Implications of Inquiry Instruction

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Teaching a math course that includes content that builds on prior coursework has a number of challenges. Almost daily, my colleagues and I are reminded that ninth-grade algebra courses has the highest failure rates in the school. This assertion fails to take into account the fact that material presented in several algebra courses is the buildup and expansion of content that was introduced in prior grades. In some cases, ninth grade algebra students come into class after failing their math courses in middle school. Given that math concepts build from year to year, this has significant long-term effects on students' math performance. As such, teachers face the decision to continue to pass these students along or put their proverbial feet down and stop the runaway train in its tracks.

While traditional teaching methods serve a purpose for traditional students, they are not the answer to for our lower-performing students. But conversely, that same atmosphere [traditional methods] tends to create apprehension on the part of the low and marginal students because it tends to stultify creativity and discourage risk-taking behavior and collaboration (Malloy & Malloy, 1998). .Maintaining these practices can continue to produce the same inadequate results and prolong a disservice. Students need the opportunity to demonstrate their level of understanding through a variety of instructional engagements instead of the cookie cutter lessons and assessments required in many districts. Moving beyond the traditional instructional math practices can increase engagement and motivation.

Connecting Theory to Practice

Adopting a social constructivist paradigm permits students to create their understanding by associating new material with prior encounters rather than simply memorizing information prepared by a teacher (Adnan et al., 2021). Because math concepts can sometimes feel abstract

or disconnected for students, developing instructional strategies and approaches that allow students to learn by creating meaning in a more personal way can prove beneficial. This is especially important for students who do not have the prerequisite math skills.

Furthermore, Greco et al. (2018) explained that utilizing an inquiry-based social constructivist method allows learners to take part in the enthusiastic and authentic discovery, something that fits well within the math class. This is increasingly important as several of our ninth-grade students are several grade levels behind in math. Expecting them to complete the same assessments as the on-track students put them at a disadvantage.

Because passing students who haven't mastered the math skills is not the answer, one way that administration can support teachers is by allowing them the ability to do what is necessary to provide students with meaningful success. Zion and Mendelovici (2012) argued that teachers closest to the students have the best ability to empower their students' learning. Administrators should not then expect these students to perform at the same pace and the same level on the same assessments as everyone else, especially when these assessments are often textbook-driven or made without any local teacher input. Without support from the administration, teachers may continue to jeopardize instruction (Chichekian & Shore, 2016) at the expense of following district policies involving the use of specific textbook resources, mandated curriculum maps, and common assessments.

Instructional Implications

Inquiry learning supports opportunities for students to participate in dynamic situations where they can discover and explore through hands-on experiences (Perdana et al., 2018). Not surprisingly, Ambusaidi et al. (2021) claimed that students performed at higher levels after participating in inquiry-based methods as opposed to traditional means. More specifically, lower-

performing students tend to benefit from task-oriented learning when encouraged to make connections as opposed to having to answer multiple-choice practice questions on premade formative assessments. Additionally, inquiry offers time for students to make the connections that teachers may not afford when they are required to follow pacing guides explicitly stating the number of days they can spend on a topic.

Teachers can more readily transition to an inquiry-based constructivist approach if they are open to new ideas and have not fallen victim to over-used and ineffective methods (Greco et al., 2018). Nevertheless, this type of educational swing requires an adjustment in thought regarding learning in schools (Zion & Mendelovici, 2012). Not surprisingly, this proves to be problematic when teachers work in districts that require the use of specific textbook resources, mandated curriculum maps, and common assessments. While these tools serve an educational purpose, they are not necessarily what is best for all of our students, especially our students who tend to perform below basic in math.

Inquiry in the Algebra Classroom

Math Concept	**Traditional Lesson**	**Inquiry-based lesson**	**Real World Example**
Comparing Linear & Exponential Functions	Students first graph linear functions and then graph exponential functions.	Students explore linear and exponential functions in the context of real-world situations and related graphs and tables.	In this lesson, students would be given several similar word problems for which they have to choose the corresponding equation. In doing so, they have to understand linear vs. exponential. These are two examples of such

			word problems. They then match each to the appropriate table and graph. **Example:** Linear: To hire a taxi, you pay $5 to get in the car and $2 per mile. Exponential: You have $5 in your piggy bank and it doubles every year.
Compound Interest	Students write an exponential equation to represent compound interest.	Students explore exponential equations in the context of real-world situations and related tables.	In this lesson, students are given multiple word problems for which they have to choose the corresponding equation and then match to the appropriate graph. This is one example of such a word problem.) **Example:** You put $3,000 into an investment that yields 14% interest compounded quarterly.
Systems of Linear Equations	Students solve systems of equations through elimination or substitution.	Students explore systems of equations in the context of real-	In this lesson, students would be given two different word

