Computer-Assisted Personalized Systems of Instruction (CAPSI): An Overview of CAPSI Course Delivery in Developmental Writing

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Abstract

Developmental writers have long been viewed as marginalized, and one course delivery method which might disrupt this marginalization is computer-assisted personalized system of instruction (CAPSI). However, research on CAPSI writing courses is minimal. Despite this gap in the research, administrations across the U.S. have mandated the redesign of developmental programs based upon CAPSI course delivery. This article presents an overview of the research on computer-assisted personalized study with emphasis on developmental writers. Calls for future research include studies on student success, student personality attributes, and others.

Keywords: developmental writing, personalized instruction, CAPSI, PSI, computer-assisted instruction, course redesign

Also known as basic, intermediate, remedial, learning support, or transitional writing, developmental writing programs exist to increase students' writing proficiency to that of their college-level peers. Created concurrently with the advent of open admissions policies in the 1970s and 1980s, these programs gave more students with limited academic skills and preparation the ability to matriculate successfully in post-secondary institutions. Paradoxically, however, developmental writers have also been marginalized. Their positionality has been referred to as existing on the "frontier," the "boundary," the "academic margins," and even in an "alien world" (see in order Shaughnessy, 1977; Rose, 1989; Mutnick, 2001; and Mutnick, 1996).

Unfortunately, academic institutions themselves often work to perpetuate this marginalization. Developmental students are often separated from their college-level peers by being placed into programs and tutoring centers staffed separately from the discipline department, sometimes creating a disconnect between what skills are taught in the classes

and what skills are actually needed for college-level courses. Many colleges also require students to take college orientation or learning strategies classes not required for their college-level peers. In addition to being treated as separate, they are also treated as unequal. Nationwide, less than 25% of all developmental courses are taught by full-time faculty (Gerlaugh, Thompson, Boylan & Davis, 2007), and the minimum requirement for an instructor to teach developmental writing is often just a bachelor's degree.

All this results in writing courses plagued by insufficient resources, inaccurate placement and assessment procedures, and low student success rates (Gerlaugh, Thompson, Boylan, & Davis, 2007). Further, this accepted view of developmental students as necessarily marginalized members of the academic community affects the ongoing debate surrounding what types of courses to offer and how best to deliver them (Maffet, 2007; Mutnick, 2001).

One method which educators hoped would increase student success while lessening marginalization was differentiated learning. This course delivery method, which goes by many names including mastery learning, modularized delivery, redesigned courses, and emporium courses, creates individualized lesson plans to target demonstrated deficiencies; students self-pace to master course content, working only on skills in which they are weak. Known as personalized system of instruction (PSI), this type of course delivery was first created in 1968 by Fred Keller and evolved in the 1980's into the computer-assisted personalized system of instruction (CAPSI), which is the most widely used form of personalized course delivery today. It is this system upon which organizations such as the National Center for Academic Transformation (NCAT) and others have built their programs of individualized, mastery instruction, and it is a delivery method which has flourished at the developmental level since 2007.

Despite its proliferation, however, there exists little in the published literature to determine the success of CAPSI as a course delivery method for developmental writers, which has the potential for increased marginalization for developmental students. This gap in the literature is especially important to note as colleges and higher education systems, such as the Tennessee Board of Regents' schools, adopt accelerated learning practices. In these programs, developmental writers are often co-enrolled in college-level composition courses; as such, much of the basic writing instruction has the potential to be computer-

based in order to personalize learning, and this instruction can be conducted in supplemental labs rather than traditional, lecture-based classroom environments. This article calls attention to this troubling gap by tracing the history of CAPSI course delivery, demonstrating the growth of this delivery method at the developmental level in recent years, and highlighting the lack of research on its effect on student success and marginalization. Finally, several specific areas are discussed where future research is most needed.

The History of Personalized Instruction

Yale researcher Fred Keller first developed the concept of PSI to help students who were geographically isolated learn course content on their own without depending upon the constant presence of an instructor. Explained in his seminal article, "Goodbye, Teacher" (1968), Keller details five basic elements essential to personalized learning: self-pacing, repeated attempts to demonstrate mastery of course material, use of lectures and demonstrations primarily for motivational purposes, dominant reliance upon written communication, and use of student proctors for feedback and tutoring.

