Nonroutine Problems for Deeper Learning:

A Review of Bob London's Book "Introducing Nonroutine Math Problems to Secondary Learners"

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Abstract

A review of Bob London's Book, *Introducing Nonroutine Math Problems to Secondary Learners*.

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In the book, *Introducing nonroutine math problems to secondary learners: 60+ engaging examples and strategies to improve higher-order problem-solving skills,*experienced secondary mathematics educator Bob London, presents an important case for incorporating nonroutine problems into mathematics education. London advocates for a holistic approach that transcends routine memorization and formulaic problem-solving. London's book serves as a comprehensive guide for educators, offering practical strategies and sample problems to cultivate critical thinking skills and building mathematical maturity in students. Interestingly, while reading the book, I found myself connecting it to the philosophy of Vedanta. Vedanta offers a unique perspective on the importance of staying present during our daily routines and being in constant awareness of our evolving surroundings. In the same way, when students are introduced to nonroutine problems in mathematics, there are more opportunities to contextualize their mathematics learning to their evolving environments. This connection highlights the book's value as a resource for the ongoing conversations within our education community regarding holistic mathematics education.

The book argues that mathematics education encountered in our schools today often fails to equip students with the tools necessary to tackle the complexities of real-world problems. London proposes nonroutine problems as a solution. These problems, unlike formulaic textbook exercises, demand critical thinking, perseverance, and the ability to navigate ambiguity – all essential life skills. The book outlines a comprehensive curriculum guide, complete with sample problems categorized by mathematical content and even non-mathematical themes like community

building and emphasizes the need for concrete strategies and implementation plans for teachers. This emphasis on the practical application of mathematics and its connection to transferable skills is valuable and a great contribution to teacher education and coaching programs.

London defines nonroutine problems as those requiring a multi-step approach: first identifying and understanding the problem itself, then attempting a solution, and persisting until a satisfactory answer is reached. These problems are designed to challenge students positively by encouraging creative thinking, collaboration, and the development of important life skills. London argues that traditional textbook problems fall short in preparing students for real-life complexities and incorporating nonroutine problems into the curriculum can bridge this gap. Further emphasizing this point, London highlights the importance of "problem orientation and recognition" as the critical first step coupled with giving students the space and time to be persistent with solving the problem. This aligns with developing a deeper mathematical understanding that goes beyond routine memorization and simply obtaining answers.

The book's strength lies not only in its practical approach but also in the author's personal journey. London provides detailed guidelines for implementing nonroutine problems, including scaffolding strategies and assessment techniques that can be used in the mathematics classroom. Additionally, he provides over sixty diverse exemplar problems with supporting materials included for high school and college students studying mathematics. London's personal narrative, detailing his struggles with conventional methods of mathematics teaching and his quest for more meaningful learning, adds depth and authenticity to the message, making the book both practical and relatable to all types of educators.

Shifting Focus: Problem-Solving Beyond Answers

The book wonderfully champions a shift in focus from simply obtaining answers to cultivating a deeper understanding of the problem-solving process. By emphasizing nonroutine problems, London shows us that educators can equip students with transferable problem-solving skills beyond the walls of a mathematics classroom and make critical connections to the real world.

While the book touches on themes of community and ecology, it would also be interesting to explore how mathematics tackles community problems and encourages difficult conversations around race and ethnicity. By incorporating culturally relevant pedagogy with nonroutine problems, educators work to not only deepen students' mathematical understandings, but can also foster a more inclusive and socially aware learning environment.

Culturally Relevant Pedagogy in Mathematics

One way to consider designing for culturally relevant pedagogy in mathematics is examining our current Eurocentric mathematics systems that often overlook the significant contributions of pre-colonial traditions. The Islamic scholarship, for example, particularly the unification of Egyptian measurement techniques with the Indian number system, is not fully appreciated or integrated into the current mathematics education curriculum (Joseph, 2011). This omission creates a blind spot

in understanding the historical development of mathematics.

Culturally relevant pedagogy can also challenge the notion of mathematics as a culture-free zone (Ladson-Billings, 2021). It emphasizes the importance of students' backgrounds and experiences in fostering a deeper connection to the subject. Scholars of culturally relevant pedagogy argue for acknowledging the everyday life of mathematics, from observing nature to solving problems in communities. Teachers trained in this approach can bridge the gap between theory and practice by incorporating cultural contexts and validating the diverse mathematics knowledge students bring to the classroom. Combining nonroutine problem solving with culturally relevant pedagogy can help students further contextualize their mathematics learning to their everyday lives. This in turn creates a more humanizing learning environment in a mathematics classroom.

Pre-service mathematics teacher program example: The City Teaching Alliance Program

A good example of culturally relevant pedagogy from preservice training of secondary mathematics teachers is the City Teaching Alliance Program, a program focused on urban education in under-resourced communities, at American University in Washington, DC.[1] Teachers in the program develop culturally relevant mathematics tasks that bridge the gap between traditional classroom problems and students' communities. These tasks emphasize student voice and agency by making sure students' funds of knowledge are recognized (Anhalt et al., 2018) and students connect mathematics concepts and standards to everyday and/or cultural artifacts they see or experience in their communities (Matthews et., 2022). This approach helps students build familiarity with specific mathematics vocabulary and syntax relevant to their own communities. Cultural artifacts preservice teachers study include historic preservation sites such as Barry Farm in Southeast DC and Langston Terrace Dwellings in Northeast DC. Both of these sites are historical structures in DC and showcase struggles faced in race, class, and most recently, gentrification.

Aligning with Holistic mathematics Education

Bob London's *Introducing Nonroutine Math Problems to Secondary Learners: 60+ Engaging Examples and Strategies to Improve Higher-order Problem-Solving Skills*, stands as a valuable resource for educators seeking to enrich mathematics education. London's advocacy for nonroutine problems, coupled with a comprehensive implementation guide, empowers teachers to cultivate deeper mathematics understanding and transferable problem-solving skills in their students. Also as discussed in this review, the integration of culturally relevant pedagogy can further amplify the value of teaching nonroutine problems in mathematics classrooms. This aligns perfectly with a vision for holistic mathematics education, equipping students not only to succeed in mathematics but to thrive in a complex and ever-changing world.

[1] I am an adjunct Clinical Faculty in the City Teaching Alliance program.

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Author Bio

Dr. Deepa Srikantaiah is an educator, artist, and researcher. Her works explore culturally sustaining pedagogies, postcolonial studies, and comparative histories and international education to better understand how education can address contemporary issues of minoritization and racism in secondary mathematics and science education. She also studies US foreign policy on global education funding and programs through the lenses of precolonial knowledge systems and diasporas from South Asia and Africa.

Currently, Dr. Srikantaiah is an affiliate faculty in the graduate program in International Education Policy at the University of Maryland, College Park and the doctoral program at the School for International Training. She also adjuncts at the City Teaching Alliance Program at American University in Washington, D.C. Her scholarship has been published in numerous peer reviewed journals, book chapters, and conference proceedings.

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