UNIVERSITY OF CALIFORNIA

Los Angeles

Supporting Science and Literacy Simultaneously

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Education

by

Benjamin Cooper

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ABSTRACT OF THE DISSERTATION

Supporting Science and Literacy Simultaneously

by

Benjamin Cooper

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Professor Louis M. Gomez, Chair

How might learning principles be leveraged in learning environment designs to support increased academic success amongst traditionally underserved learners? This intervention is an example of a learning design that has successfully supported the recovery of credit amongst traditionally underserved students who previously failed introductory biology. This study sought to better understand potential relationships between the design components (program dynamics) and student success. The results show that the Blue group (students with the highest final course grade), on average, produced more words in their summaries and annotated more main ideas and supporting evidence items than their Green and Beige counterparts. After four-weeks, some students were able to articulate functions relating to the embedded support tools. Patterns do not appear to exist in support function awareness amongst students by performance groups. No discernable awareness characteristics distinguished successful and less successful students in the intervention.

The dissertation of Benjamin Cooper is approved.

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ACKNOWLEDGEMENTS

"Success is to be measured not so much by the position that one has reached in life as by the obstacles which he has overcome while trying to succeed."
—Booker T. Washington

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PREFACE

Improving learning outcomes for traditionally underserved youth is an important goal for me because I have personally experienced the transformative power of humanistic education experiences. It is true that some students have nothing but their education. For example, foster youth sometimes rely exclusively upon the schooling structure to structure their lives. Foster youth and former foster youth have known challenges, due to their often-dire circumstance, that often goes unaddressed in learning environments for multiple reasons – which are not important here. The important part is that students with diverse learning needs traverse schools. I do not believe we can continue to simply bemoan and ignore realities students face each day when we design learning environments. I truly believe good education experiences can change someone's life trajectory. Good education experiences can empower students to think critically and thrive in new learning situations throughout their life-course. In the preface, I describe two experiences before graduate school that caused me to become interested in the design of learning environments that support learning for traditionally underserved students. This is followed by a brief description of the path to this dissertation.

Before beginning my graduate studies, I volunteered in multiple schools. I also taught in an urban public high school under a transitional certificate. My students were grade 9-12 formally-identified special education students with diagnosed learning and emotional disabilities. My students varied greatly with respect to on-entry reading abilities. I learned to pay attention to this when I wondered why one African American male student had an reputation within the school for misbehaving during whole-class

instruction. I applied the three-term contingency model of Antecedent-Behavior-Consequence that I learned in my limited summer teacher training. I realized that the student only misbehaved when he was asked to read. I grew to learn he misbehaved because he felt forced to publically engage with a learning activity that he felt ill-prepared to confront. In this case, he was a poor reader, struggling with phonics issues, and he could not realistically engage the high school material without tailored-adaptable scaffolding. In fact, he was a high school student reading at a 1st grade level. It is also important to note that I remember some students were completely opposed to being pulled from class for intensive reading programs like Wilson. This points out one program will not address all student needs and the conflict with student preferences some program can present. The individual and collective burden of some students not having strategic approaches to approach the text in high school is enormous. I do not believe we can afford to say to students one program is your only option. We must find ways to cope with learner variation in ways that engage all students. This includes students who refuse to respond to selected interventions.

When students fail to attain credit in courses in high school a common remedy is credit recovery programs. These programs take many forms. The high school I worked in chose PLATO to be its credit recovery provider. Students seeking to recover credit were required to attend Saturday school where a teacher of record was present to observe their PLATO activities and provide support. The PLATO modules for US History were passages with embedded media and questions. I witnessed many students struggle to excel in the program because they lacked the requisite literacy skills to engage the text-heavy material. At the same time, I was struggling as a teacher to find ways to embed

skills as issues arose due to time constraints and other contextual variables. Important to note, this was the only mechanism for students to recover credit. I saw first-hand how lacking requisite literacy skills could translate to disengagement and subsequent dropout. I wanted to understand how to support student success across every academic quadrant in the face of extreme variation.

I begin my Ph.D. journey at the University of Pittsburgh (PITT) with my dissertation chair, Professor Louis Gomez. Initially, I explained to him that I desired to stay connected to practice during my Ph.D. journey and what some of my big picture concerns were. Chief among them identifying robust approaches to improve student life outcomes for traditionally underserved students. I have had many opportunities to work on various research-related efforts, at PITT and UCLA, aimed at ultimately improving student life outcomes by improving learning outcomes. I have learned to look for high leverage points that can produce huge outcomes.

This dissertation is important to me because it examines a program that I was involved with from the very beginning. I believe it could potentially meet the test for a good learning environment for some students. No magic bullets. This is not just any program though. Similar to Read 180 the program featured an automated technological writing tool to support summary writing. The program included multiple researchers and practitioners to ensure students and teachers were receiving support and development simultaneously. This is a co-designed credit recovery program that produced successful results two years in a row. In 2012, the credit recovery program had 28 of 29 (96.6%) Summer 2012 participants complete the course with a grade of C or better. In 2013, 35 of

40 (87.5%) Summer 2013 Credit Recovery Course participants completed the course with a grade of C or better.

The program core claim is that the use of language support tools and routines can allow the student to access the content, in general, and tools that support language and literacy use in science classrooms, more specifically, can contribute to the course failure reduction and high school dropout. The credit recovery setting affords a unique opportunity to explore strategic literacy supports with a group that has not received much systematic attention about their learning experience. Students who have already experienced failure and are at elevated risk of school failure. In this dissertation, I dig a little deeper to try to understand student's perceptions of the credit recovery program parts to identify potential high leverage points and understand what (if anything) it meant in terms of success within the credit recovery co-designed learning environment.

Similar to other literacy interventions, the credit recovery program sought to increase student achievement by recruiting metacognition in the literacy intervention approach. Metacognition can be considered thinking about cognitive processes, in addition to the regulation aspect. The tools and routines embedded in the credit recovery course were structured to facilitate thinking (and regulation) in relation to various learning processes including critical thinking. I hypothesized going into the dissertation that students benefit most when they understand how the components in the repertoire function to support their learning. This study seeks to explore how students perceived the program components in relation to their learning. Such understanding can help ensure future learning designs have maximal impact for all learners including traditionally underserved students who contend with the implications of poverty in their daily lives.

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1. INTRODUCTION

"Approximately half (49%) of the students failed at least one core academic class (mathematics, English language arts, science, and social science) during their middle school years, and over three-fourths of students (77%) failed at least one academic core course during their high school years. Students who failed a single high school course graduated 64% of the time, and each successive failure was associated with approximately 10% further reduction in the probability that they graduated" (Silver, Saunders, & Zarate, 2008, p.2).

Reading is a core educational activity that, beyond eighth grade, is often left un-scaffolded or unaddressed altogether within high school content area instruction (D'Arcangelo, 2002; Fisher & Ivey, 2005). This lack of support is noteworthy because students in high school are expected to read to learn as opposed to the learning to read - emphasized in earlier grades. This type of reading requires students to engage deeply with text structures to make meaning. The reality necessitates an understanding of text structure. Schwendimann, for example, (2011) suggests the language demands of biology coursework mimic foreign language learning demands. The academic discourse and disciplinary concepts that characterize high school science reading demand different instructional approaches than those required by the narrative text students encountered in their earlier schooling (Biancarosa & Snow, 2006; Lee & Spratley, 2010; Snow & Biancarosa, 2003).

The problem is not necessarily straightforward regarding a solution. Some students lack prerequisite literacy skills to engage with the required text in the biology classroom, and some teachers do not employ teaching approaches that are responsive to learner needs. (Greenleaf et al. 2011). Research suggests that some high school teachers do not see themselves as responsible for teaching reading or writing: instead, they see themselves accountable for conveying content (D'Arcangelo, 2002; Fisher & Ivey, 2005; Heller & Greenleaf, 2007; Jacobs, 2002; Jacobs 2008). High school teachers often possess the in-depth content knowledge and still need professional

development in developing pedagogical approaches to support science learning through literacy. Other barriers to literacy-infused science instruction include teacher views that text-centric focus overshadows inquiry, lack of access to high-quality text, and the reality that sometimes both teachers and students need literacy remediation (Pearson, Moje, Greenleaf, 2010). These challenges make clear why it is vital to find supplemental ways to improve student outcomes that do not solely rely on variable teachers.

The phenomenon is especially noteworthy in an urban context such as New York City or Los Angeles where students already struggle to access a high-quality education due to high rates of teacher turnover and other structural factors unique to the urban setting. If both teachers and students require intervention, who should receive it first and what happens to the other while learning occurs? I argue for the necessity of literacy research-informed interventions that target both student and teacher development simultaneously (Pearson, Moje, & Greenleaf, 2010; Wilkinson & Gaffney, 2016). These approaches are not conventional in high schools as student activities, and professional development budgets tend to emphasize student and teacher need separately.

The Next Generation Science Standards (NGSS; NGSS Lead States, 2013) and the Common Core State Standards (CCSS; National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) have sparked renewed attention to the essential nature of literacy within science. In science, literacy is the vehicle that facilitates scientific inquiry. Scientists are always analyzing new information. Despite this accepted fact, it is well-documented that many students in elementary and high schools have literacy challenges that can interfere with learning (Biancarosa & Snow, 2006; Lee & Spratley, 2010; Snow & Biancarosa, 2003). Traditional approaches designed to support science teacher learning and science student

learning fall short in preparing teachers to meet the NGSS expectations for science learning. New methods need to be engineered (and refined) that tackle teachers' and students' complex needs simultaneously. Students just cannot wait while teachers learn to teach in new ways because life does not halt while a teacher is undergoing development. This reality is especially true for traditionally underserved students who have already experienced failure.

Many students are failing to achieve in science (Martin et al., 2012). Silver, Saunders & Zarate (2008) found that, on average, 48 percent of LAUSD high school students fail Introductory Biology. Science learning often requires students with varying literacy skill levels to interact with large volumes of text. Reading is a complex activity many high school science teachers ask struggling readers to do routinely, without providing proper supportive learning structures, because teachers sometimes lack the appropriate pedagogical knowledge to support their students' individual literacy needs (Goldman & Snow, 2015). It is essential to be clear about what is meant by reading is a complex activity.

Lee & Sprately (2010) point out an agreement that "the ability to comprehend written texts is not a static or fixed ability, but rather one [that] involves a dynamic relationship between the demands of text and the prior knowledge and goals of readers (p.3)." They assert reading comprehension results from dynamic interactions between knowledge, strategies, goals, and dispositions. They provide multiple examples of prior knowledge: (1) word and word forms; (2) sentence structures or syntax; (3) text structures or genres; and (4) topics (p.3). Examples of strategies include: (1) asking questions; (2) making predictions; (3) testing hypotheses; (4) summarizing; (5) monitoring understanding and deploying fix-it strategies as needed (p. 3).

Another interesting lens to view this dynamic framework is classic metacognition. The model presented by Flavell contained components similar to the ones discussed in the previous

paragraph (knowledge, strategies, goals, and dispositions) with the notable exception of dispositions. Nevertheless, metacognition offers something more that should be leveraged in learning environments. Flavell (1979) argued that competence in four areas impacts cognitive processes and consequentially cognitive task performance. Flavell referred to learning activities as cognitive enterprises.

Flavell suggested that the actions and interactions of four specific phenomena be monitored concerning metacognition: (1) metacognitive knowledge, (2) metacognitive experiences, (3) goals or tasks, and (4) actions or strategies. Metacognitive knowledge is subdivided into three dimensions: (1) knowledge of person variables; (2) knowledge of task or goal variables; and (3) knowledge of strategy or action variables. Knowledge of person variables "encompasses everything that you could come to believe about the nature of yourself and other people as cognitive processors" (p. 907). Knowledge of task (or goals variables) refers to the objectives that direct cognitive performance. Knowledge of strategy variables refers to the "cognitions or other behaviors employed to achieve" the objectives directing cognitive performance (p. 907). Flavell (1979) posited,

> "[metacognitive knowledge] can lead you to select, evaluate, revise, and abandon cognitive tasks, goals, and strategies in light of their relationships with one another and with your own abilities and interests with respect to that enterprise. Similarly, it can lead to any of a wide variety of metacognitive experiences concerning self, tasks, goals, and strategies, and can help you interpret the meaning and behavioral implications of these metacognitive experiences "(p. 908).

Flavell hypothesized that metacognitive experiences were more likely to occur under conditions that promote conscious thinking. The consciousness of thought seems to be de-emphasized when metacognition is not *directly* centered. These experiences resemble the types of experiences supported by the Next Generation Science Standards. To illustrate, Flavell writes,

> "My present guess is that metacognitive experiences are especially likely to occur in situations that stimulate a lot of careful, highly conscious thinking: in a job or school task that expressly demands that kind of thinking; in novel roles or situations, where every major step you take requires planning beforehand and evaluation afterwards; where decisions and actions are at once weighty and risky; where high effective arousal or other inhibitors of reflective thinking are absent (cf. Langer, 1978). Such situations provide many opportunities for thoughts and feelings about your own thinking to arise and, in many cases, call for the kind of quality control that metacognitive experiences can help supply" (p. 908).

Metacognition is documented support reading comprehension and learning broadly. (Brown, 1978; Glaser, 1990; Wang, Haertel, & Walberg, 1990, 1993). So this idea is not new. Flavell argued that developing metacognition in children would foster both self-monitoring and control or regulation. Flavell hoped that these ideas would impact teaching and learning practices in ways that supported both formal and lifelong learning. Tools can provide learners flexibility (Brown, Pressley, Van Meter, & Schuder, 1996; Pressley, 2005) and control in the reading process. Readers are then able to develop an awareness of, and ways to monitor what they are reading. Learning to monitor the self-as-reader in a domain is a critically important skill for all students, and perhaps particularly for high school students as they embark on language heavy biology learning. Also, over time, supported by strategic literacy tools, students can effectively communicate their science understandings, in writing and classroom discussions. Without these skills and perspectives, high school biology and many other intellectual accomplishments may never be accessible to some learners, because they mainly skim across the surface of classroom learning, unable to communicate and participate in rigorous classroom activities.

Learners benefit when they have the resources to navigate learning context. Here with metacognition, I am merely referring to an awareness of learning processes that facilitate learning. Strategic supports may be one way to develop this awareness. As learners' approach texts, they must know text has a structure and that the structural features provide support for

accessing information and building content understandings. Not only must learners recognize these features in a science text, but they must also understand that these features (e.g., transition words and phrases) signal information for the reader. Main idea sentences representing claims are not only structural features but when accompanied by supporting details, can serve to help learners build content knowledge about some phenomena. Strategic language tools and routines help learners to identify structural features in a science text, and use the features to communicate in science (Gomez, Gomez, Cooper, Lozano, & Mancevice, 2013). Just as expert readers have well-honed approaches to reading like placing notes in the margins or highlighting interesting words or sentences, so, too, do less skillful readers need such routines and tools to support learning.

This study explores how students understood strategic literacy support tools. Teacher metacognitive knowledge significantly impacts the pedagogical understanding of metacognition (Wilson & Bai, 2010). Wilson and Bai (2010) suggest teachers with a deep understanding of metacognition reported teaching students to engage metacognition required complex understanding of metacognition and strategies.

Research suggests metacognition instruction is both possible and fruitful. Jacobs and Paris (1987) highlighted "metacognition is an important part of proficient reading and that it can be taught in the classroom" (p. 275). Several programs have been developed that leverage metacognition in some way. Literacy programs used at the secondary level include: Read 180 (Hasselbring, Goin, Taylor, Bottge, & Daley, 1997); Reading Apprenticeship (Greenleaf et al., 2001); Xtreme Reading (Corrin et al., 2009; Kemple, 2008); Reciprocal Teaching (Palincsar, 2003); Scaffolded Reading Experience (Fournier & Graves, 2002; Graves & Graves, 1995); and Strategic Instruction Model (Deshler et. Al., 2001). These literacy programs are discussed further

in Chapter 2. This study contributes to our understanding of how to use strategic literacy supports (window into metacognition process) to support increased achievement amongst traditionally underserved students in science classrooms. The next section presents the research goals.

1.1 Research Goals

This study sought to understand better an intervention aimed at equipping students with strategic literacy approaches to support their Biology learning. The broader intervention effort targeted teacher development simultaneously but the students are the focus of this proposed examination (Mitra, 2009). Too often, students are subject to interventions that have not demonstrated efficacy in ways that recognize individual student differences. One reason is that analyses have focused on the micro or the macro (or structural) processes of teaching and learning. A working assumption of the current study is that if the various achievement gaps are ever to improve, we must focus our attention on both the structural and micro processes, that occur within the black box of instruction (Black & William, 2006), that ultimately grant or deny students' educational access. While the macro processes that were a part of the current intervention under analysis, is not the central focus of this investigation, the macros processes will be discussed, later in this study, as part of a consideration of the context of the work. To this point, this work seeks to highlight how an intervention effort functioned from student perspectives not to advocate the immediate scaling based solely on student level analyses exclusively. This dissertation work seeks to add a student viewpoint.