A large community of teachers and researchers in the 1970s embraced this concept as an alternative to traditional, lecture-based teaching methods (Eyre, 2007). After this brief spurt of popularity, PSI fell out of favor with instructors, and by the 1980s, interest in PSI waned considerably (Eyre, 2007). Recently, though, this method has seen resurgence. The proliferation of computers and internet-based grading tools has eliminated much of the work associated with teaching personalized courses (Grant & Spencer, 2003) and allowed PSI to evolve into CAPSI—a computer-assisted personalized system of instruction (Pear & Kinsner, 1987-1988). A hybrid of computer-aided instruction and PSI, CAPSI courses have been described as the perfect delivery method (Grant & Spencer, 2003), and Pear and Crone-Todd (1999) called CAPSI an important link between educational technology and computer technology. The acceptance of online learning has also facilitated new interest in PSI (Eyre, 2007). This growth has been so rapid, in fact, that NCAT has labeled it a "movement" (National Center for Academic Transformation [NCAT], 2008a, "Course Redesign in Western PA").

This growth has been especially large on the developmental level. In 2007, the Tennessee Board of Regents required its developmental writing programs to redesign their courses and suggested as best practices several key elements found in CAPSI delivery (Tennessee Board of Regents Developmental Studies Redesign Task Force Subcommittee for English Curriculum, 2010; Twigg, 2007); they also hired NCAT as consultants to oversee the redesign, and NCAT clearly built its redesign theories upon those same principles (see NCAT, 2013; Twigg, 2003; Twigg, 2007), although the organization never gives credit to Keller or any PSI researchers. That same year, the SUNY system submitted proposals to NCAT which resulted in a redesign pilot of developmental writing at Erie Community College (NCAT, 2008c), and Texas participated in pilot projects at Richland College, Austin Community College, University of Texas at El Paso, and Brookhaven College (NCAT, 2008b). Several colleges in Florida competed for grants to redesign developmental programs with NCAT's guidance (E. Bunting, personal communication, August 2010), and according to John R. Donnelly, Vice President for Instruction and Student Services at Piedmont Virginia Community College, legislators in Virginia have asked their state colleges to redesign their developmental courses using computer-aided delivery methods to increase student success and reduce costs (personal communication, April 2011). Higher education systems in West Virginia, Ohio, Indiana, and Kentucky have also redesigned their developmental courses using CAPSI delivery, with individual schools in California and Montana designing modularized developmental writing courses on their own initiative.

This growth in CAPSI courses has been spurred by many different entities, working with courses in various disciplines. The majority of published, peer-reviewed research on personalized instruction continues to come from scholars in Canada, particularly at Athabasca University, home to the Canadian Institute of Distance Education Research and the *International Review of Research in Open and Distance Education*. At Manitoba University, where PSI and CAPSI were created, the website *CAPSI* (n.d.) reports that the system is "currently being used at a number of educational institutions" ("Welcome," para. 1). In the United States, the largest group championing CAPSI delivery is NCAT, an educational consulting group which describes itself as "an independent, not-for-profit organization that provides leadership in using information technology to redesign learning environments to produce better learning outcomes for students at a reduced cost to the

institution" (NCAT, 2010b, para. 1). Since its formation in 1999, this group has consulted with colleges nationwide on almost 150 redesigned courses in various disciplines using CAPSI elements (NCAT, 2010a). In 2008, Carnegie Mellon University received national attention when researchers created a specialized software for personalized instruction called ALICE, and it has worked with several colleges in Western Pennsylvania to redesign courses to personalize instruction (Schackner, 2008). In October 2010, Blackboard, a for-profit educational resources company, announced that it had teamed up with education provider K12 Inc. to design modularized, self-paced developmental courses and sell them to colleges who want to outsource their remedial offerings (Young, 2010).

