

Teaching Philosophy for Enhancing Learning Achievement of Undergraduate Level Students: A Reflective Qualitative Review

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Abstract

This study examined how a teacher's philosophy of teaching influences the learning achievement of undergraduate mathematics students. Using a reflective qualitative review design, the study analyzed data drawn from existing scholarly literature related to teachers' beliefs, instructional practices, and student learning outcomes. The review found that teachers' philosophical orientations toward reality, knowledge, values, and pedagogy significantly shaped classroom practices, with student-centered, inclusive, and reflective approaches consistently improving student engagement, understanding, and problem-solving skills in mathematics. The study also identified challenges such as low academic achievement, learner diversity, and rapid technological change. Evidence from recent studies on online learning, problem-posing strategies, and AI literacy highlighted the importance of teachers' philosophical clarity and continuous self-reflection. The study concludes that institutions should support reflective practice, curriculum innovation, and equitable learning opportunities to enhance undergraduate mathematics education.

Keywords: *mathematics education, teaching philosophy, learning achievement, undergraduate students, reflective practice*

Introduction

It is concerned with fundamental beliefs about knowledge, the nature of reality and value, and it challenges us to have a framework through which we see the world and make decisions. In education, philosophy acts as a foundation for teachers' beliefs about why and how learning occurs. A teacher's view on how teaching is carried out has an impact on the selection of instruction, classroom interaction, assessment and designing learning opportunities (Bowne, 2017). In place of an esemplastic or theoretical being, teaching method does not have form as algorithm in that there are yellowing glasses which guide daily pedagogic actions and professional judgments.

In mathematics teaching philosophy plays a crucial role since it is an abstract and accumulative discipline. It is not only procedural skills but also understanding of

concepts, logical reasoning and problem solving should be developed in learning mathematics. The teachers' beliefs regarding construction and acquisition of mathematical knowledge heavily influence the way in which they present content engage students in learning activities, as well as the way in which they assess students. For instance, as teachers perceive mathematics as objectivist claims about a fully developed conception of the subject they are more inclined to focus on rote learning and understand it in terms teaching from teacher where knowledge holds sway. In such a context, educators who perceive mathematics as a dynamic and built form of knowledge tend to embrace student-centered practices that promote exploration, dialogue, and critically thinking. Accordingly, a teacher's philosophical stance directly influences the extent to which students are given worthwhile learning experiences.

The teacher's philosophy is revealed in classroom practices; it shapes what methods are employed to convey subject matter and the type of questioning, dialogue and assessment that takes place. It is suggested that teachers who have an articulate and self-reflective philosophy are more likely to create inclusive learning environments in which they can be responsive to individual student needs. Such classroom climates help to nurture students who give to the environment through generalizing and conjecturing, reasoning and extending their knowledge into unfamiliar territory. Additionally, reflective teachers would be most likely to evaluate their teaching and to make appropriate adjustments in order to improve students' learning.

While the teaching of philosophy is well recognized in itself, undergraduate mathematics education still encounters long-standing problems in different parts of the world (e.g. Nepal). Poor student engagement, lack of conceptual understanding, and poor academic performance among undergraduate mathematics students has been reported in studies (Dahal, 2019; Khanal, 2019). These problems are usually attributed to the attitude of students, prior knowledge or their motivation. Yet looking just at the students ignores the crucial role of teachers and also assumes their philosophy. Rote learning, examination-oriented instruction and minimal pupil participation may possibly contribute to shallow understanding in overall and disinterest particularly in mathematics where deeper conceptual knowledge is important.

New challenges have arisen in more recent years as technology has developed and higher education has changed. The convergence of online and blended learning, the expansion of digital tools, and the rising importance of artificial intelligence in education have all altered the teaching and learning landscape. These shifts force teachers to challenge traditional pedagogical practices and think about their conceptions of knowledge, learning, and technology. Study has also shown that teachers who contest due to continuous self-examination and hold philosophical clarity have a greater capacity for responding to shifting conditions in teaching formulas. Strategies such as problem-posing, cooperative learning, and technology integration can lead to increased engagement and

understanding when implemented based on well-founded pedagogical principles.

Student-centered, inclusive and reflexive ways of teaching are gaining importance in current mathematics education literature. They also acknowledge students as learners who actively participate in building knowledge while embracing a diversity of learning styles, backgrounds and abilities. A teacher's philosophy strongly shapes the distinction in this respect as to whether such approaches are embedded or surface level. Without a solid philosophical grounding, changes in instruction may not go very deep and succeed into actual improvements in learning.

