings during service-learning can promote deeper learning [76]. To gain trust in the community and build long-term relationships through service-learning, educators can equip students with reflexive consciousness of local conditions and cultural competence so that they can better involve the community in planning, monitoring, and evaluating their community engagement [73].

When students engage in culturally contextualized service-learning, shaped by transdisciplinary insights and responsiveness to cultural norms, they often experience deeper self-reflection than they would in a one-size-fits-all approach. Students become adept at perspective-taking by interrogating how Western concepts taught in class intersect the local realities they encounter [73]. They also

learn to negotiate different ways of defining and solving issues in the community, recognizing that purely technical solutions may fail if social or cultural contexts are overlooked [74]. They begin to question themselves as much as they question social issues as part of understanding themselves as learners and members of a wider community [73].

7. CONCLUSION

Service-learning is a pedagogical approach that provides students with hands-on learning experiences, while also addressing community needs. Reflection is a critical component of service-learning that transforms students' experiences into insights through five key elements: connection, continuity, context, challenge, and coaching. Educators can use various strategies to facilitate reflection, such as journals, group sharing, prompts based on transformative learning and critical pedagogy, multimedia, and community debriefing.

AI can promote metacognitive awareness and reflexivity in service-learning by providing real-time feedback, personalized reflective prompts, and offloading lower-level tasks. However, the integration of AI in service-learning should strike a balance between leveraging its strengths and preserving the irreplaceable human dimensions of the learning experience.

The adaptation of service-learning to diverse cultural contexts, particularly in Asia, highlights the importance of transdisciplinary communication in bridging Western pedagogical models with local cultural realities. Transdisciplinary communication ensures that service-learning resonates with local values and enhances students' ability to engage in perspective-taking and critical self-reflection.

As such, service-learning exemplifies the synergistic relationship between education, methodology, and research in fostering twenty-first century skills, including metacognitive awareness and reflexivity, among students. Service-learning provides students with opportunities to apply theoretical knowledge in real-world situations (education), engage in reflective practices (methodology), and conduct inquiries (research) regarding the impact of their actions. As students navigate through the challenges of engaging with the community, they are prompted to critically examine their assumptions, biases, and problem-solving approaches to enhance their metacognitive awareness and reflexivity. This integration of education, methodology, and research allows students to develop a deeper understanding of their own thought processes, decision-making strategies, and the broader implications of their community engagement. It not only improves learning outcomes but also prepares students to become self-aware, adaptable, and reflective lifelong learners.

In conclusion, service-learning, when implemented thoughtfully and with consideration of cultural contexts, can facilitate metacognitive awareness and reflexivity in students. By integrating education, methodology, and research, and leveraging emerging technologies responsibly, service-learning can prepare students to be self-aware, reflective learners ready to address the complex challenges of the twenty-first century.

8. DECLARATION OF COMPETING INTERESTS

The author declares that they have no conflicts of interest.

9. DECLARATION OF USE OF GENERATIVE ARTIFICIAL INTELLIGENCE

ChatGPT was used for ideation, whereas Paperpal was used for the literature search and language editing.

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