In general, CAPSI courses have proven successful in increasing success rates and cutting instructional costs. The success of PSI- and CAPSI-based courses in math and the behavioral sciences is well documented (Eyre, 2007; Sherman, 1992), and the Center for Personalized Instruction documented a flood of articles and studies concluding PSI as superior to traditional delivery methods (Sherman, 1992). NCAT also claims success with the majority of its redesigned courses: "More than ten years of experience with NCAT's basic methodology, proven in scores of courses in different disciplines in different institutional settings, has resulted in an approach to redesign that can reliably produce positive academic outcomes at reduced costs" (National Center for Higher Education Management Systems, n.d., "Lessons Learned," para. 2). Overwhelmingly, the evidence shows that PSI is not only highly successful across a variety of disciplines (Eyre, 2007; Sherman, 1992) but also effective for low-aptitude students (Ironsmith & Eppler, 2007).

With writing, however, the waters are murkier. Despite the reported successes of CAPSI delivery, the overwhelming majority has occurred in non-composition courses, and compared to the large amount of data available in other disciplines, especially mathematics and the behavioral sciences, very little data is available on the success of CAPSI writing courses, while data on CAPSI developmental writing courses is practically non-existent. CAPSI's potential effect on developmental writers and the marginalization of developmental programs in general is still left unknown, despite top-down pressure from administrations for educators to individualize course delivery.

The Gap in the Literature

The amount of research on PSI and CAPSI delivery in general is quite large. In the 1970s, an abundance of research on PSI was conducted, especially in Canada, where behavioral scientists embraced the method (Sherman, 1992). There was a short-lived journal dedicated to PSI, titled the *Journal of Personalized Instruction,* and the Center for Personalized Instruction served as a clearing house for PSI studies. Although interest in personalized instruction waned by the 1980s (Eyre, 2007), an interest in PSI still exists today, especially in behavioral studies and mathematics. The majority of research on PSI continues to come from scholars in Canada, particularly at Manitoba University and Athabasca University, and over two dozen dissertations and theses written during the past two decades on PSI or CAPSI demonstrate that PSI still appeals to emerging researchers.

A glimpse into the literature for answers, however, produces little that is helpful in determining the success of personalized writing instruction and reveals more gaps than gains. Surprisingly, even after developmental educators have embraced the use of classroom technology and even as the use of CAPSI delivery grows nationwide, few articles have been published about technology and its effect on developmental writers (Stine, 2010). More troubling, no research has been published to date in peer-reviewed journals on the success of CAPSI developmental writing courses.

Only a small quantity of research exists regarding CAPSI writing courses. An early dissertation from 1980 researched the viability of exporting a PSI English class from the private laboratory school where it was created to a public school setting in terms of economic efficiency, teaching effectiveness, and desirability (Rose, 1980). Although Rose found that PSI was a successful method for teaching grammar, composition skills were not taught, and Rose's study never determined if the students' overall writing skills increased. Corbin's 1985 dissertation focused on PSI and developmental writers—the only dissertation to do so—but the focus was not on whether writing abilities improved but on the personality trait of persistence as a predictor of future academic performance. His results are hardly surprising: persistence was found to be a strong predictor of future academic success. What is important, however, is his admittance that his conclusions about the effects of mastery learning for developmental English are tentative due to unknown variables such as student motivation. Misegadis (1988) conducted an experiment among

Composition I students to determine if self-paced or traditional course design resulted in greater achievement. What she concluded was that differences in instruction had no effect on writing skills; there was no significant difference in writing skills post-test scores nor in final grades. In addition, students preferred the traditional delivery method to the self-paced method. Although this study was too early to for computer-assisted instruction, it provides valuable insight on the limitations and problems of self-paced study.

In the 1990s, Thomas Brothen developed an interest in CAPSI and wrote a series of articles about the topic, including one of the earliest articles in 1994 on computer-assisted delivery and developmental students. This article, "A Computer-Assisted Exercise that Increases Self-Regulated Studying" (Brothen, 1994), touched on using technology to create a self-paced and individualized course, yet the article focused only on one exercise completed on computers and did not mention CAPSI specifically as a course delivery method. Brothen continued to explore the idea of PSI and CAPSI during the next five years, but none of his articles focused exclusively on developmental writers. "Transforming Instruction with Technology for Developmental Students" (Brothen, 1998) specifically mentions PSI and its possibilities for transforming writing, but no new research or data is given. This article simply presents research results reported nearly a decade before by James Kulik, who found that PSI interventions are beneficial for 90% of students and increase average performance on exams from the 50th to the 70th percentile (as reported in Bonham, 1990). Ironically, no data specific to developmental writing students is presented. This article also does not present anything significantly different about personalized study that was not in Brothen's earlier 1996 article, "Comparison of Non-Performers and High Performers in a Computer-Assisted Mastery Learning Course for Developmental Students," which, despite its title, focused on CAPSI in an introductory psychology class, not in a developmental-level course. Although correlations were drawn between the psychology course and developmental-level courses, there are too many differences for an accurate comparison, especially considering the differences in disciplines and that the psychology course was a college-level course, not developmental-level. A 1999 follow-up study to this article by Brothen and Wambach appeared three years later, but it, too, investigated personalized study in an introductory psychology course.