In the light of such factors, it is important for us to explore how teachers' teaching philosophy affect the learning achievement of undergraduate mathematics. An appreciation of this relationship can help illuminate the influence on practice and experience in learning mathematics classrooms by conceptions regarding knowledge, reality, and values. In addition, such an analysis may help guide practice- and institutional-wide initiatives to support reflective practice, professional development, and curricular reform. Supporting teachers to articulate and critique their teaching philosophies may help institutions of higher education promote more effective, equitable, and compelling mathematics instruction.

This study thus searches for an answer to the question: how does teachers' philosophy of teaching affect that learning achievement of undergraduate mathematics students? In synthesizing the literature, we also hope to draw attention to how philosophical orientation influences teaching practice and learning outcome; and recommends directions for reform in undergraduate mathematics education of Nepal, as well as other similar settings.

Statement of the Problem

Concerns about the undergraduate mathematics performance persist in higher education. Lack of attendance, low motivation and engagement are some major challenges (Dahal, 2019; Khanal, 2019). But there's been less focus on how teachers' beliefs and practices impact learning. Insight into a teacher's philosophy and how it is manifested in classroom practices can lead to better understanding, higher levels of problem solving and attainment in mathematics.

Purpose of the Study

This is the focus of the present study, where we take a critical look at how teacher's philosophies about teaching affect student learning of undergraduate mathematics. Its focus is the relationship between teachers' conceptions of knowledge, teaching and learning from those held by the world at large, and their classroom roles, instructional strategies, and reactions to individual students. Through the examination of these philosophical orientations, this study seeks to understand how reflective and student-

centered pedagogical practices can have an impact on students' learning experiences and academic performance in undergraduate mathematics education.

Objectives of the Study

1. To examine how undergraduate mathematics teachers perceive themselves and their roles in the classroom.
2. To analyze whether teachers' instructional methods support effective learning and address diverse student needs.
3. To explore how teachers integrate students' experiences, backgrounds, and prior knowledge into mathematics teaching.

Research Questions

The reflective qualitative study is underpinned by the following research questions:

1. To what extent do teachers perceive themselves as pedagogues?
2. What impacts do educational philosophies have on pedagogy and achievement?

Ethical Considerations

This study is purely a reflective review of literature and does not include any human participants or new data. So there are no concerns involving informed consent, anonymity or confidentiality. Still, moral responsibility is a focus of study. All sources referred to are duly acknowledged in order to recognize the intellectual contributions of fellow scholars and prevent plagiarism. The literature has been read critically and the author's ideas have been treated as fairly as possible. Academic integrity, transparency, and respect for ethical scholarship have been adhered to throughout the investigation thereby striving for responsible and credible contribution to undergraduate mathematics education.

Review of Related Literature

Empirical Review

It is often reported in the research that teachers' beliefs and philosophical orientations are a key factor influencing their teaching approaches related to mathematics and student performances. Teachers' fundamental beliefs whether absolute or constructivist are major determinant of their teaching methods (Lamichhane, 2017). Constructivist or fallibilist teachers are more likely to have student-centered, inquiry-based practices, while teachers who hold more rigid, absolutist beliefs reflect the use of traditional, lecture-based instruction.

Dhungana (2023) demonstrated autoethnographic reflection to be a source of transformative self-critique, one by which educators can bridge the gap between their philosophies and pedagogies, converting conventional classrooms into culturally

responsive learning environment that encourages reflective praxis. He also highlighted teachers who use constructivist strategies develop deeper connections with students. In mixed-lingual and non-homogenous classrooms like in Nepal, pedagogical approaches that look to learning as social co-construction which is interactive could produce more engaging learning and understanding (UNDP 2006). Paudel (2023) also found that teaching practices characterized by active engagement particularly when integrated with technology and group work contributed toward increasing students' mathematics efficacy and interest, thus emphasizing the effect of teachers' beliefs about active learning on classroom decisions as well as on student experiences.

Sharma, Sharma and Khanal (2024) studied equity and inclusivity by investigating the influence of teachers' gender beliefs on participation and motivation in the mathematics classroom. In Nepal, such beliefs shape how teachers construct inclusive and responsive learning experiences for all students. Lamsal (2025) posited that, by empowering teachers to use learning-centered reflective practices, students are able to be more involved and have deeper understanding of the concepts being taught. Further, Piyakun and Phusee-Orn (2025) note that teachers' growth beliefs affect students' mindset and motivation which in turn affects learning performance, therefore, teacher belief can cause a chain of effects on learners' outcomes.

This holds true for Nepalese studies as well as for international researchers; On the whole, those teachers holding reflective, student-centered and growth-minded beliefs are more inclined to be involved in implementing practices that promote student engagement, problem solving and deep understanding of content. In contrast absolutes or more traditional philosophy may perpetuate teacher centered pedagogy that restricts a student's engagement to act and be involved in exploring mathematical ideas. These results emphasize the need to promote reflective practice, philosophical clarity, and pedagogical innovation in undergraduate mathematics education.