The intervention occurred in the context of credit recovery. Here, credit recovery context, to be described more fully in Chapter 2, refers to a setting that affords students an opportunity to gain credit for a course they previously did not complete satisfactorily. Each student who

participated in the intervention course previously did not satisfactorily complete the biology course. The intervention is an example of a principled learning design that has successfully supported the recovery of credit amongst historically underserved students who previously failed introductory biology (Gomez, Gomez, Cooper, Lozano, Mancevice, 2016). The use of language support tools and routines can allow the student to access the content, in general, and tools that support language and literacy use in science classrooms, more specifically, can contribute to the course failure reduction and perhaps high school dropout. The credit recovery backdrop of this intervention affords a unique opportunity to explore strategic literacy supports with a student group that has not received much-targeted attention regarding their learning experience.

The intervention was designed to respond to a specific problem facing an urban high school science faculty: student failure in introductory biology courses. Specifically, this dissertation focuses on addressing literacy issues in science context to remedy student failure using strategic literacy supports. The high school course curriculum structured introductory biology as a semester-long two-course sequence: Biology A and Biology B. Guided by a design-based research methodological approach, the research team collaborated with the local school staff to co-design two summer credit recovery experiences that leveraged professional development, metacognition, and technology to support student science learning[1]. The learning environment sought to (a) provide students with a supportive environment to recover biology credit; (b) help school staff actively think about the role that language plays in science course failure through the co-design and iterative refinement of science instructional practice; (c) understand whether leveraging metacognitive literacy strategies can assist with the reduction or amelioration of biology course failure. This dissertation focuses exclusively on students and

[1] Two different credit recovery course iterations unfolded in the summers of 2012 and 2013.

purposefully excludes teachers from the analysis. Therefore, I will not address the second broad intervention goal in this dissertation.

To provide additional context. It is critical to note that schools function within complex systems. Therefore, the articulated research goals would be traction-less (or definitely more difficult) without supporting structural processes and organizational supports within the school. Examples include supportive, flexible teaching supports, supportive guidance counselors, community programs, undergraduates, graduate students, and faculty support. The program was four weeks. Students were situated within an intervention environment where they were encouraged to use language support tools to participate in various group and individualized routines and activities.

Research suggests that through the acquisition of literacy skills students can simultaneously better access science content and not only recover science credit but possibly develop new habits of mind that support them beyond the intervention. The hope was that teachers would see examples of student success, then adapt their instructional approaches in ways that would eliminate the need for the intervention. Nevertheless, this study focuses on the students and their perception of the intervention. A particular contribution of this effort is the particular focus on student's voice. Research in schools has often not incorporated direct student perspectives (Jenkins, 2006; Loutzenheiser, 2002; Nieto, 1994; Mitra, 2001; Mitra 2009; and Yonezawa & Jones, 2007), by contrast this effort sought to centralize student voice by starting the analysis with student interviews and using student perspectives to drive any intervention refinement recommendations (O'dwyer, Carey, and Kleinman, 2007).

The purpose of this study was to investigate: (1) whether student performance appears related to summarization and annotation practices, and (2) students' perceptions of the strategic

literacy supports leveraged in the intervention. This research inquiry sought to understand any variability in awareness, using student perspectives, for literacy strategies amongst traditionally underserved students, and to understand any relationships between strategy uptake and academic performance. I refer to the range of awareness regarding tool affordances to understand a short 4-week intervention had on students. The following research questions guided the research inquiry:

- Does student performance in the intervention course appear related to how students utilized literacy supports (summarization and annotation)?
- Are all students aware (able to articulate) of the benefits of specific literacy supports? Which benefits do they identify? Do patterns exist in student awareness amongst students by performance?
- What (if any) were the awareness characteristics of successful and less successful in the intervention?

1.2 Summary

In this chapter, I provided an overview of the issues relating to the study. I have presented research goals and questions. In the next chapter, I review several areas of research that bind together to add context or inform this study directly to situate my work in what we do and do not already know.

2. Literature Review

The purpose of this chapter is to review literature related to the intervention that was designed to support students' science learning. The chapter begins with background information and literature concerning credit recovery since the intervention occurred in the credit recovery context as opposed to the traditional classroom context. By traditional, I refer to a course that is taught over a full semester or year. The emergence of credit recovery programs is a clear example of how education policies can emerge to shape educational praxis. Section 2.2 will attend to documented literacy issues in the credit recovery context. Section 2.3 explores literacy interventions in high schools. Section 2.4 explores metacognition in the context of literacy interventions. Section 2.5 explores metacognition in the context of reading apprenticeship. Section 2.6 explores evidence for strategic supports. Section 2.7 examines past attempts to provide students access to the metacognition process through strategic supports.

2.1. From Accountability Policies to Credit Recovery Programs

Historically, repeating the course in summer school was the only corrective remedy (Cooper, H., et al.,2000; Denton, 2002; Gold, 2002); today, many states and districts offer multiple ways for students to recover credit, known as credit recovery programs, that extend beyond traditional summer school (Dessoff, 2009; Sawyers, 2010; Zinth, 2011). The exact number of credit recovery programs is unknown. Nevertheless, one thing *No Child Left Behind* did with data was to cause schools to think about how to deal with student course failures and dropout rates to prevent negative graduation trend data from causing various labels, such as underperforming, and sanctions from being imposed.

Credit recovery is an example of a response to a policy that is currently transitioning into an endorsed or encouraged policy response to promote achievement and student success, despite

little empirical support. The proliferation of credit recovery programs and recent changes to national education policy underscore the importance of devoting more research to credit recovery. *No Child Left Behind (2001)* was a policy instrument intended to advance America's global competitiveness and close achievement gaps to ensure every student received a quality education. *No Child Left Behind* required that education authorities receiving federal funds provide specific continuous evidence of school quality and school improvement. Authorities were required, by section 1907, to report disaggregated graduation rates and other achievement data so that achievement and progress could be evaluated. The disaggregation allowed for the systematic monitoring of academic gaps relating to economic, racial/ethnic, and special education status (Yell, 2006).

In turn, this achievement data, representing school quality, was tied to school funding and operation decisions. Relating achievement data to funding essentially forced schools to focus on school improvement. This connection highlights the role that education policy plays in schools. Credit recovery programs emerged from *No Child Left Behind and* other accountability measures as a policy-responsive mechanism for schools to use to help students recover course credit after course failure to increase graduation rates. In essence, credit recovery programs (which will be further unpacked later) provided students subsequent opportunities to pass previously failed classes satisfactorily. To date, no federal definition for credit recovery has been proffered.

The fact that credit recovery never appears in *No Child Left Behind,* but it appears twice in the replacement national education policy *Every Student Succeed Act (2015).* This is interesting because despite the proliferation of credit recovery programs its definition remains vague in federal policy. Countless districts are using credit recovery models – predominately online – to address student course failure. The policy does not explicitly define credit recovery.

Instead, credit recovery is presented in the replacement national education policy as an acceptable "local use of funds" by local educational agencies to boost graduation rates. Specifically, the policy states: "credit recovery and academic acceleration courses that lead to a regular high school diploma" (pp 18). The problem is that it is unknown which credit recovery courses lead to regular high school diplomas. Whether this signal a shift from an emphasis on what works is noteworthy but equally important is the need to understand what is known about credit recovery and critical examinations of credit recovery efforts to ensure that students are benefiting in a tangible way that is consequential for both short-term and long-term development.

The second instance where credit recovery appears in *Every Student Succeeds Act* also is related to using of federal education funds, but potentially underscores the terms ambiguity and promise of the idea. Important to this understanding is the fact that the second instance is referring to credit recovery in the community context, in the form of community centers[2], not schools. I found no study that has examined the role of the community centers in the recovery of credit. Credit recovery is arguably presented as an outcome connected to educational activities in the second instance. *Every Student Succeeds Act* lays out fourteen[3] local activities that

[2] According to *Every Student Succeed Act*, Community learning centers perform the following functions: "(A) assists students to meet the challenging State academic standards by providing the students with academic enrichment activities and a broad array of other activities (such as programs and activities described in subsection (a)(2)) during non-school hours or periods when school is not in session (such as before and after school or during summer recess) that—''(i) reinforce and complement the regular academic programs of the schools attended by the students served; and''(ii) are targeted to the students' academic needs and aligned with the instruction students receive during the school day; and''(B) offers families of students served by such center opportunities for active and meaningful engagement in their children's education, including opportunities for literacy and related educational development" (p. 182).

[3] ESSA states: '(a) AUTHORIZED ACTIVITIES.—Each eligible entity that receives an award under section 4204 may use the award funds to carry out a broad array of activities that advance student academic achievement and support student success, including—''(1) academic enrichment learning programs, mentoring programs, remedial education activities, and tutoring

community centers can use federal funds to support. The policy permits the use of funds to support "well-rounded education activities, including such activities that enable students to be eligible for credit recovery or attainment" (p. 191). Similar to the issue noted with the first reference to the term credit recovery, it remains unclear what "well-rounded educational activities" enable credit recovery due to the limited existing scholarship on credit recovery. It does seem like a worthwhile pursuit to investigate what educational activities efficiently would allow students to recover credit by analyzing credit recovery intervention efforts.

Every Student Succeeds Act does recognize that all educational activities may not be efficacious for achieving targets. To this end, very brief guidelines [4] are provided for three areas:

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services, that are aligned with—''(A) the challenging State academic standards and any local academic standards; and''(B) local curricula that are designed to improve student academic achievement;''(2) well-rounded education activities, including such activities that enable students to be eligible for credit recovery or attainment;''(3) literacy education programs, including financial literacy programs and environmental literacy programs;''(4) programs that support a healthy and active lifestyle, including nutritional education and regular, structured physical activity programs;''(5) services for individuals with disabilities;''(6) programs that provide after-school activities for students who are English learners that emphasize language skills and academic achievement;''(7) cultural programs;''(8) telecommunications and technology education programs;''(9) expanded library service hours;''(10) parenting skills programs that promote parental involvement and family literacy;''(11) programs that provide assistance to students who have been truant, suspended, or expelled to allow the students to improve their academic achievement;''(12) drug and violence prevention programs and counseling programs;''(13) programs that build skills in science, technology, engineering, and mathematics (referred to in this paragraph as 'STEM'), including computer science, and that foster innovation in learning by supporting nontraditional STEM education teaching methods; and''(14) programs that partner with in-demand fields of the local workforce or build career competencies and career readiness and ensure that local workforce and career readiness skills are aligned with the Carl D. Perkins Career and Technical Education Act of 2006 (20 U.S.C. 2301 et seq.) and the Workforce Innovation and Opportunity Act (29 U.S.C. 3101et seq.)" (PG 191).

[4] ESSA states: ''(1) IN GENERAL.—For a program or activity developed pursuant to this part to meet the measures of effectiveness ,monitored by the State educational agency as described in section 4203(a)(14), such program or activity shall—''(A) be based upon an assessment of objective data regarding the need for before and after school (or summer recess) programs and activities in the schools and communities;''(B) be based upon an established set of performance measures aimed at ensuring the availability of high-quality academic enrichment

measures of effectiveness, periodic evaluation, and use of the results from evaluations. Continuous program improvement is encouraged in the guidelines. The policy states: "used to refine, improve, and strengthen the program or activity, and to refine the performance measures" (p. 192). This will be great news for future students. To ensure current and future students are empowered by credit recovery improvement efforts, researchers *should* describe and investigate those efforts targeting achievement and student success, to ensure the highest impact educational activities comprise program development and refinement. The next section will examine the limited existing credit recovery research literature.

Another shortcoming of current research is that the foundational problems that led to many students failing are left unaddressed by many programs leading to compounded academic deficits later despite reported success. This may partially explain the inconsistent results. Palisoc (2013) is one notable exception. This study examined the impact of literacy on credit recovery outcomes. They found reading skills mattered for content mastery. Furthermore, they suggested that reading skills promoted self-regulation and saved time. These findings highlight the need for research that seeking to understand reading skills, strategies and other forms of metacognitive

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opportunities;‘‘(C) if appropriate, be based upon evidence-based research that the program or activity will help students meet the challenging State academic standards and any local academic standards;‘‘(D) ensure that measures of student success align with the regular academic program of the school and the academic needs of participating students and include performance indicators and measures described in section4203(a)(14)(A); and‘‘(E) collect the data necessary for the measures of student success described in subparagraph (D).‘‘(2) PERIODIC EVALUATION.—‘‘(A) IN GENERAL.—The program or activity shall undergo a periodic evaluation in conjunction with the State educational agency's overall evaluation plan as described in section 4203(a)(14), to assess the program's progress toward achieving the goal of providing high-quality opportunities for academic enrichment and overall student success.‘‘(B) USE OF RESULTS.—The results of evaluations under subparagraph (A) shall be—‘‘(i) used to refine, improve, and strengthen the program or activity, and to refine the performance measures;‘‘(ii) made available to the public upon request, with public notice of such availability provided; and‘‘(iii) used by the State to determine whether a sub grant is eligible to be renewed under section 4204(j)." (pp. 192).

knowledge that support learning in the credit recovery context. Multiple reading strategies and skills can be understood as forms of metacognitive knowledge (further discussion in section 2.4). This study directly tackles this problem of student failure, in the credit recovery context, in a way that has not been explored previously. This research seeks to go beyond whether students passed the class to begin to explore how they made sense of the supportive environment and what that meant for students' learning participatory practice. The next section will outline the primary types of credit recovery program to situate the program under examination here.

2.2.Credit Recovery Programs

The use of credit recovery programs to provide high school students with opportunities to obtain previously forfeited course credit to improve graduation rates is a strategy that requires attention (Roblyer, 2006; Washburn, 2004). Together, the national proliferation of credit recovery programs, program variety, improving graduation rates, and the lack of empirical research ignite this call. Credit recovery programs emerged as one way for schools to demonstrate school improvement by converting student failures into student successes. Forms of credit recovery are what districts came up with. Credit recovery is administered in three forms: (1) Face-to-Face, (2) Fully Online, and (3) Blended Approaches (Dessoff, 2009).

The face-to-face model includes a traditional teacher whereas the fully-online approach is fully technologically mediated. The integration of technology and its proliferation has sparked concern about the technological replacement of traditional teachers (Snow, 2011). It is important to note that credit recovery is not commonly identified as a specialized form of distance education (see, Collins & Halverson, 2009; Gomez & Cooper, 2012). Distance education programs afford opportunities for individualization and increased access. Unfortunately, individualization is often limited and usually does not include coupling program structure to

individual learner differences. Research here is critical considering online environments often require different forms of reading and writing than those required in traditional classrooms where listening and speaking are recruited as resources and communication forms (Warschauer, 2008). The blended approach blends technology and teacher interaction to provide students an opportunity to recover credit from failed courses. Although these dimensions can be used to classify approaches, it is important to note that no federal standardized definition for credit recovery currently exists despite their proliferation and relationship to *No Child Left Behind* and *Every Child Succeeds Act*.

Systematic inquiry into credit recovery has been extremely limited despite their proliferation (Heppen et al., 2013; Heppen et al., 2016; O'dwyer, Carey, and Kleinman, 2007). To this point, Heppen et al., 2016, write "no rigorous evidence currently exists on the efficacy of online credit recovery in high school" (pp. 3). The Institute of Educational Sciences further emphasized this in their 2015 report where they found no credit recovery study met the WWC design standards thereby limiting any conclusions about the effectiveness or ineffectiveness of credit recovery programs (USDOE, 2015). It is important to note that even less research has been done to understand Face-to-Face and Blended credit recovery approaches. The brief found when comparing students taking the online format versus the in-person format, students struggled and displayed negative mathematical dispositions, had lower algebra assessment scores, and overall grades. Despite this contrasts, they found that longer-term academic outcomes, for example, subsequent course performance, were not significantly different. Means et al. (2009) demonstrated through meta-analysis that students in the online context performed better than students in the face-to-face platform. They acknowledge very few studies exist in the K12 context and therefore their results should be interpreted with caution. Despite the limited and

mixed resulted, sixty to seventy percent of districts surveyed in two studies routinely offer online credit recovery opportunities (Picciano et al., 2012; Watson et al., 2012).