		world situations and related graphs.	problems for which they have to write the linear equation and then graph. They then need to locate the point of intersection and explain its significance. **Example:** A candle begins at a height of 30 inches and burns at a rate of 2 inches per hour. A candle begins at a height of 20 inches and burns at a rate of 4 inches per hour.
Rate of Change	Students calculate the rate of change from equations, tables, and graphs.	Students explore rates of change in the context of real-world situations and related graphs and tables.	In this lesson, students would be given several situations in word form for which they have to match to the appropriate graph and table. **Example:** Brian walked to the store at the end of his street, bought a soda, and then ran all the way back.

Frequency, Frequency Tables, and Measures of Central Tendency	Students calculate statistical values from pre-organized, uniformly presented data.	Students explore a Tour It presentation of Cedar Point Amusement Park to calculate statistical values from data they obtain from hotspots embedded in 360-degree images.	In this lesson, students would tour sites virtually (similar to the Cedar Point example) and calculate statistical data.

Conclusion

With today's diverse classrooms in mind, teachers should utilize instructional strategies that go beyond packaged lessons and scripted programs. Students are not one-size-fits-all, and therefore may not benefit from a one-size-fits-all instruction. Nonetheless, what teachers believe they can do in their classrooms is unfortunately influenced by external pressures (Chichekian & Shore, 2016). As such, teachers must find a way to navigate the bridge between theory and practice (Scott, 2016) and champion the use of differentiation over the sour taste of defeat. Accordingly, by linking social constructivism to inquiry, teachers may inspire students across many different levels to attain their highest possible potential (Perdana et al., 2018). These considerations can help students become more successful in not only the math classroom, but beyond.

References

Adnan, Mulbar, U., Sugiarti, & Bahri, A. (2021). Scientific literacy skills of students: Problem of biology teaching in junior high school in south Sulawesi, Indonesia. *International Journal of Instruction, 14*(3), 847-860. https://doi.org/10.29333/iji.2021.14349a

Ambusaidi, I., Badiali, B., & Alkharousi, K. (2021). Examining how biology teachers' pedagogical beliefs shape the implementation of the Omani Reform-Oriented Curriculum. *Athens Journal of Education, 8*(3), 263-304. https://doi.org/10.30958/aje.8-3-3

Balogun, I., & Yusuf, A. (2019). Teaching civic engineering to learners through best practices. *Anatolian Journal of Education, 4*(1), 39-48. https://doi.org/10.29333/aje.2019.414a

Cattaneo, K. (2017). Telling active learning pedagogies apart: From theory to practice. *Journal of New Approaches in Educational Research, 6*(2), 144-152. https://doi.org/10.7821/naer.2017.7.237

Chen, R. (2021). Fostering students' workplace communicative competence and collaborative mindset through an inquiry-based learning design. *Education Sciences, 11*(17), 1-13. https://doi.org/10.3390/educsci11010017

Chichekian, T., & Shore, B. (2016). Preservice and practicing teachers' self-efficacy for inquiry based instruction. *Cogent Education, 3*(1), 1-19. https://doi.org/10.1080/2331186X.2016.1236872

Duncan, T., & Redwine, R. (2019). Shifting schemas: Perspectives and practice in a learner centered course. *International Journal of Teaching and Learning in Higher Education, 31*(1), 154-165.

Greco, R., Bernadowski, C., & Parker, S. (2018). Using illustrations to depict preservice

teachers' self-efficacy: A case study. *International Journal of Instruction, 11*(2), 75-88.

Perdana, R., Budiyono, Sajidan, Sukarmin, & Atmojo, I. (2018). A conceptual of teaching models inquiry-based social constructivism (IbSC). *IOP Conference Series: Earth & Environmental Science, 243*(1), 1-8. https://doi.org/10.1088/1755-1315/243/1/012110

Scott, L. (2016). Theory and research in construction education: The case for pragmatism. *Construction Management and Economics, 34*(7/8), 552-560. https://doi.org/10.1080/01446193.2016.1151539

Zion, M., & Mendelovici, R. (2012). Moving from structured to open inquiry: Challenges and limits. *Science Educational International, 23*(4), 383-399.