Dimensions of Teaching Philosophy in Mathematics

Ontology: Beliefs About Learners

Ontology is the dimension that deals with teachers' beliefs about learners and knowledge. Teachers who view mathematics as immutable tend to emphasize memorization and rules. Mathematics is seen as a creative and active subject where students are encouraged to explore, reason and solve problems (Moon & Blackman, 2017).

Epistemology: Beliefs About Knowledge

What do teachers believe about how knowledge is created and learned? The traditional methods prioritize 'right' answers, and rote learning. Constructive conceptions of learning promote questioning, inquiry and students building their own understanding (Loya, 2020; Watson, 2016).

Problem-posing and project-based learning in mathematics is known to enhance students' problem-solving skills and conceptual understanding (Christidamayani & Kristanto, 2020).

Axiology: Values and Ethics

Values of teachers and their impact on the relationship and inclusion in classrooms. Students of all backgrounds feel valued, respected, and motivated when educators teach inclusively and ethically (Cohen et al., 2011; Zhang et al.2025).

In mathematics, that translates to giving all learners the chance to participate and help when necessary and recognizing students' prior knowledge as well as their cultural experiences.

Pedagogy: Teaching Methods and Assessment

Pedagogy is what teachers do with their philosophy. Mathematics engagement and achievement is significantly enhanced by student centered approaches, active learning, formative assessment (Dahal, 2019).

Even in online learning, feedback and group discussions can help students learn effectively (Klein et al., 2020). Exploratory approach can let the students design and solve their own questions, make better understanding and create a more confident student (Christidamayani & Kristanto, 2020).

Conceptual Frame work

This study has been premised on the assumption that teachers' metaphysical (ontological), epistemological, axiological and pedagogical beliefs are directly related to their teaching methodology, which informs student engagement and learning. Mathematical knowledge is seen from an ontology point of view as dynamic and produced rather than static, this translating a constructivist perspective on reality. In terms of epistemology, knowledge is seen as co-constructed by teachers and students. A teacher's values, axiologically, fairness, inclusivity and respect for all learners influence classroom decision making and relationships. Pedagogically, these values manifest themselves in teaching styles, monitoring and evaluation processes, organizing of classrooms.

This study's theoretical model connects these philosophical beliefs with observable teaching practices that, in turn, impact student engagement and academic success. Teachers with reflective, student-centered and growth-oriented beliefs are more likely to engage in classroom that promote curiosity, participation, well-constructed ideas. On the other hand, teachers who have firm beliefs using traditional transactional methods may adopt teacher-centered approaches that provide students with limited participation and fewer chances for meaningful learning.

Philosophy (Ontology, Epistemology, Axiology, Pedagogy) → Practice of Teaching →

Methodology

Research Design

This study adopts a reflective qualitative review design, drawing on secondary sources such as journal articles, scholarly books, and research. Ontology is the dimension that deals with teachers' beliefs about learners and knowledge. Teachers who view mathematics as immutable tend to emphasize memorization and rules. Mathematics is seen as a creative and active subject where students are encouraged to explore, reason and solve problems (Moon & Blackman, 2017).

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Philosophy (Ontology, Epistemology, Axiology, Pedagogy) → Practice of Teaching → Engagement of Student in Class Process → Academic Achievement reports related to mathematics education, teaching philosophy, and student achievement. The purpose is to synthesize existing knowledge to understand how teachers' philosophical beliefs influence classroom practices and, ultimately, student outcomes in undergraduate mathematics.

Research Paradigm

The research is conducted from an interpretivist perspective, where knowledge is considered to be socially constructed (Denzin & Lincoln, 2005). The approach is to understand teachers' beliefs, values and practices in the real setting of classrooms, with meaning, reflection and subjective experiences of individuals being stressed instead of pure objectivity.

Data Sources

Search in databases Relevant literature were systematically searched from diverse academic databases such as google scholar, NepJOL etc. published between year 2015 and 2025. The search was limited to studies on philosophy teaching, mathematics pedagogy including problem solving strategies, reflective teaching and student learning outcomes. Included in those works were peer-reviewed papers concerning undergraduate mathematics or teacher beliefs in tertiary education, while non-academic and studies not related to mathematics education were excluded. A total of 20 studies were initially found, and by close examination for relevance, quality, and framework, 15 papers were included for a thorough review.

Data Analysis

Thematic analysis was used to analyze the four central dimensions of a teaching philosophy: ontology (what lecturers believe about learners and reality), epistemology (views on knowledge and how students learn), axiology (values, ethics, inclusivity in teaching) and pedagogy (teaching methods, assessment techniques and classroom management). Review The selected studies were systematically reviewed, coded and analyzed for trends, similarities or differences between these dimensions. The results were discussed in relation to undergraduate mathematics education and the implications of teacher's philosophical orientations for their classroom practice, student engagement and learning attainment. This included a rigorous, transparent and reflexive process of analysis that facilitated genuine insights into the relationships between teacher beliefs and the effective teaching of mathematics.