The limited published literature suggests the blended format may yield the best achievement results (O'dwyer, Carey, and Kleinman, 2007; Plummer, 2012). O'dwyer, Carey, and Kleinman (2007) found that students in the blended format barely outperformed their face-to-face peers. Approximately 72% of the students in the treatment group found the technology to be an enjoyable aspect of the blended course. They point out the difference might be attributed to the newness of the learning environment to the learner. The study highlighted "a lower percentage of students in the treatment classrooms reported feeling either confident or very confident in their algebra skills after the course" despite similar overall achievement outcomes (pp. 15). The students in the treatment group outperformed those in the traditional classroom on 18 of the 25 items assessed in the posttest. They suggest future research attend to student satisfaction alongside other affective measures. Additionally, they call for future research that explores the role of "technology-enhanced teaching tools" in the development of conceptual understanding.

Sadik and Reisman (2004) pointed out that online learning environments are heavily text-based and require strong literacy skills. Unsurprisingly, the one study that examined literacy in the online credit recovery context found that reading skills did matter in the largely text-based environment despite the added technological affordances (e.g., not bound by time and space) making the absence of a traditional teacher problematic (Palisoc, 2013). Palisoc (2013) suggested accounting for reading skills might increase understanding, promote effective self-regulation, and save time. I posit that more attention must be paid to how learning can be supported in credit recovery frameworks. This research effort is the first effort to examine strategic literacy

approaches to improving achievement in any credit recovery setting. The next section will discuss strategic literacy approaches to improving achievement in the regular classroom setting.

2.3 Literacy Intervention Programs

High school literacy interventions tend to target comprehension. Literacy programs used at the secondary level include: Read 180 (Hasselbring, Goin, Taylor, Bottge, & Daley, 1997); Reading Apprenticeship (Greenleaf et al., 2001); Xtreme Reading (Corrin et al., 2009; Kemple, 2008); Reciprocal Teaching (Palincsar, 2003); Scaffolded Reading Experience (Fournier & Graves, 2002; Graves & Graves, 1995); and Strategic Instruction Model (Deshler et. Al., 2001). Each program is described in the table below. Each program is comprised of a different set of design principles relating to the state of research. Except Read 180 and Reciprocal teaching, these programs are largely still working to demonstrate impact. For this reason, I will not compare the programs in a manner that suggest one is superior. I do wish to point out that some of these programs leverage similar design principles and incorporate similar strategies. For example, Reading Apprenticeship, Xtreme Reading, Reciprocal Teaching, and The Strategic Instruction Model incorporate paraphrasing or summarizing practices (Armbruster, Anderson and Ostertag, 1987). Each program presented in the chart takes at least one year to implement. I believe we need to continue to explore and refine these approaches while simultaneously developing approaches that quickly impact student learning and do not exclusively hinge on individual teacher's professional development opportunities. While Read 180 is typically used to address different challenges than the other programs it is noteworthy because it includes individualized adaptive software whereas the other approaches depend greatly on the facilitator initially. This is indicated in table 1 as mixed implementation type. The Instructional Process implementation types generally lack the artificial intelligence or adaptive technology component.

Literacy Program	Description	Impact	Type Implementation
Reading Apprenticeship	Teachers "model disciplinary-specific literacy skills, help students build high-level comprehension strategies, engage students in building knowledge by making connections to background knowledge they already have, and provide ample guided, collaborative, and individual practice as an integral part of teaching their subject area curriculum" (WestEd, 2017).	Kemple et al. (2008) Controlling for pretests, the Reading Apprenticeship outcomes for comprehension (ES = +0.09, p > .05) and vocabulary (ES = +0.05, p > .05) resulted in a mean effect size of +0.07.	Instructional Process
Xtreme Reading	"Xtreme Reading uses a meta-cognitive approach that is built on 7 reading strategies. Four strategies focus on comprehension: Self-Questioning, Visual Imagery, Paraphrasing, and Inference Strategies. The Self-Question Strategy is intended to teach students to ask themselves questions, make predictions, and talk about answers while reading. The Visual Imagery Strategy is intended to teach students to make pictures in their minds while reading. The Paraphrasing Strategy is intended to help students put main ideas and details in their own words. The Inference Strategy is designed to help students ask and answer thoughtful questions as they read, infer, and predict information (from Xtreme Reading Profile)"	Kemple et al. (2008) For Xtreme Reading, controlling for pretest, he outcome for comprehension (ES = +0.09, p > .05) and vocabulary (ES = +0.01, p > .05), for a mean effect size of +0.05.	Instructional Process
Reciprocal Teaching	Teachers model then help student slowly learn to guide discussions using the following strategies: summarizing, question generating, clarifying, and predicting.	Rosenshine and Meister (1994) reported a mean effect size of .32 for standardized test a	Instructional Process
Scaffolded Reading Experience	"Provide a set of activities designed to assist a particular group of students to successfully read, understand, learn from, and enjoy a particular selection" (Graves and Graves, 1995, p. 29)		Instructional Process
Strategic Instruction Model	Teach metacognitive reading strategies, especially paraphrasing, to help students comprehend text		Instructional Process

Table 1: Literacy Interventions

2.4 Leveraging Metacognition in Designed Learning Environments

Several literacy intervention approaches were reviewed in the last section. Several times the word metacognition was used to describe individual interventions. This section will examine what metacognition is and how it can be leveraged with literacy in designed learning environments. Metacognition has been studied concurrently with numeracy and literacy. Interest in metacognition in the field of education has increased since developmental psychologist John Flavell (1976,1979) coined the term, based on work examining metamemory (for review see Flavell & Welllman, 1977). If cognition examines the application of strategies to support task completion, then metacognition examines the interaction of strategy selection, strategy use, and task completion processes. The literature operationalizes metacognition in varying ways, but many researchers have agreed that metacognition involves two interactive processes: awareness of metacognitive knowledge and control (regulation) of cognitive processes using metacognitive knowledge. The awareness component involves the mind's ability to stand back and watch itself in action. The regulation component involves the ability to coordinate knowledge to support cognition and learning. These two components interplay within metacognitive experiences.

Ann Brown and her colleagues made several additional contributions to Flavell's model, which inform understandings of metacognition and implementation efforts to foster it within formal and informal educational settings (Baker & Brown, 1984; Brown et al., 1982; Brown, 1985). Specifically, Brown (1978) helped further understandings of the awareness and regulatory aspects of metacognition by highlighting the roles executive functioning and metacognitive skills play in metacognitive regulation during reading. Executive functioning includes identifying objectives, planning, and tracking progress. Schraw (1998) discusses metacognition as a higher

order thinking skill. These are requisite skills to realize the vision being articulated for science education.

Students with increased metacognitive knowledge understand their learning and are empowered to control their learning (self-regulation). Metacognitive knowledge promotes utilization of diverse, effective strategies, thoughtful task planning, self- monitoring, progress evaluation, and refinement of metacognitive knowledge. These benefits are what I will be looking for to determine metacognition principle influence. It is important to note that comprehension strategies *sometimes* include features principled in metacognition.

The ability to take control of one's learning could mitigate systematic educational disruptions[5] and should be an attractive pursuit to those interested in improving student outcomes amongst high-poverty, urban schools. Several researchers have emphasized the potential benefit derived from developing metacognitive skills within students in traditionally underserved contexts (Brown, 1978; Lee, 1995; Means & Knapp, 1991). Few studies have directly examined achievement or attainment in the high school science classroom through meta cognitive lens, especially amongst traditionally underserved students.

2.5 Metacognition in Reading Apprenticeship

Emphasizing metacognition can help improve student achievement in high school content subject-areas (Karlen, Merki, Ramseier, 2014; Schraw, 1998; Williams et al., 2002) but teachers do not routinely emphasize it (Schoenbach et al., 2003). Reading Apprenticeship (Greenleaf et al., 2001; Greenleaf et al., 2011; Schoenbach, Greenleaf, and Murphy, 2012) is an example of a multi-strategic, research-driven instructional framework that leverages metacognition and

[5] Systematic educational disruptions refer to the negative mechanisms within some urban schools that impact student learning. Examples include: high teacher turnover rates, high student mobility rates, limited access to texts, and large class sizes.

routines in the high school science context. This framework frames reading, as a complex problem-solving inquisition, where the tasks and learner experience frame achievement. They highlight, in accordance with the literacy research, that proficient readers share several characteristics including: (1) engagement; (2) motivation to read and to learn; (3) drive to persists during difficulty; (4) ability to engage socially around the tasks; and (5) ability to strategically monitor their own comprehension (Schoenbach, Greenleaf, and Murphy, 2012, p.21) The reading apprenticeship framework is meant to foster these characteristics by making textual structure, tacit learning processes, and strategies explicit. Schoenbach, Greenleaf, and Murphy (2012) write,

> "at the center of the Reading Apprenticeship approach, and linking the four dimensions of classroom life[6], is an ongoing conversation in which teacher and students think about and discuss their personal relationships to reading, the social environment, and resources of the classroom, their cognitive activity, and the kinds of knowledge required to make sense of text. This metacognitive conversation is carried on both internally, as teacher and students individually read and consider their own mental processes, and externally, as they talk about their reading processes, strategies, knowledge resources, and motivations and their interactions with the affective responses to texts" (pp. 25-26).

Metacognition is leveraged in the framework in several ways including on-going metacognitive conversations centered around things like noticing where you pay attention. Other techniques include: think-aloud protocols, metacognitive bookmarks, talking to text notes, multiple-entry journals, and metacognitive reading logs. These strategies and techniques engage internal processes known metacognition. Compared to a control group, Greenleaf et al., (2011) found teachers trained in the reading apprenticeship framework for 10 days (1) provided increased support for literacy and reading comprehension in biology classrooms, (2) provided

[6] Four dimensions of reading apprenticeship framework: 1. Social dimension 2. Cognitive dimension 3. Personal dimension 4. Knowledge-Building dimension

increased use of metacognitive routines, (3) provided increased collaborative learning structures, and (4) students scored higher on state assessments in English language arts, reading comprehension, and biology. With a similar demographics to the group understudy here, Greenleaf and colleagues (2011), provided evidence that when teachers learn strategic literacy techniques and metacognitive awareness for integrating language in biology instruction, students report that they increase their reading and science integration and have increased confidence in approaching science reading. Romance and Vitale (2005) show very similar positive results on teacher technique and student learning among elementary science learners. Developing an awareness of text features, and how to use them to build content understanding is essential for learners. I argue this development may help the student access the benefits of metacognition.

Again, it is important to note the training for reading apprenticeship occurs separately for students and teachers. Nevertheless, several of the same techniques were used to facilitate student access to metacognition in the high school biology credit recovery program.

2.6 More Evidence of Strategic Literacy

Evidence suggests that students who are explicitly instructed in strategic language approaches show increases in reading comprehension (Brown, Pressley, Van Meter, & Schuder, 1996; Dole, Brown, & Trathen, 1996; Rosenshine & Meister, 1997). Results from recent studies have suggested that in the context of science instruction, specific metacognitive strategic language and literacy support (Zywica &Gomez, 2008) matters to both science learning and to the development of reading comprehension (Herman et al., 2010). At the high school level, during a two-year effort, beginning with a year of sustained and collaborative design and professional development activity, (Herman et al., 2010) taught biology teachers how to integrate a set of strategic language approaches in science instruction. Teachers, in turn, introduced

students to and maintained the use of, these strategies throughout an academic year. Students' independent understanding of, and proficiency with using the strategies in science readings, independent of their instructional texts, was also assessed as part of this intervention. Findings (Herman et al., 2010) suggest that students' science learning ability, both measured by researcher-made, and teacher-made assessments, was significantly related to students' ability to use the strategies. Also, students' reading comprehension, as measured by standardized tests, was significantly related to their strategy use.

Veenman, Wilhelm, and Beishuizen (2004) demonstrated that metacognition has the potential to predict learner performance, partially independent of intelligence, across multiple ages. This study included fourth-grade students, sixth-grade students, eighth-grade students, and college students. The overall correlational analysis suggested intellectual ability and metacognition could explain 40.8% of the variance in learning performance. The individual variances for intellectual ability and metacognition were 2.4% and 14.4%, respectively. The study found metacognition was a primary predictor of learner performance on content task for fourth-grade students: explaining 54% of the overall variance. The study found metacognition was a relevant performance predictor on top of intellectual ability for sixth-grade and eighth-grade students. Metacognition was not found to be a distinct factor amongst the college students. Leutwyler (2009) found that there is no automatic development of students' self-reported use of metacognitive learning strategies during high school. This research is also important because it speaks directly to the earlier studies by suggesting that although young children might not routinely engage metacognition when they do it invariably impacts learner performance (Veenman & Spaans, 2005). This means to ensure students can leverage metacognition we must attend to metacognition in learning designs in explicit and consequential ways.

Research suggests that while metacognitive intervention might promote language performance, amongst English language learners, the evidence is mixed concerning the ability of metacognitive interventions to enhance metacognitive knowledge and learner performance (Rahimi & Katal.,2012; Raoofi et al., 2014). This suggests the need to be very intentional about what constitutes evidence of metacognition. Here I simply assert that the strategic supports in the credit recovery context may have engaged metacognition processes. Pressley, Borkowski, and O'Sullivan (1985) found that when students realize the connection between strategy use and academic performance they are more inclined to use the strategy later. This research sought to explore the connections students made between strategy use and their performance and how those connections relate to how the performed along various indicators.

2.7 Affording Student Access to the Metacognition Process Through Strategic Supports

Understanding connections students make between strategy used and their performance might enable practitioners and students harness more in their learning pursuits. Prior research suggests that providing students access to the metacognition process, through the integration of multiple strategies using tools and routines, can increase both science learning and reading (Herman et al., 2008, 2010). The relationship between strategy proficiency and reading is not clear. In one study, Herman and colleagues found that tool proficiency predicted science achievement once on-entry reading ability was controlled (Herman et al., 2008). Specifically, they found that summarization and multiple-entry journal tool proficiency predicted science achievement once on-entry reading ability was controlled. Annotation was not a significant predictor in the models controlling for on-entry reading ability. One additional thing that stood out about this study was that multiple-entry journal tool proficiency was correlated with both the science unit test and the science comprehension measures. The other two tool proficiencies were

only correlated with the science comprehension measure, which only includes questions about reading. In another study, Herman and colleagues found, "strategy proficiency, with the three previously referenced strategies, predicts unique variance in science achievement even when controlling for reading" (Herman et al., 2010). They found that 26% to 40% of the variance in science achievement was explained by reading and strategy proficiency collectively. They hypothesize that the inconsistency of annotation tool proficiency in predicting science achievement might be related to the variation in annotation use.

Previous research suggests providing students who previously failed biology access to the metacognition process can indeed be an effective strategy for increasing science achievement (Cooper et al., 2014; Gomez et al., 2014; Gomez et al., 2016). Approximately, ninety-seven percent of students who regularly attended the program recovered the course credit[7]. Analyses of the summer 2012 program data revealed associations between use of several language support tools and science achievement. Correlational analyses suggest that students who use more words in their summaries produce higher summary scores and perform at high levels on classroom assessments. Analyses also revealed that student test scores increased 50% compared to their prior course experience. This finding suggests that science knowledge was impacted although it is not completely reliable considering the test were different.

This dissertation study sought to extend our understanding of the intervention by examining the summer 2013 program data using qualitative inquiry methods. Although, this study does use numerical information to explore student performance, this dissertation study is concerned with the student experience. This study did not seek to build any quantitative data models to explain any phenomena.

[7] 33 students registered for the 2012 course. All students were not able to maintain enrollment

2.6 Summary

In this chapter, I have: (1) provided background information literature pertaining to credit recovery programs since the intervention occurred in the credit recovery context; (2) documented literacy issues in the credit recovery context; (3) discussed literacy interventions in high schools; (4) discussed metacognition in the context of literacy interventions; (5) discussed metacognition in the context of reading apprenticeship; (6) discussed additional evidence for strategic supports; and (7) discussed past attempts to provide students access to the metacognition process through strategic supports. In the next chapter, I present the program overview and methodological approach. The goal is to understand, from the students' perspective, how the intervention functioned (or did not function) to provide students access to the learning process, through the integration of multiple strategies using tools and routines, can increase both science learning and literacy simultaneously.

3 METHODOLOGY

3.1 Broad Methodological Context

Methodologically, the intervention understudy was guided by the design-based research tradition (Barab & Squire, 2004; Brown, 1992; Sandoval & Bell, 2004; The Design-Based Research Collective, 2003). Design-based research can be considered a series of approaches that seek to build "theory, artifacts, and practices that account for, potentially impact, learning and teaching in naturalistic settings" (Barab & Squire, 2004, p. 2). This dissertation study seeks to understand how students recruited and understood strategic literacy supports based on course performance.

