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Academic Language Development in Action: Building Teacher Capacity through the Development of Academic Language

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Abstract

This research focuses on engaging teacher education candidates in curriculum development that promotes a greater foundational understanding of mathematical concepts through the development of Academic Language. When students fully understand the demands of language, mathematics content area knowledge is acquired on a deeper conceptual level and this understanding of language can then be applied successfully across disciplines. This research demonstrates how students' language and discipline knowledge are indelibly connected and presents strategies to develop direct and explicit instruction of tier-three, field-specific Academic Language. The researchers focus on how to provide pre-service educators with strategies to promote efficacy in the translation of a general understanding of vocabulary into a deeper knowledge of complex, conceptually dense words found in content specific language. The result of regularly incorporating academic language instruction into segments of learning in mathematics is a more profound overall understanding of discipline concepts.

Keywords: Academic Language (AL), pedagogy, diverse learners, vocabulary

Introduction

The goal of this project was to provide curricular enhancement for an HBCU's Educator Preparation Program to expand classroom tools that build Academic Language (AL) in mathematics and assist pre-service educators with enhancement of 21st-century competencies required to have a positive impact on local, regional, and potentially, national K-12 student achievement. Researchers demonstrate how conceptual knowledge is connected through direct and explicit teaching of field-specific Academic Language and pre-service educators learned to translate a general understanding of vocabulary into a deeper knowledge of complex, conceptually dense words found in the field of mathematics that result in a more profound understanding of the content being taught.

One of the primary goals of Educator Preparation Providers (EPP) is to produce educators who can effectively prepare all students for successful transitions into careers and college. To accomplish this goal, research has demonstrated that teachers of mathematics and essentially all disciplines must incorporate pedagogical strategies that bring a deeper, conceptual level understanding of the content (Golden, 2007). An important aspect of this process is the full integration of pedagogical strategies that provide direct and explicit instruction of field-specific, academic language. Unfortunately, this aspect of instruction is often neglected or given minimal attention. Post-secondary level instructors can help future educators develop real pedagogical skills that will help their students translate a general understanding of vocabulary into a deeper knowledge of more complex, conceptually dense words found in the field of mathematics and other disciplines that result in a more profound understanding of these fields overall. Integration of such strategies and applications align well with the primary goal of building advanced teacher capacity in the instruction of mathematics and all disciplines.

Description

This research focuses on enhancing 21st-century competencies required of current pre-service educators in an HBCU teacher preparation program to improve teacher impact on K-12 student achievement through enhanced implementation of Academic Language development. Vast research has been conducted on the significance of Academic Language (AL) and student success at the elementary and secondary levels; however, developing students' AL at the college level has received less attention. This is likely because historically, colleges have relied on entrance exams such as the SAT and ACT as part of the admissions process to screen candidates; such assessments use high-level and obscure vocabulary to filter students through the admissions process. Students with advanced academic vernacular and quantitative skills score well on gatekeeper tests and achieve admissions. However, the benefits of having advanced linguistic cultural capital in academic language extend well beyond higher SAT scores and have proven to help students successfully navigate gateway and more advanced college courses (Hass, 2014).

At the college level, students must be able to translate a general understanding of vocabulary into a deeper understanding of complex, conceptually dense and field-specific terminology to develop a more profound understanding of related field concepts. Entering college with an advanced understanding of AL and knowing how to navigate mathematics from a language perspective provides an undeniable advantage when traversing higher education. Consequently, students without this form of cultural capital typically have additional obstacles that too often lead to attrition (Bourdieu and Passeron, 1977). Therefore, building AL at the college level is significant for all students to increase achievement, persistence, and degree completion; however, building AL is of particular significance to college students who are pursuing a degree in teaching, because these students will pass this academic capital on to their future students. As future educators develop an understanding of how to build AL knowledge, they will then be able to increase their own capacity in teaching and utilize the techniques they learn to build AL in the K-12 classroom.

As colleges move to provide greater access to the general population, more students are entering college without access to the academic language they will need to know to successfully persist, reach degree completion, and for future educators, build capacity in teaching of mathematics and other content areas. According to Barrett (2005), without a significant college-level lexicon, the rigors of daily reading assignments and assessments can diminish motivation and be a potential cause for early attrition. Therefore, students who have experience engaging in techniques to build AL as a means of deepening content knowledge will also have a greater capacity to build these skills in the (K-12) classrooms, where they will teach post-graduation.