Findings

The synthesis of the literature reviewed produced some major patterns in relation to how teachers' philosophy of mathematics affects undergraduate learning of mathematics. Effective mathematics teachers see themselves as facilitators of the learning process, rather than as providers of information first. They help students explore, solve problems and develop reasoning skills (Bowne, 2017; Perron et al., 2021). Reflective teaching enables teachers to modify their methods based on students' needs, and also to develop themselves professionally.

In relation to teaching practice, student centered learning was the central theme. Inquiry-based, cooperative, problem-solving activities were found to improve students' motivation and learning outcomes. There are also regular opportunities, such as projects, peer presentations and self-assessment, for students to take ownership of the learning process. Teachers also have a critical role in enabling students to develop self-regulation, goal-setting and problem solving skills that will support lifelong learning. There was also an emphasis on the importance of teaching mathematics meaningfully and interestingly by taking account what students know, their cultural experience and context, so that background knowledge is included in mathematics teaching. Strategies like culturally responsive teaching and scaffolded support also help all kids succeed.

Discussion

The results highlight that teachers' philosophical beliefs have an influential impact on effective mathematics instruction. When teachers consider themselves facilitators and are reflective, student-centered, they allow for more in-depth learning, while supporting engagement and independent study. These findings are consistent with those of Lamichhane (2017) and Dhungana (2023), who claimed that constructivist reflective beliefs promote exploratory classroom practices while rigid teacher centered

philosophies can impede student engagement.

The review also emphasizes the role of learner-centered learning and fair assessment practices. As suggested by Piyakun and Phusee-Orn (2025) and Lamsal (2025), pedagogies based on growth-focused mindset may increase motivation as well as achievement. That is, the axiological thinking of teachers when taking into account students' prior knowledge and cultural context to promote experiential learning plays a key role in promoting meaningful and inclusive learning environments (Sharma et al., 2024).

Current issues, including digital literacies (e.g. technological integration), online learning and AI literacy, make the requirement for educators to consider their own practice and beliefs regarding how students learn more pertinent than ever. As Zhang et al. (2025) and Klein et al. (2020) explain, technology only adds to learning when being used purposefully to support the need of students. Problem-posing methods also illustrate how philosophy is transformed to become practical guidance for critical thinking, collaboration, and problem solving as practice in the world (Christidamayani & Kristanto, 2020).

Taken together, these results indicate that there is a critical need to promote reflective, student-centered and inclusive teaching philosophies with a view to enhancing student engagement and achievement within undergraduate mathematics classrooms. The implications suggest that professional development, curriculum design, and support systems should be designed to encourage philosophical clarity and reflective practice as a cornerstone of effective mathematics education.

Conclusion

A teacher's conception of the teaching is central to undergraduate mathematics learning. Teachers presumed beliefs on learners, knowledge, values and pedagogy play a significant role in determining school practices, student participation as well academic outcomes. Findings reveal that purposeful reflective inclusive and student-centered strategies together with some problem-posing as well as integration of technology contribute to enrich students' understanding, problem-solving ability, and motivation.

This paper offers an important perspective on the relationship between educators' espoused philosophical beliefs and their enacted classroom practice when it comes to the teaching of mathematics. Based on policy, teacher preparation needs to focus on reflective practice, pedagogical clarity and inclusive strategies. Schools should fund curriculum development to encourage active student learning, technology integration, and equal access for all learners.

Further research the dimensions could be the basis for empirical research, e.g.: 'How do different educational philosophies lead to specific student outcomes in a variety of

contexts?'; or comparative analysis between disciplines and cultures. In sum, nurturing teachers' philosophical consciousness and their reflective practice is necessary if we wish to produce graduates of mathematics education that are fit for the 21st century.

Limitations

This study has several important limitations. Since it is a research review, the articles cited in that rely solely on secondary sources and instead of presenting new empirical data, the findings merely reflect already published classroom experiences. The analysis is further limited by the fact that different regions have access to differing levels of quality published research and may under-represent particular viewpoints, particularly from under researched areas. Moreover, the sample is restricted to undergraduate students from Nepal and such results might not hold good for higher education levels or other disciplines or cultures. Finally, even though the thematic analysis enabled us with a systematic manner to uncover teachers' philosophical dimensions, the interpretations are still shaded by authors' analytical point of view. Nevertheless, the study provides useful results on how teachers' beliefs influence teaching and learning; findings the future empirical studies could be built upon.

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