3.2 The Intervention

The research project started with the school administration reaching out to the research team for assistance designing an intervention to help high school students recover previously forfeited biology course credit (Gomez et al., 2016). The team begins the project by meeting with students and teachers to understand their perspectives on why students experienced failure. During the school year proceeding the 2012 summer intervention, I held a focus group[8] with lower-income, EL high school juniors, and seniors at the same university-affiliated school, about their perceptions of biology teaching and learning. The focus group was selected by the school guidance counselor. The focus group was asked whether students tend to experience difficulty in biology class and to share information about the challenges students face in the biology classroom. The research team also queried several of the high school science teachers. The manner in which responses, clustered in three areas, were remarkably similar. Both students and

[8] The focus group was selected by the guidance counselor for the research team

teachers nominated three primary roadblocks (see Figure 1) to student learning in Introductory Biology classes.

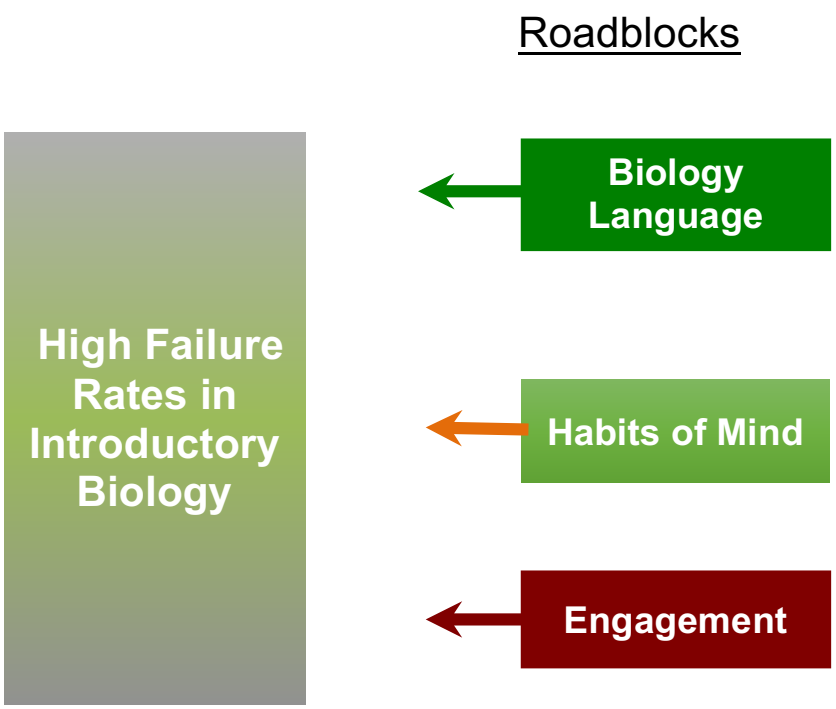


Figure 1 Roadblocks to student learning in Introductory Biology

We learned from teachers and students that students were not engaged by the biology texts and the lecture-based approach to teaching introductory biology. Lacking engagement, students tended to fall behind and stop persisting towards successful course completion. From the perspective of students', some of the fascinating content in science is rendered boring by lecture-based pedagogy and decontextualized experiences with the curriculum. Students' habits of mind - students' beliefs about what they are "good at" and the impact of those beliefs on how students behave when the learning becomes difficult - also presented a roadblock. For example, too often, over time and science experiences, students may have come to believe that they are *not* "science people." Armed with this belief, when science becomes difficult, they do not persist in

completing homework or studying for exams. The interviews suggested that students do not seem to have or exercise adaptable habits of mind that lead to spending more time with the subject matter.

Nevertheless, both teachers and students zeroed in on the language of biology as a particular explanation of why Introductory Biology is so difficult for some students. In a variety of ways, students are stymied by the high demands for reading, writing, speaking, and listening in biology courses. Science teachers have little to no experience with specifically organizing their biology instruction to foreground science content, while also supporting the language needs of students with low literacy skills (e.g., students who are reading 2-5 years below grade level) and non-English background learners. Teachers expect that students have not or cannot read the biology text and, then compensate by lecturing science content. Also, teachers report that they rarely, if ever, administer short-answer or essay response exams avoiding tasks requiring written science prose - predictions, claims, and evidence, or syntheses. Especially when it comes to language, subject area teachers of adolescents have a weak set of professional skills (Gomez & Gomez, 2007). Also, science teachers report that they have little to no experience with explicitly organizing their biology instruction to foreground science content while simultaneously supporting students in understanding the language of science (Gomez & Gomez, 2007). To add to the challenge, much of the professional development at the intersection of language and science, is episodic, loosely coupled to the specifics of classroom content and assessment, and, as a result, is less effective (Gomez, 2010). Professional Development is also generally geared toward adults/teachers which naturally increases students' reliance upon teachers to experience student success.

In this dissertation, I explain our efforts to respond to the failure rate in Introductory Biology focused on addressing the challenge of language and literacy (i.e., reading comprehension, talk, and writing) in biology. Our literacy focus was to provide strategic literacy support to help students see and leverage text-based features that support science and literacy simultaneously. Informed by research on strategic approaches to literacy, we sought to help students to become attuned to how language is used in classroom scientific discourse in class. The meetings and the research were integrated to form the intervention's theory of change presented in the driver diagram (Figure 3.1) (Bryk et al., 2015; Langley et al., 2009). The driver diagram below presents the theory underlying the research design.

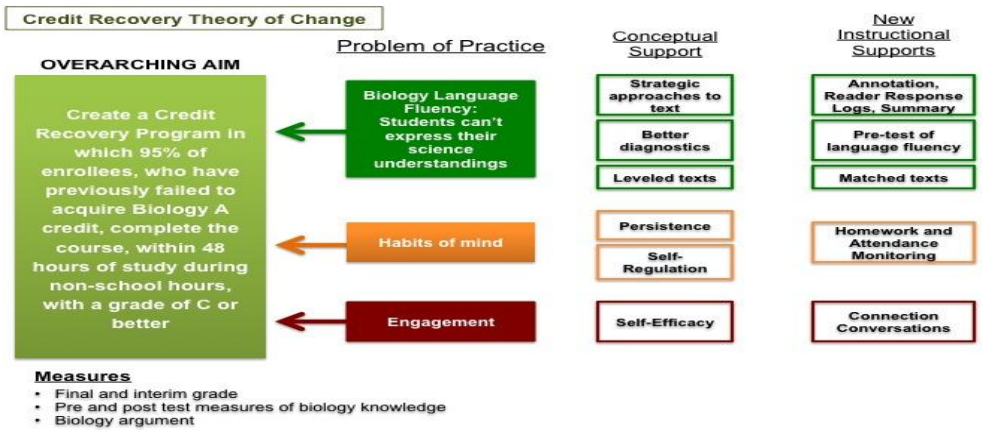


Figure 2: Intervention Driver Diagram

The intervention aimed to deliver a program where 95% of enrollees, who have previously failed to acquire Biology credit, complete the course, within 48 hours of study during non-school hours, with a grade of C or better. As stated in the preface, 87.5 % of enrollees, who had previously failed to acquire Biology credit, successfully completed the intervention course, within 48 hours of study during non-school hours, with a grade of C or better[9]. Again, this study

[9] Poor attendance appears to be a common characteristic amongst students who did not succeed in the intervention course.

is specifically concerned with students who successfully completed the course and assented (with guardian consent) to participate in the research. The program overview is presented next followed by descriptions of the parts.

Intervention Overview

Our approach to course design was collaborative. We co-designed the course with the support of 3 science teachers. The course design involved intensive practice in reading science texts, over one four-week period, along with automatic feedback using the Write to Learn tool. The class met for four hours five days per week. The classroom support team (i.e., university faculty, graduate students, an intern and the University-Community School liaison) helped teachers in integrating the reading-to-learn support tools, including Write to Learn, in their classroom practice.

At the end of each day, the teacher and the classroom support team met for a daily debriefing session. These sessions lasted for approximately one hour. The meetings served as an opportunity for the team members to check-in about that day's lesson. The meetings involved the classroom teacher and members of the University study team. In general, a debrief meeting would begin with the classroom teacher sharing observations and experiences related to that day's lesson. The study team members--some of whom may have also been directly involved in teaching portions of a lesson and assisting students asked clarifying questions, and shared their observations and insights. In each of these sessions, both the teacher and members of the support team discussed their warrants for design changes. The group regularly discussed any necessary changes to the daily program design and instructional elements. The team also divided responsibilities for implementing the changes over the coming days.

The intervention unfolded over four weeks in July 2013. During these four weeks, participants were expected to attend class for four hours each day Monday through Thursday. Each day the instructional routine included the following elements: customized reading selections, which were different from their standard textbook materials, laptop use for access to the Write To Learn Tools, and intensive instruction in the literacy tools (i.e., annotation, double-entry journals, and summarization) embedded in the classroom teaching and learning experience, Because these customized reading selections were part of the Write to Learn corpus students' written summaries could be automatically scored according to several criteria: content correctness, plagiarism (i.e., the degree to which text in a student's summary was copied directly from the text), and the number of irrelevant and relevant words present in the text. Each text that students read in the course was analyzed using the Reading Maturity Metric which provides an estimate of text complexity based on vocabulary.

At the end of each day of the program, students responded, in writing, to a series of "Exit Slips" and "Quick Write" questions designed to gauge progress, provide the teacher, and classroom support team with direct feedback of subsequent instruction, and inform improvement of program design. Quick writes were a good way to find out what students thought about the day's learning experience. Exit slips and quick writes were useful as forms of reflection into the classroom learning experience. Exit slips consisted of a set of questions that asked students to rank their levels of confidence concerning content learned that day and summary writing. Both tools were used to track students' knowledge informally. Also, exit interviews were conducted with program participants at the end of the four weeks.

A vital aspect of this intervention was regular and intensive instruction in the use of the reading to learn classroom literacy tools (annotation, double-entry journaling and summary

writing). For review, students had daily access to the Write to Learn which they used to create summaries of the classroom biology texts. The Write to Learn tool provided students with automatic feedback that is particularly important for readers. Expert readers can monitor their comprehension, and in particular, have a sense of what they fail to understand. Students used the Writing to Learn tool several times per week. We hoped that Write to Learn would help students develop a meta-understanding of the role that language plays in their learning. The Write to Learn tool's feedback assisted students in gauging the adequacy of their content area knowledge and also provided standard measures of writing ability and reading comprehension.

This study examined the strategic supports section of Figure 2. In alignment with the driver diagram, the investigation is focused on whether the strategic supports employed by students moved closer to the identified aim to achieve 95% of the students passing the course with a C or better. Strategic supports were chosen because they were the most emphasized element in the intervention programming. This does not suggest attendance monitoring did not occur. It simply means the bulk of the program resources were allocated toward the strategic support element. Nevertheless, because student failure in this program appears related to attendance, future studies should exam other program features.

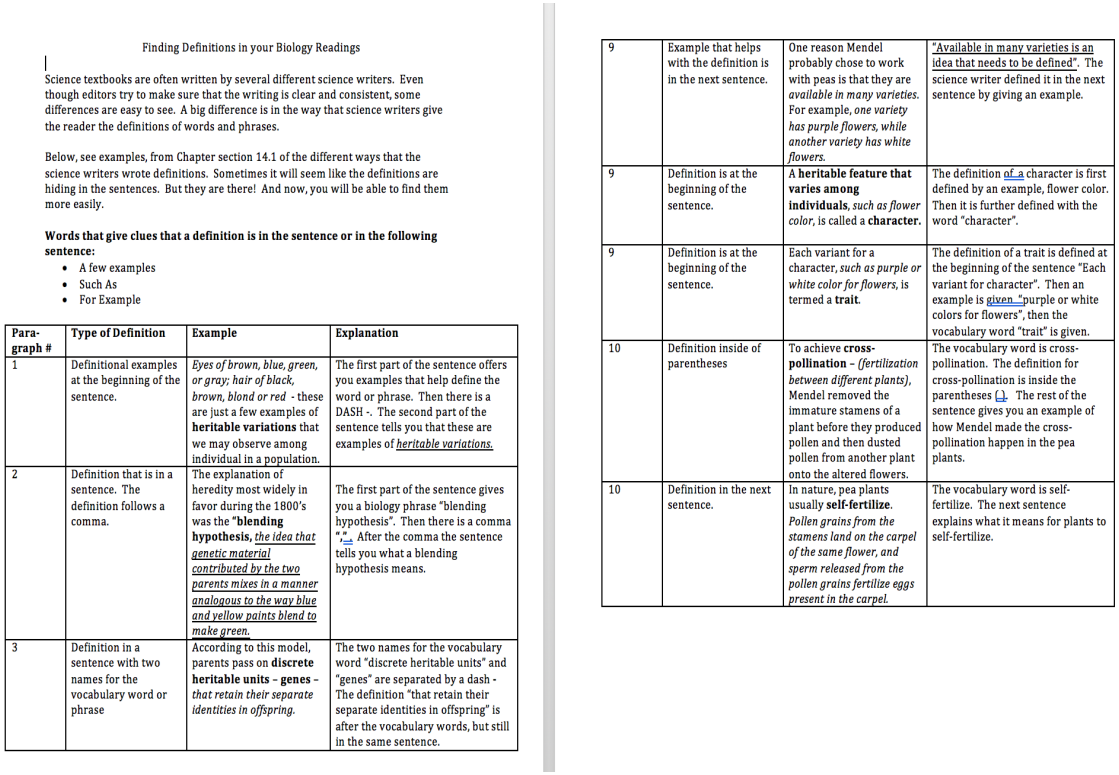
This intervention leveraged metacognition by providing students access to the tools to help them manage their science learning process. Supporting students in this way has the added potential to give learners more control over their learning by allowing them to regulate and manage the learning process. The following design features potentially fostered metacognition in the credit recovery context: (1) content learning goals; (2) assessments; (3) annotation tool; (4) multiple entry journal tools; (5) strategic literacy lessons and (6) the summarization tool. In

metacognition terms, these features function to increase the control students can exert by improving their ability to respond to presented inquiry activities. Each element is outlined below.

Content Learning Goals. Learning goals were developed for each day to ensure science content remained central. These goals afforded students' opportunities to see learning goals that they would be expected to coordinate their work efforts to achieve. Learning goals afford opportunities for productive regulation for students and teachers. These goals were developed by the teacher with the research team. They answer, what am I supposed to be doing?

Pre-assessment/Post-Assessments. The pre- and post- assessments were designed to capture students content confidence levels, prior knowledge, and content knowledge gains. Together, these assessments provide a mechanism for students to demonstrate knowledge gains and potentially promote reflection. They also allow the teacher to become clearer about what they expect students to know. These pre-assessments also provided potential space for students to develop a strategy for how they would demonstrate learning.

Strategic Literacy Lessons. Several literacy lessons were embedded into the credit recovery course to support literacy. These took the form of handout similar to Figure 3 where students were supported to find definitions in their readings.



Finding Definitions in your Biology Readings

Science textbooks are often written by several different science writers. Even though editors try to make sure that the writing is clear and consistent, some differences are easy to see. A big difference is in the way that science writers give the reader the definitions of words and phrases.

Below, see examples, from Chapter section 14.1 of the different ways that the science writers wrote definitions. Sometimes it will seem like the definitions are hiding in the sentences. But they are there! And now, you will be able to find them more easily.