Part of the issue at the post-secondary level, is that frequently, college instructors assume students are prepared for coursework and are equipped with the necessary language to navigate the given discipline. This supposition can add significant time and effort for students as they work to learn the content and the language of the discipline. Johnston (2019, p. 1) notes, "the impenetrable language of universities is a serious problem for students because it adds another layer of obstruction as they try to navigate higher education." In addition, Barrett (2005) also found that the academic language located in standardized tests and college-level text created challenges for traditional students who had limited AL acquisition, students who were unable to decipher the language in word problems, and for nontraditional students returning to college after some time away from school.

Additional barriers to learning also result when a student's vernacular language differs significantly from the complex academic vocabulary, syntax, and discourse prevalent in AL if assistance in building AL is not provided. Koch and Drake (2018) compiled statistics on DFWI rates, the rate of students who received a D or an F, withdrew, or received an incomplete, in several college level gateway courses and found students with less social capital, defined as first generation and students from lower income families, were more likely to have DFWI than students with social capital. According to Koch and Drake (2018),

The study looked at accounting, calculus, and chemistry courses in particular, where women had DFWI rates up to 8 percent higher than men and African American students had DFWI rates up to 18 percent higher than white students. Even more troubling, slower starts to academic careers compounded into lower retention rates. Looking at calculus, for example, among students who had taken the course and had been dismissed by their university after their freshman year, 95 percent were in the DFWI group. But another hidden population of students were in good academic standing (a 2.0 GPA or higher overall) and chose not to return for the second year: among those, 50 percent of students were in the DFWI group in their calculus course.

The take-away according to Koch and Drake (2018) is not to blame students or faculty or to lower standards, but instead, to redesign courses in ways that optimize students' academic potential.

Given historical post-secondary teaching practices that place emphasis on content knowledge and minimally address advanced content literacy strategies, it is fair to say content experts likely make assumptions that students already deeply understand the language used to receive and convey complex content concepts. According to Schleppegrell (2004), "Teachers need greater knowledge about the linguistic basis of what they are teaching and tools for helping students achieve greater facility with the ways language is used in creating the kinds of texts that construe specialized knowledge at school" (p. 3). Without additional content specific literacy support to build AL, learners can become lost in language that is vague or unfamiliar. Well-prepared instructors at the college level have the potential to build AL and minimize some of the additional barriers associated with limited AL proficiency.

Therefore, redesigning courses where inclusion of discipline-specific AL development is incorporated into instruction could potentially be one way to resolve persistent inequities among students and help more students realize their academic and career goals. This research sought to answer the question, if educators at the college level engaged students in activities that supported the development of subject-specific vocabulary, syntax, and discourse, would students have more academic success and increase their own understanding of how to do the same for their future students? This work sought to examine the effects of intentionally applied AL development activities to enrich and further develop subject-specific vocabulary, syntax, and discourse at the college level to increase achievement and teaching capacity among pre-service educators.

Research Methodology

One of the most essential aspects of teaching and learning is understanding the meaning of words and terms as used within a given field. Therefore, researchers selected math courses redesigned for the educator preparation program and administered both pre, mid-point, and post language-understanding assessments that include mathematical representations where applicable, embedded within the courses. Throughout the course modules, instructors provided active vocabulary activities designed to enhance AL understanding.

To intentionally build language meaning, instructors provided students with key terms highly relative to learning associated with each week's module. Students were required to create digital notebook dictionaries where students write instructor-provided meaning, write the meaning in their own words, secure a picture or representation of the word/meaning, identify parts of speech, and use the word/symbol within the appropriate context. Instructors will engage students in several activities to actively require recall, recognition, and association of the words/symbols and their definitions (Marzano, 2009). Next, instructors will have students use sentence starters and transitions to carry out the language demand, for example, a language function: analyze, describe, synthesize, explain, compare, evaluate, justify, etc. The goal of using sentence frames to complete a writing task is to enhance students' application of writing field-specific communications utilizing the appropriate syntax and patterns of communication of the discipline. Finally, instructors will engage students in specific discussion activities with targeted language used to further develop students' application of field-specific discourse.