Only one peer-reviewed article was found while conducting research for this article which presents research data directly connecting personalized study to writing improvement. Published in 1984 in *Teaching of Psychology* (Allen, 1984), the article predates CAPSI, and the author presents findings from an abnormal psychology class in which the instructor created a personalized system of instruction for student writing. Results showed that a personalized system with multiple attempts at revision improved student writing in 12 of 18 criteria. There are two interesting aspects about this article. The first is its reference to the work-intensive nature of mastery learning of writing, for which the grading cannot easily or accurately be done even now via computer. Second, its literature review section references Keller's concept of PSI but does not mention any other articles on PSI or personalized writing instruction. Apparently, the lack of research on PSI and writing was just as large in 1984 as it is today. Because of the gap in the research, the extent to which CAPSI works to lessen or maintain the marginalization of developmental writers by affecting student success remains unknown.

The Need for Future Research

The lack of research into CAPSI delivery at the developmental level has clearly worked to perpetuate—if not actually worsen—the marginalization of developmental writers. If we are to create a better learning environment for our students, then more research is needed to determine what effects CAPSI has on developmental writers and what ways educators can use these tools to most effectively increase success rates.

Additional studies also need to focus on the students themselves. By its inherent structure, an individualized course demands more self-responsibility and a more fully developed sense of motivation from students than traditional courses, as procrastination has long been recognized as a perennial problem in CAPSI delivery (Eyre, 2007). No studies have examined the extent to which these traits need to be present in order for developmental writing students to be successful in CAPSI courses. Likewise, no one has yet to examine to what extent soft student skills should be developed in order to be successful in a course which is a de facto independent study. In a comparison of social interaction in hybrid and traditional courses conducted by Welker and Berardino (2005-2006), the students in the hybrid course reported "reduced camaraderie with peers, reduced face-to-

face exposure with the professor, reduced class-to-teacher interaction and reduced number of team building activities" (p. 46); faculty noted "inconsistencies in classroom dynamics related to optional attendance policies that occur when few if any students attend class and the class mix is different each time the class meets" (p. 42) and "too little personal interchange with students that blocks the evolution of extemporaneous discussion" (p. 42). As one student in their study commented, "I just learn best when someone is telling me information face-to-face" (p. 46).

Previous studies on CAPSI delivery show that class meetings improve student success and retention (see Mintz, 2001). However, this study was conducted among college-level, not developmental-level, students. There is no information about the amount of social interaction that is needed with class peers by developmental students nor about how working in isolation on individualized assignments affects their performance. Further, for those students who are successful at the developmental level in a personalized, mastery-learning course, what effect does this type of learning in a foundational college course have on long-term matriculation? When they no longer have the opportunity to complete multiple attempts at mastery—that is, when they are no longer able to revise until their writing has reached an acceptable level—will they be able to produce writing of passing quality in a single attempt? How well do students who learned the basics of writing in a self-paced course adapt to a highly structured, traditional first-year writing course?

Clearly, much work is left to be done. What we cannot do, even in the face of daunting reforms and increasing marginalization, however, is allow technology to drive student learning rather than assist it. In this regard, Dr. Teri Maddox, Dean of Arts and Sciences at Dyersburg State Community College, aptly summarizes the sentiments of many developmental instructors:

> I still see what developmental classes can do for students. That's why for me, I'm all with the NADE philosophy that reform is wonderful, I'm happy for change. Technology is terrific. Let's modularize if that will work. Let's do *whatever* works . . . but let's not do what doesn't work. . . . So let's not go backward. Let's go forward. (personal communication, 2012)

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