Words that give clues that a definition is in the sentence or in the following sentence:

- A few examples
- Such As
- For Example

Para-graph #	Type of Definition	Example	Explanation
1	Definitional examples at the beginning of the sentence.	*Eyes of brown, blue, green, or gray; hair of black, brown, blond or red* - these are just a few examples of **heritable variations** that we may observe among individual in a population.	The first part of the sentence offers you examples that help define the word or phrase. Then there is a DASH -. The second part of the sentence tells you that these are examples of *heritable variations.*
2	Definition that is in a sentence. The definition follows a comma.	The explanation of heredity most widely in favor during the 1800's was the **"blending hypothesis,** *the idea that genetic material contributed by the two parents mixes in a manner analogous to the way blue and yellow paints blend to make green.*	The first part of the sentence gives you a biology phrase "blending hypothesis". Then there is a comma ",". After the comma the sentence tells you what a blending hypothesis means.
3	Definition in a sentence with two names for the vocabulary word or phrase	According to this model, parents pass on **discrete heritable units – genes** – *that retain their separate identities in offspring.*	The two names for the vocabulary word "discrete heritable units" and "genes" are separated by a dash - The definition "that retain their separate identities in offspring" is after the vocabulary words, but still in the same sentence.
9	Example that helps with the definition is in the next sentence.	One reason Mendel probably chose to work with peas is that they are *available in many varieties.* For example, *one variety has purple flowers, while another variety has white flowers.*	"Available in many varieties is an idea that needs to be defined". The science writer defined it in the next sentence by giving an example.
9	Definition is at the beginning of the sentence.	A **heritable feature that varies among individuals**, *such as flower color*, is called a **character.**	The definition of a character is first defined by an example, flower color. Then it is further defined with the word "character".
9	Definition is at the beginning of the sentence.	Each variant for a character, *such as purple or white color for flowers*, is termed a **trait**.	The definition of a trait is defined at the beginning of the sentence "Each variant for character". Then an example is given "purple or white colors for flowers", then the vocabulary word "trait" is given.
10	Definition inside of parentheses	To achieve **cross-pollination** – *(fertilization between different plants)*, Mendel removed the immature stamens of a plant before they produced pollen and then dusted pollen from another plant onto the altered flowers.	The vocabulary word is cross-pollination. The definition for cross-pollination is inside the parentheses ( ). The rest of the sentence gives you an example of how Mendel made the cross-pollination happen in the pea plants.
10	Definition in the next sentence.	In nature, pea plants usually **self-fertilize**. *Pollen grains from the stamens land on the carpel of the same flower, and sperm released from the pollen grains fertilize eggs present in the carpel.*	The vocabulary word is self-fertilize. The next sentence explains what it means for plants to self-fertilize.

Figure 3. Finding Definitions in you Biology Readings

Annotation Tool. Text annotation (Herman et al., 2008; Herman & Wardrip, 2012; Zywica & Gomez, 2008) is a strategy used to illuminate text structures using specific symbols. Appendix J presents the text structures and their corresponding symbols in the form of a tool provided to teachers and students. Zywica and Gomez (2008) found the following annotations were correlated with measures of science achievement: main idea, content (science) vocabulary, and transition words. Main idea and supporting evidence were two text structures that were emphasized in the credit recovery program. Students were heavily guided, initially, in recruiting the strategy but guidance decreased over time for most students. The gradual release of responsibility here reflects the developmental participatory focus of the proposed study. In addition to the inherent strategy connection, this tool should be considered special in the way that it unites strategy and task variables.

Multiple-Entry Journal Tool[10]. Multiple-Entry journals are a reader-response tool that provides a structured forum for students "to monitor and document their understanding of science texts" (Herman et al., 2008, p. 344; Herman & Wardrip, 2012). The tool promotes active reading and reflection. The tool appears versatile and allows teachers to focus both on science concepts and text structures simultaneously. In addition to the inherent strategy connection, this tool should also be considered special in the way that it unites strategy and task variables.

Summarization Tool. Summary writing is a skill that requires the reconciliation of new and old knowledge and the construction of a robust external textual representation that can be understood by an external audience (Gomez & Gomez, 2007; Herman et al., 2008). Specifically, "in summarizing students must comprehend the text, identify the main ideas, differentiate secondary ideas, integrate new knowledge with prior knowledge, and condense the information in a succinct and logical way" (Herman et al., 2008, pp. 344-345). Write to Learn is a technological summary tool that uses a Latent Semantic Analysis algorithm (Landauer, 1998) to compare the co-occurrence of students' written products to a large corpus of texts about the subject, e.g., introductory biology to evaluate the student summary. The tool provides analytics/feedback to the student that can be used to evaluate performance and facilitate summary revision. Examples of summary analytics/feedback include plagiarism, time on task; total words written; the number of unimportant words; total number of passing attempts; and the average performance on each subsection. This tool is empowered by technology to unite strategy and task variables in ways that promote student success. This study sought to understand how (if at all) students understood the tools and whether those understandings reflect any common

[10] Multiple-Entry journal includes double-entry, triple-entry, and quadruple-entry journals

learning practices amongst students in the 2013 intervention. Appendix L contains handouts with summarization elements students were prompted to keep in mind as they composed their summaries.

3.2 **Research Questions and Rationale for Method**

The research questions that guided this inquiry were:

(1) Does student performance in the intervention course appear related to how students utilized literacy supports (summarization and annotation)?

(2) Are all students aware (able to articulate) of the benefits of specific literacy supports? Which benefits do they identify? Do patterns exist in student awareness amongst students by performance?

(3) What (if any) were the awareness characteristics of successful and less successful in the intervention?

To answer, these questions, this study relied on inquiry methods to examine student interviews and descriptive information. Here rich data afforded the opportunity to explore of student experiences in the intervention course. The data permitted a targeted exploration of what strategic approaches to text amongst meant for students in terms of supporting science learning in the credit recovery context (Seawright & Gerring, 2008; Gerring & Cojocaru, 2016). This research sought to use student interviews to classify students relative to their awareness of literacy strategies along a continuum to afford opportunities for better understanding of the affordances of these literacy strategies.

Study Context

During the 2012 summer program, several literacy strategies and tools were identified and routinized to support students' understanding of written Biology text, including annotation, multi-entry journals, and summaries. This study explores how program participants understood the strategies (specifically annotation and summarization), categorize students' understandings, and explores students' understandings through the rich program dataset.

Participants

School Demographics. Participants for the 2013 summer intervention were recruited in the Spring semester of the 2012-2013 school year from students who failed Biology Part 2 within one K-12 school with school-university partnership school. The school is located in the downtown area of a large metropolitan West Coast city. The school opened in 2009. During the 2012-2013 school year, the overall student ethnic breakdown for the school was 80% Latino/a, 13% Asian, 2% Black, 3% Filipino, and 1% White/Other. In terms of English language proficiency, 51% of students were classified as English learners, and 29% of students were reclassified fluent English proficient. Eighty-one percent of the student enrolled were economically disadvantaged.

Recruitment. The research team worked with the school guidance counselor to recruit student participants. The institutional review board (IRB) forms for this study can be found in Appendix A-G. The forms include the teacher consent for the teachers participating in this collaboratively-designed intervention. The science teachers and school personnel initiated the design partnership.

Participant Demographics. Forty students (30 males and 10 females) participated in this study. The overall student ethnic breakdown for the program was 90 % Latino/a (n = 36), 7.5 % Asian (n = 3), and 2.5% Black (n=1). The participants included one student who was formally

classified to receive special education services, at the time of the study. Approximately fifty percent of the participants scored below basic on the English Language Arts and Science assessments. Tables 1 and 2 indicate program participants' levels of performance on the annual state standards assessment, in the areas of English Language Arts (ELA) and Science, along with the number of students, at that performance level. Variability existed amongst students' language classifications. Table 3 presents program participants' language classification.

CST: ELA

		Frequency	Percent
Valid	Far Below Basic **1**	6	15.0
	Below Basic **2**	14	35.0
	Basic **3**	17	42.5
	Proficient **4**	2	5.0
	Advanced **5**	1	2.5
	Total	40	100.0

Table 2 State Standards Test ELA Performance Levels

CST: Science

		Frequency	Percent
Valid	Far Below Basic **1**	11	27.5
	Below Basic **2**	8	20.0
	Basic **3**	13	32.5
	Proficient **4**	3	7.5
	Total	35	87.5
Missing	System	5	12.5
Total		40	100.0

Table 3 State Standards Test SCIENCE Performance Levels[11]

[11] No participants scored in the Advanced category

Language Classification

		Frequency	Percent
Valid	English Only	2	5.0
	Limited English Proficiency	17	42.5
	Reclassified Fluent English Proficiency	9	22.5
	Total	28	70.0
Missing	System	12	30.0
Total		40	100.0

Table 4 Program Participant Language Proficiency[12]

3.3 Data Sources

The major aim of this study is to explore any role awareness of literacy strategies might play to support their science learning in the credit recovery context. Also, the study seeks to understand any value of the literacy strategies from the students' perspective. Although, this study uses qualitative and quantitative data[13] were used to explore the role of awareness in the intervention (see table 4). Data sources included: classroom field notes, classroom tasks, student interviews, student annotations, and student summaries. This dissertation does not utilize each piece of available data. Instead it focuses on the data needed to answer the specified research questions. Nevertheless, all available student data is listed to demonstrate program activities for researchers and practitioners seeking to build similar programs to support student learning.

[12] No participants were classified as "Initially Fluent English Proficient."

[13] All data is redacted with five digit codes replacing names.

Data	Quantity
Classroom Field Notes	15 days[14]
Classroom Tasks ▪ Pre-Assessments ▪ Post-Assessments ▪ Labs ▪ Miscellaneous Classroom Assignments[15] ▪ Final Exam ▪ Homework	 ▪ 4[16] ▪ 4[17] ▪ 2[18] ▪ 1[19] ▪ 1[20]
Annotations (Readings and Lecture Notes)	See Footnote 28 +
Double/Triple/Quadruple Entry Journals	1[21]
WriteToLearn® Summaries	9[22]
Student Interviews	30

Table 5 Summary of Data

[14] July 1 – 25, 2013 Monday through Thursday, excluding July 4, 2013.

[15] Some classwork assignments were placed in other categories

[16] Evolution; DNA Genes & Proteins; Descent with Modification; DNA Structure; and Genetics Problems

[17] Transgenic Animal Virtual Lab; Reebop Activity; RNA Transcription and Translation; and Measuring Human Skulls

[18] Replication, Transcription, & Translation Review; Summary Practice

[19] Evolution

[20] Syllabus-forms Signed; Grade Report Signed; Mutation Problems; and Genetics Problems-Practice

[21] DEJ: Human Evolution

[22] 10.2 Mendelian Genetics; 11.2 Nucleic Acids; 11.5 Transcription and Translation; 14.3 Natural Selection; 14.1 Darwin's Theory of Evolution; 13.3 GMOs; Extra Credit 13.1 Recombinant DNA Technology; Extra Credit 11.4 Genes for Coding Proteins; Extra Credit 11.3 DNA Replication

Classroom Field Notes. Field notes were composed to document planning, implementation, and refinement activities. Research team members rotated, in terms of who recorded the field notes. Classroom observations included the documentation of all information presented and classroom activities. Included in notes from design team meetings were: tool changes and instructional decisions about subsequent program days.

Classroom Tasks. Classroom tasks include post-assessments, labs, final exam, homework, and miscellaneous classroom assignments. The pre- and post- assessments were designed to capture students content confidence levels, prior knowledge, and knowledge gains. The labs were designed to simulate the active nature of science and reinforce content. The final exam was not cumulative. Homework was not regularly assigned during the intervention.

Student Interviews. Semi-structured, open-ended interviews were used to capture student perspectives on the credit recovery program. The interview was designed to understand the impact of program participation directly from students. The interviews covered the following areas: program structure, metacognition support tools, program incentives, teaching methods, and student confidence. To facilitate communication during the interviews program artifacts were used by the interviewers.

Student Annotations. Students annotated provided text using the guidelines presented in Appendix J. The guidelines connected textual categories with symbols. Specifically, the guide called for students to double-underline main ideas and single-underline supporting evidence. Student annotated texts were collected, redacted, scanned to ".pdf" files. Students were instructed to double underline main ideas, single underline supporting evidence, rectangle key content vocabulary, and triangle any other difficult words. Guided by myself and the other team members, two post-baccalaureate research assistants counted each category, for each student, for

each reading. Counts were verified amongst the two research assistants and two graduate students (including myself). Subsequently, these counts were summed to provide the total number of annotations in each of the four specified categories. The program used 5 readings: 14.1, 16.1, 20.4, 22.2, and 25.5. The reading 20.4 was excluded from analysis because it was a modeled annotation and most students' annotation mirrored the model annotation. Essentially, I seek to understand how the meaning of annotations is made in students' practice. In understanding how students make meaning of annotation I hope to understand more about the affordances of the annotations as a tool. Here, I hope we can shed light on questions like who does annotation work for (if anyone), how does it work, when does it not work, who does it not work for, and should it be adopted elsewhere?

Student Summaries. All student summaries were captured through the WriteToLearn tool. Students routinely wrote summaries in the program and used the feedback and evaluation mechanism in the tool to regulate progress. Write to Learn uses a Latent Semantic Analysis algorithm (Landauer, 1998) to compare the co-occurrence of students' written products to a large corpus of texts about the subject, e.g., introductory biology. Students were required to achieve green or good before proficiency was recognized by the instructor. Codes were listed horizontally. Score and length variables are captured for each subsection of a reading. For example, reading 10.2 has four sections – therefore we capture eight score and length charts variables. The reason for this is that most students submitted multiple summaries – so we are capturing the first and final submissions for growth analyses. The first attempt for subsection 1 is (1a), the final attempt for subsection 1 is (2a), then the first attempt for subsection 2 is (1b) and so on. Multiple automated measures were captured to monitor summary quality and development including time on task; total words written; the number of unimportant words; total number of

passing attempts; and the average performance on each subsection (See Table 6). Figure 3 depicts the report available through the WriteToLearn program with the data. The following procedures were performed to compute the Average: Score across all sections and readings: (1) The categorical variables (Poor, Fair, Good, and Excellent) were converted to ordinal variables whereby 1 = Poor, 2 = Fair, 3 = Good, and 4 = Excellent; (2) The scores for each section within an individual reading were averaged to produce an overall score for each reading; (3) The final measure was computed by averaging the individual reading scores. Figures 5-6 show the feedback as it appears to the student in the program.

CODE	NAME	DEFINITION
T_Activities	Total Number of Activities	The total number of activities completed by the student.
T_Passing	Total Number with Passing Scores	The number of activities completed by the student with a passing score.
T_PctPassed	Total Percent Passed (0-100)	Percentage of activities attempted by the student deemed passing.
A_Attempts	Average Number of Attempts	Average number of times student attempts an activity.
A_MoT	Average Minutes on Task	Average number of minutes' student spend on activities.
A_WFA	Average Number of Words on First Attempt	Average number of words written by student on the first summary attempt.
A_FAC	Average % Copied on First Attempt	Average percentage copied by student on the first attempt.
A_WLA	Average Number of Words on Last Attempt	Average number of words written by student on the final summary attempt.
A_LAC	Average % Copied on Last Attempt	Average percentage copied by student on the final attempt.