Major Contributions

This work has the potential to enhance and deepen learning for education preparation program students' and build future teaching capacity in mathematics and all content area instruction. This research also has the potential to improve student retention at the post-secondary level and increase persistence, achievement, and degree completion. This study will highlight how an HBCU Educator Preparation Program curriculum can enhance 21st-century competencies required of current pre-service educators, so that they may have an impact on local, regional, and possibly national K-12 student achievement. This body of research will also add to the discourse on P-16 student achievement and improving college graduation rates.

The PI and Co-PI along with other faculty have been working to create a Math Pathways program that uses evidence-based pedagogies and embedded AL support to enhance student learning for a diversified student body. The mathematical literacy, understanding, and success pathway is a theoretical approach that focuses on literacy and understanding of academic language and how this translates mathematically. This approach directly applies a culturally relevant pedagogy that allows learners to learn in context which results in greater student self-efficacy and mathematical success.

Faculty involved in this work are familiar with the Adult Numeracy Initiative (ANI) professional development (PD) model and others like it. It is our understanding that teacher preparation for adult mathematics instruction must be sufficiently intensive and focused on providing instructors with a strong base of mathematics content and pedagogical knowledge. We have the capabilities and proven strategies to expand classroom tools that build AL in mathematics to assist adult learners in: 1) becoming active learners, 2) deepening their conceptual understanding, 3) expounding upon multiple intelligence integration, and 4) developing a translation of mathematical vocabulary into a deeper understanding of complex, conceptually dense terminology.

Preliminary Results

Although this research is ongoing, anecdotal evidence collected at this point would suggest that candidates' perceptions on developing AL have been positive as student report believing activities provided led to learning on a deeper level. For example, when Math Education students at an HBCU located in the southeastern United States were asked, how useful were the Academic Language PowerPoints and Vocabulary Crossword Puzzles in understanding math specific discipline vocabulary? Student responses were positive overall, as demonstrated in the qualitative examples provided below.

The Academic Language Power points and Vocabulary Crossword Puzzles were extremely useful in helping me better understand specific math vocabulary. I have a better knowledge of math vocabulary terms and how to apply that terminology in solving math equations. The Crossword Puzzle was fundamental, while the Academic Language PowerPoints were very informative (Student #1).

Very useful. The majority of math exams such as the PRAXIS CORE exam introduced me to a lot of math vocabulary and diction that only a math major knows; fortunately, this class explored all those terms and the academic language within these word problems as well-simplifying the stress load of these questions (Student #2).

Additionally, when candidates, how well did Academic Language assist you with the understanding of mathematical procedures and conceptualization of mathematical concepts in gateway course, MATH 126? Student responses were again positive, as established in the examples provided below.

Academic Language assists me in understanding mathematical procedures and conceptualizations, especially in x value equations. When having to solve math word problems; I apply Academic Language to the problem that helps break down what exactly the question is asking (Student #1).

I finally know that "of" does not mean to divide, but it means to multiply. The academic language is everything when it comes to math, reading and even other disciplines. Honestly, this class helped me in understanding the concepts of what these questions were asking me. It does not have to even be the following: it could be like "choose the best answers from the following" (Student #2).

Finally, when students were asked to describe overall experiences in MATH 126, *Quantitative Reasoning for Pre-Ed Majors* and to provide any recommendations for future course sections, student responses were very positive, as confirmed in the examples provided below.

Overall, experience in MATH 126 Quantitative Reasoning was a lifesaver for me. Before enrolling into this course, I was not so strong in the subject of mathematics. This course gave me high confidence in knowing math terminology, solving equations, and much more. I am more prepared to take the PRAXIS CORE MATH and it gave me the dedication and determination, and MATH 126 is to thank (Student #1).

I am blessed and fortunate to have taken this class! Not just for the PRAXIS, but even for my own career and future pursuits. I feel like I am so much more ready for education now that I have had some training in academic language (primarily this math). I will certainly recommend this class to all pre-education majors like myself (Student #2).

As anecdotal responses would suggest, pre-service teacher candidates see value and find merit in developing AL skills, and therefore, the goal is, as these students develop skills and engage in specific Academic Language activities in EPP programs, candidates can then parlay these skills to P-12 students once they have classrooms of their own. At this point of the research, we are seeing positive outcomes of strategic implementation of Academic Language strategies within a college level math course, and candidates report these activities have led to learning on a deeper level.

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