Table 6: Write-to-Learn Measures Defined

ID	T_Activities	T_Passing	T_PctPassed	A_Attempts	A_MoT	A_WFA	A_FAC	A_WLA	A_LAC	R10.2_Title	R10.2_Date	R10.2_SALC_1	R10.2_SALC_2	R10.2_SALC_
17332	7	3	43	3.9	68	78	2	120	0	Mendelian Genet	12/2/13	2	3	2
54759	4	1	25	1.5	69	108	6	114	5	Mendelian Genet	12/3/13	1	/	1
67152	7	1	14	4.9	116	105	0	145	18	Mendelian Genet	12/3/13	2	4	2
25083	7	0	0	1.4	71	181	0	187	0	Mendelian Genet	12/4/13	2	2	2
71241	5	2	40	5.8	85	60	0	144	1	Mendelian Genet	12/4/13	2	2	2
42954	7	1	14	3	69	67	4	111	4	Mendelian Genet	12/4/13	4	4	2
66916	3	0	0	1.3	133	170	0	170	0	Mendelian Genet	12/4/13	2	2	2
91508	5	5	100	5.8	100	88	6	176	0	Mendelian Genet	12/4/13	4	4	2
31629	5	3	60	3.2	123	148	8	181	10	Mendelian Genet	12/4/13	4	4	2
98288	8	5	63	5.5	89	72	8	153	0	Mendelian Genet	12/4/13	4	4	2
45440	8	8	100	7	215	181	2	231	0	Mendelian Genet	12/4/13	4	4	2
56986	3	0	0	2	161	121	3	120	0	Mendelian Genet	12/4/13	2	2	2
50494	7	2	29	3.1	75	136	0	179	0	Mendelian Genet	12/4/13	4	4	2
46974	5	0	0	5.8	85	83	0	233	0	Mendelian Genet	12/4/13	4	4	4
97606	7	2	29	2	82	155	12	212	6	Mendelian Genet	12/4/13	4	4	2
55064	7	4	57	6	84	95	1	207	1	Mendelian Genet	12/4/13	2	4	2
62240	11	4	36	1.8	76	214	3	216	2	Mendelian Genet	12/4/13	2	4	2
77764	1	0	0	1	67	471	0	471	0	Mendelian Genet	12/4/13	1	1	1
41148	3	0	0	4.3	175	84	4	129	0	Mendelian Genet	12/4/13	2	3	2
99043	6	3	50	3.8	82	169	12	218	3	Mendelian Genet	12/4/13	4	4	2
15847	4	2	50	5.8	155	90	6	167	0	Mendelian Genet	12/4/13	4	4	2
19849	11	10	91	3.5	57	248	0	211	0	Mendelian Genet	12/4/13	4	4	2
60455	8	6	75	4	119	177	17	176	1	Mendelian Genet	12/6/13	3	4	2
64142	7	4	57	5.3	128	75	0	165	0	Mendelian Genet	12/6/13	3	4	2
19872	11	11	100	5.2	92	117	1	196	0	Mendelian Genet	12/6/13	4	4	2
19472	5	1	20	3.6	72	124	0	177	0	Mendelian Genet	12/6/13	2	3	1
78979	7	3	43	2.1	92	184	3	212	2	Mendelian Genet	12/6/13	4	4	3

Figure 4: Summary Raw program output

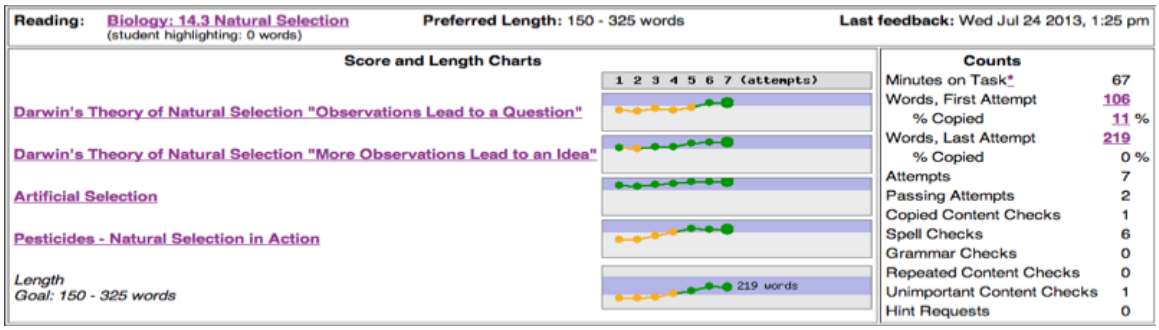
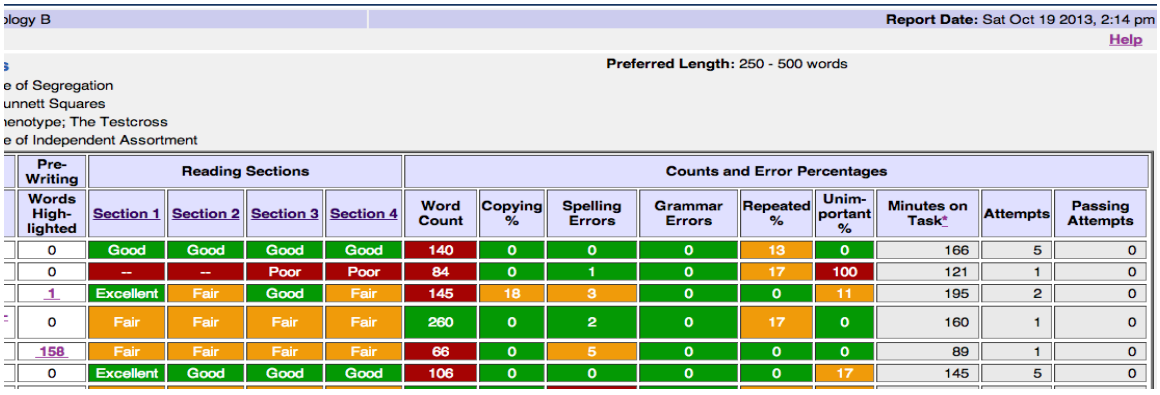


Figure 5: Summary Individual Section Student Feedback



	Pre-Writing	Reading Sections				Counts and Error Percentages								
	Words High-lighted	Section 1	Section 2	Section 3	Section 4	Word Count	Copying %	Spelling Errors	Grammar Errors	Repeated %	Unim-portant %	Minutes on Task*	Attempts	Passing Attempts
	0	Good	Good	Good	Good	140	0	0	0	13	0	166	5	0
	0	--	--	Poor	Poor	84	0	1	0	17	100	121	1	0
	1	Excellent	Fair	Good	Fair	145	18	3	0	0	11	195	2	0
	0	Fair	Fair	Fair	Fair	260	0	2	0	17	0	160	1	0
	158	Fair	Fair	Fair	Fair	66	0	5	0	0	0	89	1	0
	0	Excellent	Good	Good	Good	106	0	0	0	0	17	145	5	0

Figure 6: Summary Activity Student Feedback

3.4 Analytic Treatment

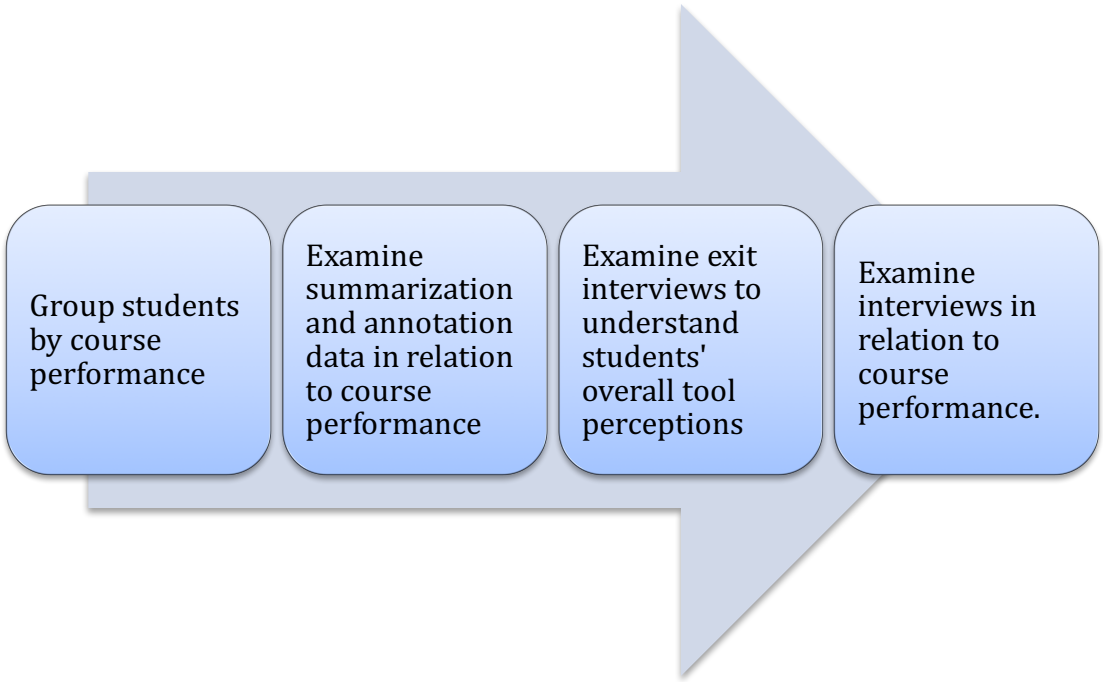
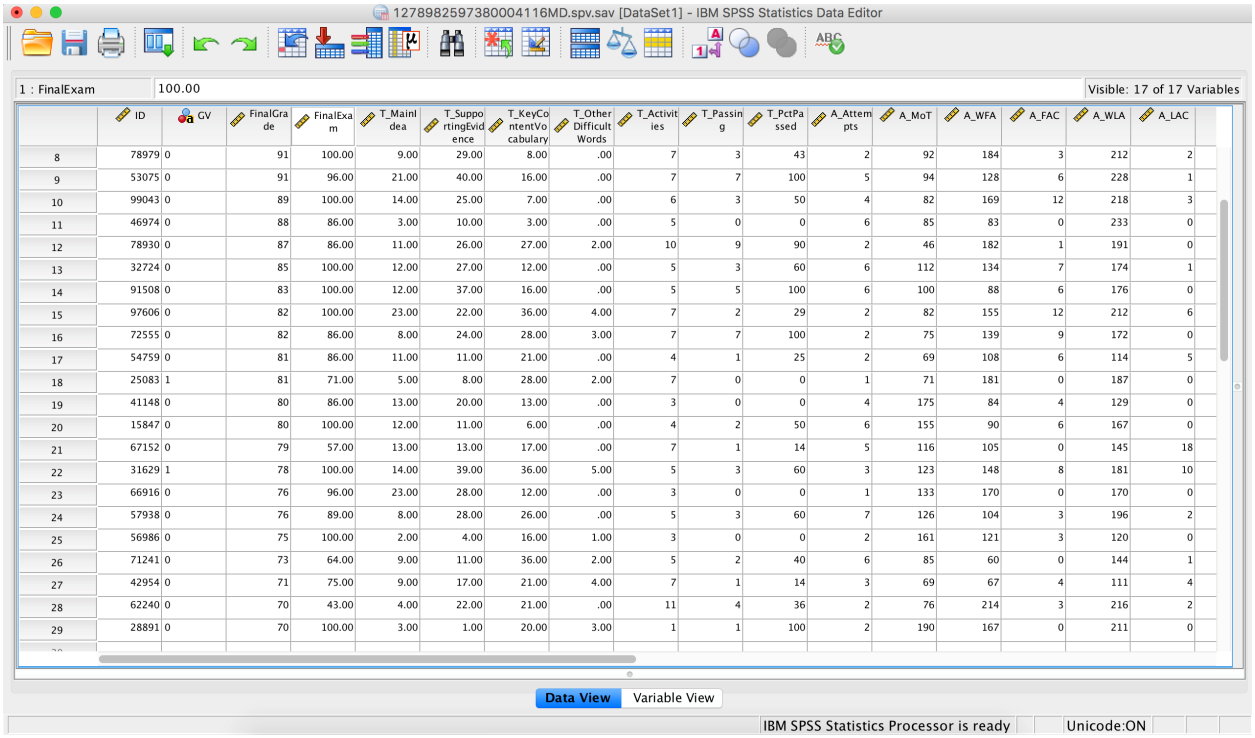


Figure 7: Analytic Treatment

To understand whether students differ in their strategic literacy use based on course performance students were first placed into one of three groups. Appendix K presents the three groups that guided this analysis. Students were grouped based on their final course grade. This was done instead of averaging test grades because the final test did not have a wide distribution. Students in the Blue group earned a final grade between 90 and 100. Students in the Green group earned a final grade between 80 and 89. Students in the Beige group earned a final grade between 70 and 79.

Next SPSS was used to explore the Write-to-Learn and annotation measures (See Figure 8). SPSS was used to visualize how students navigated the credit recovery context based on course grade primarily through descriptive. Clustered bar graphs are presented. The goal of this inquiry is to identify differences not to emphasize significance. Identifying any trends was the focus.



	ID	GV	FinalGrade	FinalExam	T_Mainldea	T_SupportingEvidence	T_KeyContentVocabulary	T_OtherDifficultWords	T_Activities	T_Passing	T_PctPassed	A_Attempts	A_MoT	A_WFA	A_FAC	A_WLA	A_LAC
8	78979	0	91	100.00	9.00	29.00	8.00	.00	7	3	43	2	92	184	3	212	2
9	53075	0	91	96.00	21.00	40.00	16.00	.00	7	7	100	5	94	128	6	228	1
10	99043	0	89	100.00	14.00	25.00	7.00	.00	6	3	50	4	82	169	12	218	3
11	46974	0	88	86.00	3.00	10.00	3.00	.00	5	0	0	6	85	83	0	233	0
12	78930	0	87	86.00	11.00	26.00	27.00	2.00	10	9	90	2	46	182	1	191	0
13	32724	0	85	100.00	12.00	27.00	12.00	.00	5	3	60	6	112	134	7	174	1
14	91508	0	83	100.00	12.00	37.00	16.00	.00	5	5	100	6	100	88	6	176	0
15	97606	0	82	100.00	23.00	22.00	36.00	4.00	7	2	29	2	82	155	12	212	6
16	72555	0	82	86.00	8.00	24.00	28.00	3.00	7	7	100	2	75	139	9	172	0
17	54759	0	81	86.00	11.00	11.00	21.00	.00	4	1	25	2	69	108	6	114	5
18	25083	1	81	71.00	5.00	8.00	28.00	2.00	7	0	0	1	71	181	0	187	0
19	41148	0	80	86.00	13.00	20.00	13.00	.00	3	0	0	4	175	84	4	129	0
20	15847	0	80	100.00	12.00	11.00	6.00	.00	4	2	50	6	155	90	6	167	0
21	67152	0	79	57.00	13.00	13.00	17.00	.00	7	1	14	5	116	105	0	145	18
22	31629	1	78	100.00	14.00	39.00	36.00	5.00	5	3	60	3	123	148	8	181	10
23	66916	0	76	96.00	23.00	28.00	12.00	.00	3	0	0	1	133	170	0	170	0
24	57938	0	76	89.00	8.00	28.00	26.00	.00	5	3	60	7	126	104	3	196	2
25	56986	0	75	100.00	2.00	4.00	16.00	1.00	3	0	0	2	161	121	3	120	0
26	71241	0	73	64.00	9.00	11.00	36.00	2.00	5	2	40	6	85	60	0	144	1
27	42954	0	71	75.00	9.00	17.00	21.00	4.00	7	1	14	3	69	67	4	111	4
28	62240	0	70	43.00	4.00	22.00	21.00	.00	11	4	36	2	76	214	3	216	2
29	28891	0	70	100.00	3.00	1.00	20.00	3.00	1	1	100	2	190	167	0	211	0

Figure 8: SPSS Data Representation

Exit interviews were used to explore whether students are aware of the benefits of strategic literacy supports. To analyze the exit interviews, I focused on students' perceptions of specific language support tools (e.g., annotation, summary, lecture, and discussion) in relation to reading and learning science. In vivo coding (Saldaña, 2015) was used to index students' thoughts on the usefulness and function of the literacy support tools using Nvivo (See Figure 9). Indexing student thoughts produced a set of categories which I used to organize all the students. Some of the categories were collapsed together due to similarity, after students were organized into categories using a table. This analytic work appears in Appendices J and K.

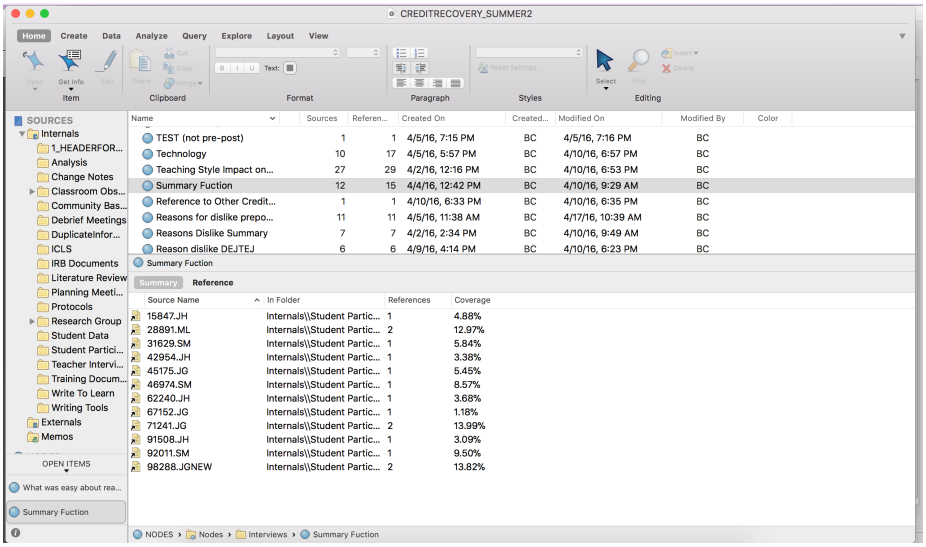


Figure 9: Nvivo Data Representation

To facilitate comparison by course performance students were placed into the same three groups. I read each interview transcripts and recorded notes to begin this process. I used the notes to cluster the responses. Next, I reviewed the transcripts again and inserted student interview responses next to each theme in matrices. These matrices are provided in the appendix. These examples included identification numbers and student group numbers to facilitate examination of the interview responses in relation to student performance. Next, I examined the matrices to attempt to describe any pattern related to students' perceptions of the relative usefulness of each tool for reading and learning science. I indexed students' thoughts about the function of the tools to potentially identify any awareness characteristics of successful and less successful in the intervention course.

3.5 Summary

In this chapter: I have (1) set the methodological context; (2) described the overall intervention; (3) presented the research questions and analytic method rationale; (4) presented the study context; (5) discussed data sources; and (6) presented the analytic treatment. In the next chapter, the results are presented and discussed.

4 Results and Discussion

In this chapter, I present and discuss the results related to the research questions. The program understudy sought to remediate students' prior course failure in high school biology using the theory presented in Figure 2. Specifically, this study sought to understand how the strategic literacy supports did (or did not) support student success in the designed intervention course.). Students were split into three groups based on their final course grade to explore performance variation in relation to the strategic literacy supports (summarization and annotation. Final course grades included test scores, lab scores, completion of multi-entry-journals, completion of annotations, and students' overall performance with Write-To-Learn. Initially, I sought to group students by their final test score, but 15 out of 29 students scored 100 (See Table 7). When these final test scores were examined in relation to final course scores I learned that three students who scored 100 on the final exam earned a C in the intervention course. Students' performance on the final exam did not always match course performance. This discovery led me to explore learner performance based on final course grade. Students in the Blue group earned a final grade between 90 and 100. Students in the Green group earned a final grade between 80 and 89. Students in the Beige group earned a final grade between 70 and 79. The average final course grade for the intervention course was 83.62% (Std. Error: 1.814; Std. Deviation: 7.594[23]).

Research Question 1. Does performance in the intervention course appear related to how students utilized literacy supports (summarization and annotation)? Similar to prior studies, the results demonstrate performance in the intervention course may be related to some student summarization and annotation practices. First, the summarization results are presented followed

[23] Minimum: 70 | Maximum: 94

by the annotation results. The summary measures outlined in the data tables located at Appendices J and K were pre-embedded in the Write-To-Learn program. In the table below you will find an explanation of the importance of each summary measure.

Measures	Importance
Total Number of Activities Total Number with Passing Scores Total Percent Passed Average Number of Attempts Average Minutes on First Task	Window into student engagement with WTL Window into student success with WTL
Average Number of Words on First Attempt Average Number of Words on Last Attempt	Window into change in length of student summaries
Average Percent Copied on First Attempt Average Percent Copied on Last Attempt	Window into amount student copied

Table 7: Potential Importance of Summary Measures

Clustered bar graphs were created to explore differences in Write to Learn Performance by course performance. This study does highlight those differences but does not engage significance due to sample size. First, I will present the results that I anticipated based on data analyses from the 2012 intervention. The students in the Blue group produced a higher mean number of words (149.33 words, SD 67.069) on their initial attempt compared to their Green (128.45, SD 39.617) and Beige (128.44, SD 50.718) counterparts (Figure 10). The students in the Blue group produced a higher mean number of words (200.78 words, SD 44.031) on their final attempt compared to their Green (179.36, SD 35.615) and Beige (166.00, SD 38.295) counterparts (Figure 11). The mean number of words increased for all groups between initial and final summary. This blue group averages suggests the number of words students produced in their summaries could be connected to course performance.

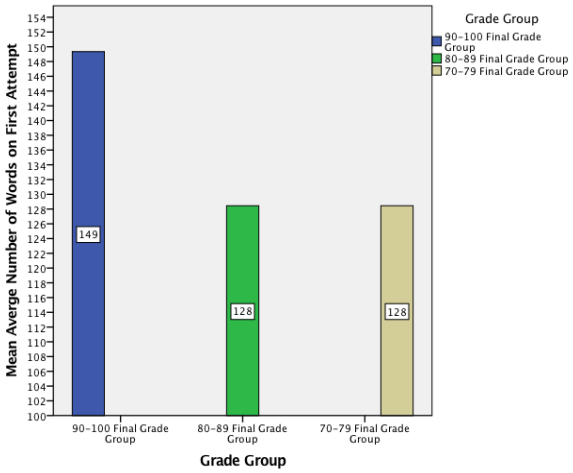


Figure 10: Average Number of Words First Attempt by Performance Group

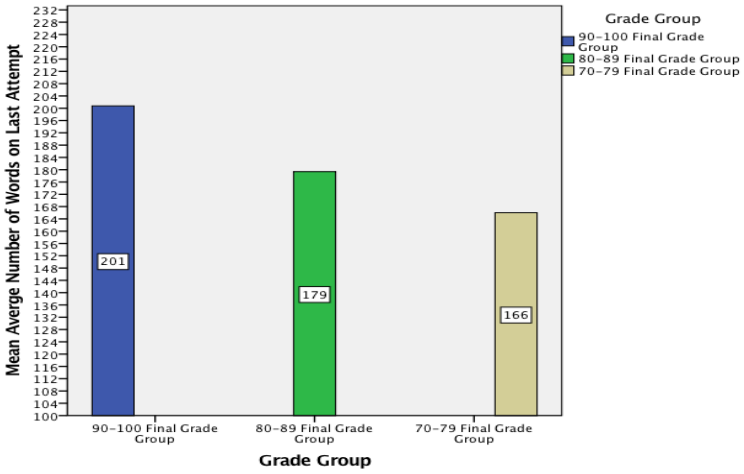


Figure 11**:** Average Number of Words Final Attempt by Performance Group

The students in the Blue group collectively had a higher mean module completion rate (70.56%, SD 22.148) compared to their Green (45.82%, SD 38.825) and Beige (36%, SD 33.211) counterparts (Figure 12). This result suggests students in the blue group experienced greater success completing summaries. It is important to note that completion rates reflect students' ability to write a summary deemed good by Write-to-Learn.

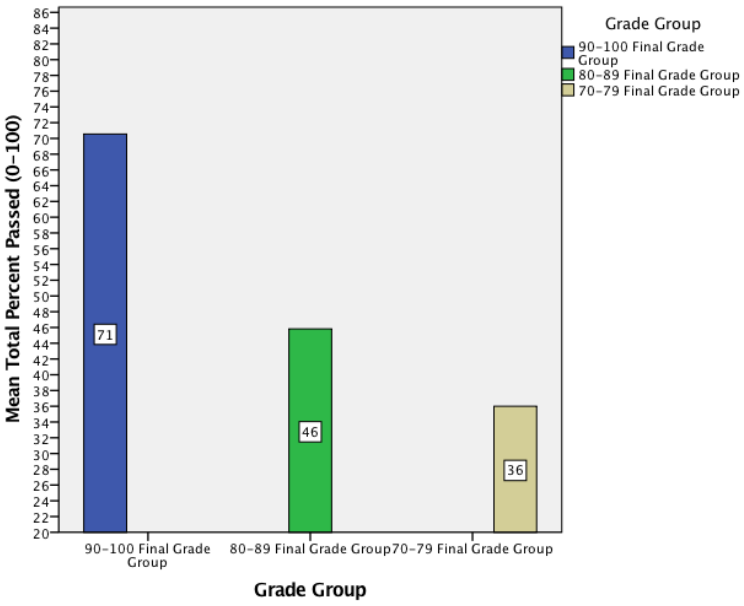


Figure 12**:** Total Percent Passed by Performance Group

The students in the Blue group collectively had a higher mean attempt frequency per module (4.92, SD 1.470) compared to their Green (3.63, SD 1.946) and Beige (3.40, SD 1.915) counterparts (Figure 13). This suggest students in the blue group were more likely to attempt writing a summary for a module multiple times compared to their counterparts in the green and beige groups.

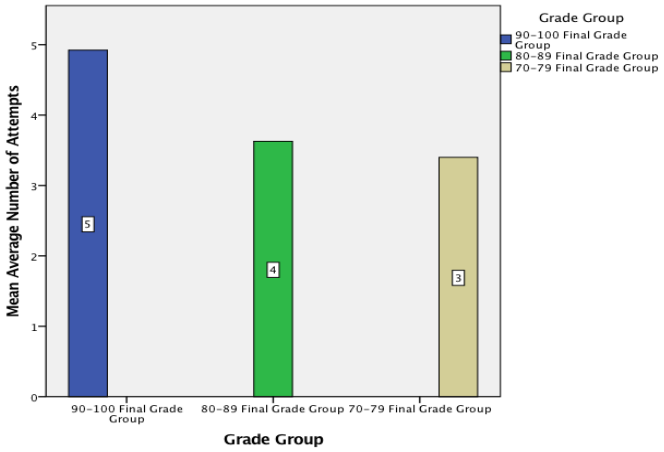


Figure 13: Average Number of Attempts by Performance Group

Next, I will present the results that were more surprising. The students in the Beige group (119.89 minutes SD 39.644) collectively spent more time on the task during the first attempt compared to their Blue (85.44, SD 13.393) and Green (95.64, SD 38.471) counterparts (Figure 14). This means that students who were less successful (beige and green groups) spent more time composing their first summary submission for each module compared to their blue counterparts.

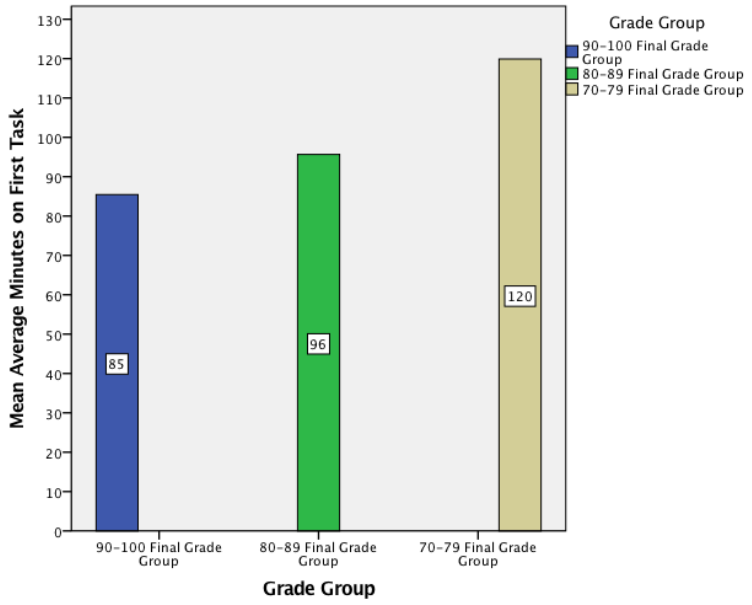


Figure 14: Average Time Spent on First Task

The students in the Green group (5.73%, SD 4.268) collectively copied more than their Blue (3.11, SD 3.10) and Beige (2.33, SD 2.293) counterparts during their first attempt (Figure 15). The students in the Beige group (4.11%, SD 6.092) collectively copied more than their Blue (0.44, SD 0.726) and Green (1.36, SD 2.248) counterparts during their final attempt (Figure 16). The percent copied increased for the Beige group between their first and final summary attempt. This suggest that some of the less successful students responded to poor summary feedback indications by increasing the amount of copied text from the reading selection.

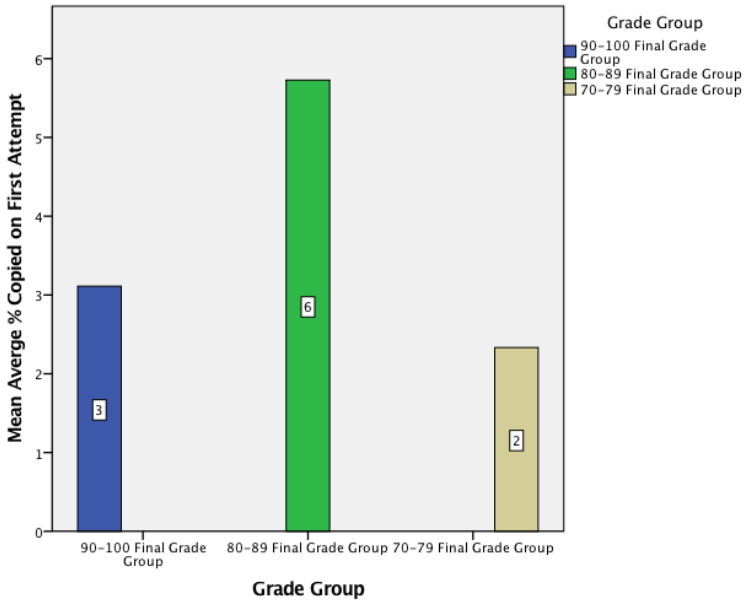


Figure 15: Average Percent Copied on First Attempt

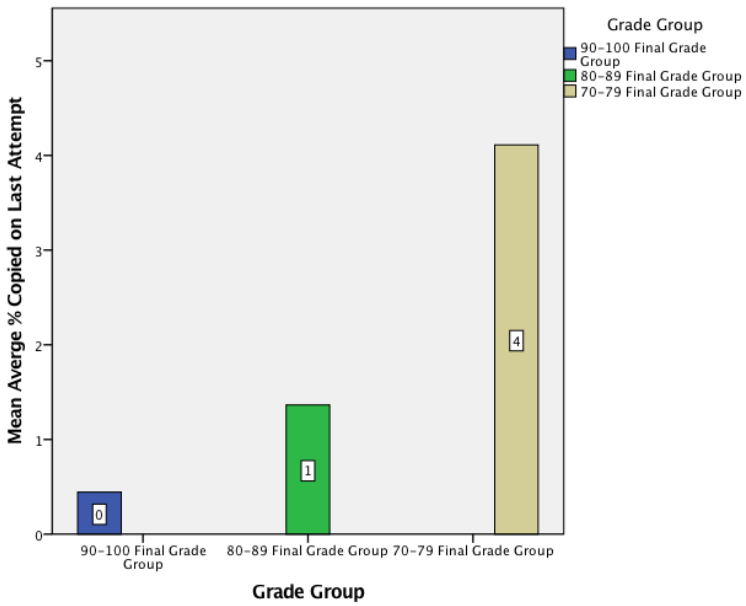


Figure 16: Average Percent Copied on Final Attempt

Descriptive Statistics for Annotation

Students were asked to annotate for the main idea, supporting evidence, key content vocabulary, and other difficult words. Appendices J and K presents descriptive statistics for each measure. Clustered bar graphs were created to explore differences in Write to Learn Performance by course performance. This study does highlight those differences but does not engage significance due to the small sample size. First, I will present the results that were more or less anticipated. The students in the Blue group, on average, annotated more main ideas (16.667 annotations, SD 12.961) compared to their Green (11.273, SD 5.179) and Beige (9.444, SD 6.579) counterparts (Figure 17). This suggest the students who performed best (students in the blue group) in the course annotated more main ideas than their peers in the green and beige groups.

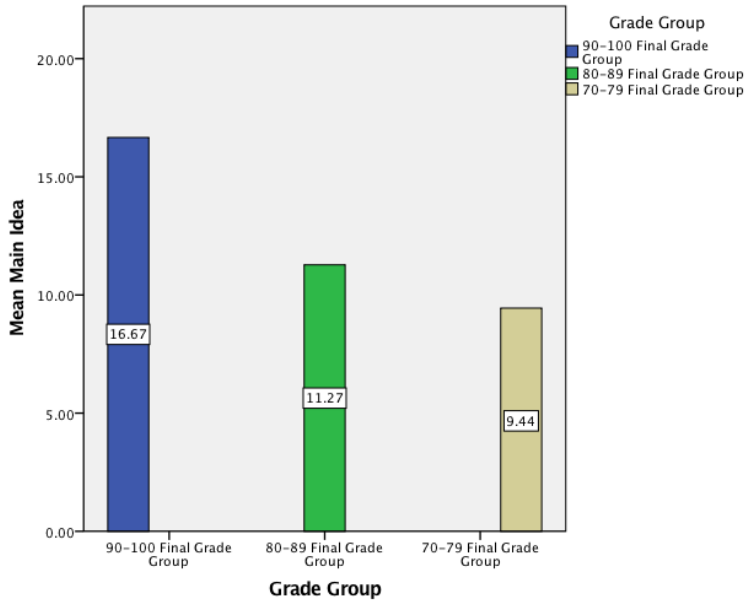


Figure 17: Average Main Ideas Annotated by Performance Group

The students in the Blue group, on average, also annotated more supporting evidence (32 annotations, SD 11.292) compared to their Green (20.091, SD 9.082) and Beige (18.111, SD 12.333) counterparts (Figure 18). This suggest the students who performed best (students in the

blue group) in the course also tended to annotate more supporting evidence than their peers in the green and beige groups.

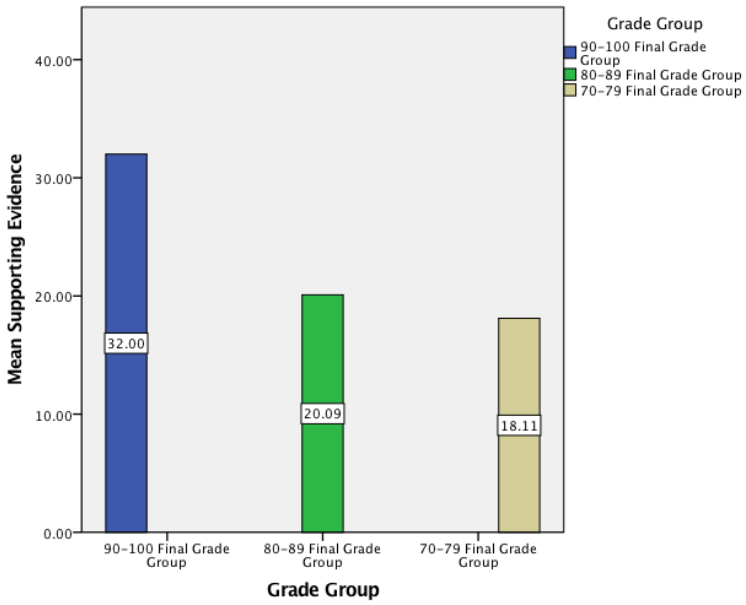


Figure 18: Average Supporting Evidence Annotated by Performance Group

One result that I found particularly interesting was the students in the Beige group (22.778 annotations, SD 8.438) on average, annotated more key content vocabulary compared to their Green (17.909, SD 10.812) and Blue (18.111, SD 9.144) counterparts (Figure 19). This suggest students in the lowest performing group focused more on key content vocabulary than their higher performing peers in the blue and green groups.

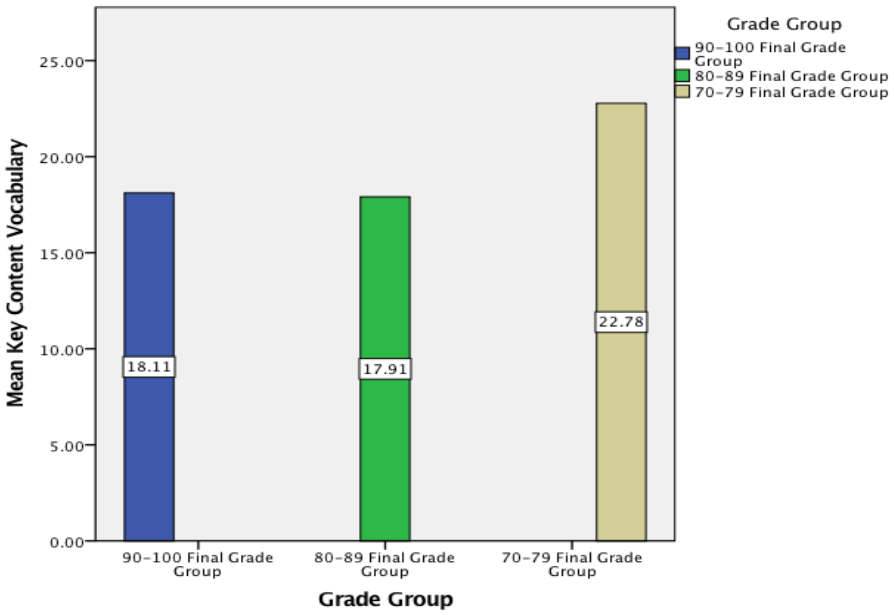


Figure 19: Average Key Content Vocabulary Annotated by Performance Group

Another result that I found particularly interesting was the students in the Beige group (1.667 annotations, SD 1.936) on average, annotated more other difficult words vocabulary compared to their Green (1, SD 1.483) and Blue (.889, SD 1.364) counterparts (Figure 20).). This suggest students in the lowest performing group identified more additional difficult words than their higher performing peers in the blue and green groups.

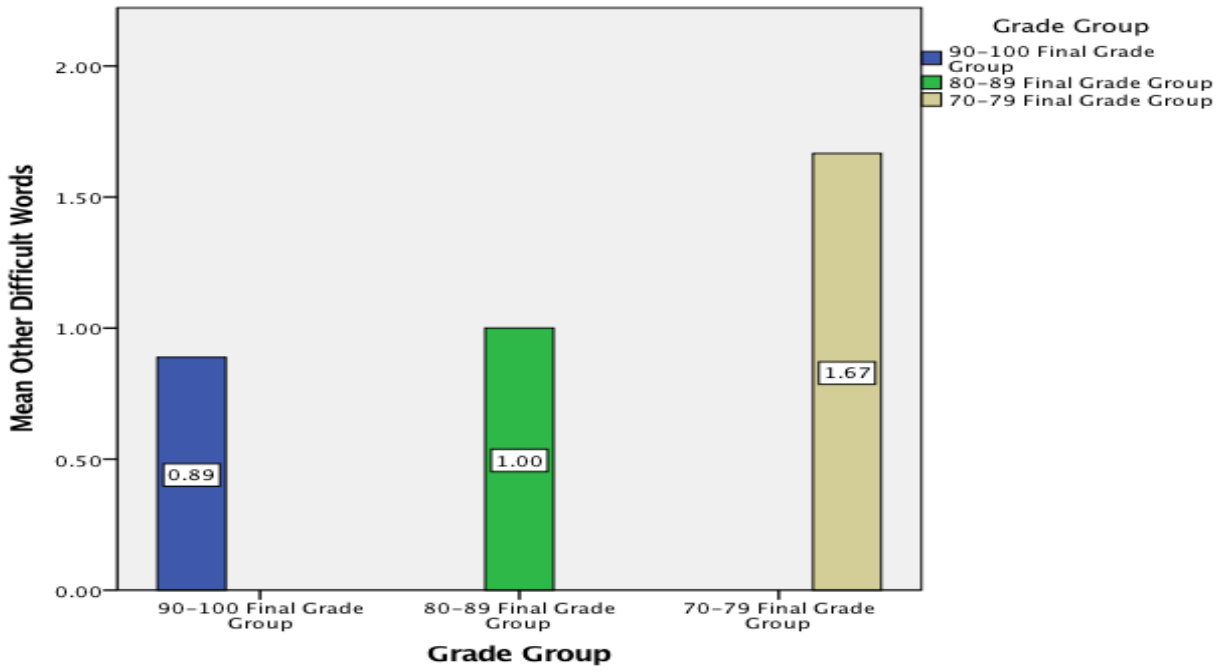


Figure 20 Average Other Difficult Words Annotated by Performance Group

Summary Research Question 1. Performance in the intervention course appears related to how some students utilized literacy supports (summarization and annotation). Students in the high performing Blue group, on average, produced more words in their summaries, made more summary attempts, and experienced a higher completion rate, than students in the Green and Beige groups. Students in the Blue group, on average, also annotated more main ideas and supporting evidence than their counterparts in the Green and Beige groups. Less successful students in the Beige group, on average annotated more key content vocabulary and other difficult words than their counterparts in the Green and Blue groups.

Research Question 1 Discussion. Some students may differ in their strategic literacy tool use and these differences may be related to *course performance*. The presented results do support previous research suggesting annotating for main idea and supporting evidence is fruitful for student learning (Gomez et al., 2016; Zywica & Gomez, 2008). The results underscore an

important reminder that annotation is a practice that must be developed. For example, the results raise questions about the quality of student annotation practices. When students annotate large amounts of key content vocabulary and other difficult words, is it an indication they need additional support uncovering main ideas and supporting evidence? This questions are being raised without hypotheses because the quality of student annotations was not examined directly in this study.

In the traditional classroom context teachers, commonly indicate that they do not have the time or resources to help students manage their reading loads and to provide quality feedback on written work. This intervention facilitated learner individualization using the Write-to-Learn software and increasing the number of adults to support student learning. The results do demonstrate how the summary technology and its embedded feedback mechanisms may function in conjunction with the strategic literacy tools to support student learning in ways that are observable. Future interventions should include targeted teaching based on how students are using the support strategies individually because comprehension nor literacy development writ large is static (Lee & Sprately, 2010). For example, how might the Beige group be supported to leverage the benefits the Blue group seem to accrue by annotating main ideas. In the next section, I turn to research question 2 which examines student intervention awareness.

Research Question 2. Are all students aware of the benefits of specific literacy supports? Do patterns exist in student awareness amongst students by performance?

Students did not express interest for one support tool above and beyond the other support tools (See Appendix K). Students did not express overwhelming dislike for any one support tool (See Appendix K). Annotation and Pre-Post Assessments did receive the highest frequency of responses indicating tool students liked least. Interesting to note students did generally specify

their dislike for the pre-assessment assessment, while others simply implicated test broadly in their responses. WritetoLearn (n= 9) and Annotation (n =15) were believed to support reading the most amongst those students interviewed (See Appendix K). While some students did not identify a tool as hard to use, some students did see DEJ (n =8) and annotation (n=6) as difficult to use (See Appendix K). Amongst the strategy components, Students most frequently reported that Annotation (n=9), Pre-post assessments (n=11), and DEJ (n=6) helped them to learn science (See Appendix K). Students again were sometimes specific with regard to the assessment strategy. Two students specified post assessments, three students specified pre-assessments, and the remaining six students spoke to them together. Table 7 presents another example showing student preferences did not cluster by course performance.

Support	Student Interview Response
WritetoLearn 5	Blue 1 Green 0 Beige 4
PrePost Assessments 7	Blue 3 Green 3 Beige 1
DEJ 8	Blue 3 Green 3 Beige 2
Annotation 10	Blue 3 Green 5 Beige 2

Table 8: Which tool did you like the best?

To explore whether students' feelings were patterned by course performance, responses were reexamined in relation to the group number. There were no observable indications that students' feelings towards the tools was related to course final course grade. To illustrate, the

students (n =8) who indicated they liked the DEJ support tool best were not all from a specific group. Three were from the blue group, three were from the green group, and two were from the beige group. This result demonstrates students did not prefer tools in accordance with their overall course performance. This finding highlights the ability of the tool set used in the intervention to address different needs and appeal to different students for different reasons. As discussed, in chapter 3, to understand whether students were aware of the benefits of specific literacy, student exit interview responses were examined in relation to each program element to understand how students understood the program design elements (specifically annotation and summary). Students differed in their ability to articulate the benefits of specific literacy supports. Furthermore, there was no clear discernable awareness pattern by performance. In the next two sections, results for annotation and summary are presented. Additional results can be found in Appendices J and K.

Annotation Function. Students articulated in the exit interviews that annotation served multiple functions. Functions included: {1} make text structures visible (notably main idea and supporting details), {2} reduce confusion, {3} supported summary writing, {4} aid recall, and {5} foster affinity for reading. Several students acknowledge annotation was helpful in helping them get through large amounts of information. Table 7 presents student responses that characterize each notion. The point is to illustrate the functions identified by students. These results do not imply every student was able to articulate strategic function. More examples can be found in Appendices J and K.

Function	Illustration
Make text structures visible	"At first I didn't know what to do with the readings, like, how to find the main ideas. Stuff like that. Then, like, later on you guys teach me how to, find it." [19872-Blue Group] I didn't like really know that I could find the main idea and supporting evidence in the- the same article, and it gives you everything." [41148-Green Group] "Well because it helps you a lot to get the information out of the pages, and getting the main idea, the suporti- supporting evidence of it." [57938-Beige Group]
Reduce confusion and promote understanding	"It's like back then like I didn't, I really didn't know how to like uhm like I was, sometimes I didn't understand what I was reading, but after we started doing this I started getting it a little bit more." [78930-Blue Group] "Because when I read it, I .. and I annotate I actually understand what it's saying instead of just reading it and not understanding nothing." [56986-Beige Group]
Support summary writing	"When I read a paragraph like I would just pick out like the thing that Miss taught us, the main idea and then an example that supported that idea, and then wrote like a little sentence or two about it." [44950-Blue Group]
Aid recall	"Because, it was, easier, easier to remember the stuff." [54759-Green Group] "Like if there's like a main idea while I'm reading and I highlight it and then later when I need it, like you get what it was. It's right there." [55064-Blue Group]
Foster affinity for reading	"Well cause I didn't like to read now since I like annotating I started liking to read." [32724- Green Group]

Table 9: Summary Table: Annotation Functions from Student Perspective

Summary Function. Students perceived that summarization to serve functions largely related to the technology. Functions included: {1} provide additional support, {2} improve language and self-confidence, {3} support summary writing. Below you will find student responses that characterize each notion. Table 8 presents student responses that characterize each

notion. The point is to illustrate the functions identified by students. More examples can be found in Appendices J and K.

Function	Illustration
Provide additional support	"28891 Oh, I think it was easier 'cause, like, instead of having to write it with paper, like, you could do it with technology. [GRADUATE STUDENT] Mmm hmmm 28891 And plus you could, like, you could have it opened up to the, to where you're typing the journal entry in and you could also have the summary opened up. You could also highlight it, explain, you could have it read to you- [GRADUATE STUDENT] -Mmm…- 28891 -It shows you the definitions and stuff. [GRADUATE STUDENT] Okay. So you liked all of those parts of that particular tool- 28891 -Yeah- [GRADUATE STUDENT] -You found them helpful? 28891 Yeah Mmm…- 28891 -It shows you the definitions and stuff. [GRADUATE STUDENT] Okay. So you liked all of those parts of that particular tool- 28891 -Yeah- [GRADUATE STUDENT] -You found them helpful? 28891 Yeah" [28891-Beige Group] Like, I feel a little more confident about it than I did before. [GRADUATE STUDENT] Why? 28891 'Cause like now if we have, like, a certain topic I could just go to Write To Learn, look it up, like, have 'em read it to me. [28891-Beige Group]
Improve language and self-confidence	"Yeah, the summaries well, they just helps you improve it so, you make it sound more your grade level not so like your barely learning this. Just makes it sound more professional." [46974- Green Group] "Well, it helped me how to like how to like type good like good English" [15847- Green Group]
Support summary writing	"Well cause now I have to like be carefully like to make my summaries like good and stuff. [GRADUATE STUDENT] Mhmm. 91508 To make it better not like whatevers. 02:40 [GRADUATE STUDENT] Ok." [91508-Green Group]

Table 10: Summary Table: Summary Functions from Student Perspective

Summary and Discussion Research Question 2. Similar to previous research, strategic language tools and routines appear to help learners identify structural features in text, and use those features to communicate in science (ex. Write summaries) (Gomez et al., 2016; Herman et al., 2010; Romance and Vitale, 2005; Zywica & Gomez, 2008). Across groups some students were able to operationalize and articulate strategy functions after four weeks while others were

not. Student varied in their level of awareness of the specific strategies function. As anticipated, there were distinctions in how students understood the tools overall. Some students did appear able to articulate the function of annotation and multiple entry journals better than summary. Any variability does not appear to related to performance (course grade) in the intervention course. Annotation functions identified by students included: (1) make text structures visible (notably main idea and supporting details); (2) reduce confusion; (3) supported summary writing; (4) aid recall; and (5) foster affinity for reading. Several students acknowledge annotation was helpful in helping them get through large amounts of information. One student stated: "Well cause I didn't like to read now since I like annotating I started liking to read" [32724- Green Group]. It is clear this student believes there is a link between his performance before and after annotating. This type of epiphany alongside the literacy strategies may have the potential to promote lifelong learning. While elucidating the potential to accomplish so much for students with annotation, these results also underscore why students may not have previously experienced success in their science coursework. If a student is confused in the course reading to learn, with zero strategies (annotation or otherwise) to mediate confusion, failure will occur. No one should be shocked.

This possibly suggest future interventions might benefit from explicitly teaching tool function to students in ways similar to what teachers receive in their professional development. This would ensure student sense making is fostered. The reality that many underserved students have to watch their teachers be developed on the sidelines, sometimes in their classroom, while time waits for no one (Goldman & Snow, 2015; Wilkinson & Gaffney, 2016). This means that new ways to support student learning will have to continue to be developed to attempt to guarantee students are not penalized based on teacher access.

Students spoke about WritetoLearn and summarization in conjunction with one another. This is important because students were able to see immediate feedback upon submitting summaries and they were able to see changes in themselves as learners. This is aligned with the notion undergirding this research that increasing student strategic repertories can produce learning gains. Additionally, it demonstrates the power of technology and the ability of some students to engage in sense making that allowed them to connect the program parts at least partially. Next, we move to research question 3.

Research Question 3. What (if any) were the awareness characteristics of successful and less successful in the intervention? To attempt to identify any common awareness characteristics of successful and less successful students in function awareness analytic charts were examined. The study revealed no observable awareness characteristics of successful, less successful, and unsuccessful students in the credit recovery course. Students were not overly represented within one performance cluster in relation their support preferences or their ability to articulate the affordances of the program components. One illustration is in Table 11. You can clearly see that students across groups articulated tool functions. For example, four students from the blue group, pointed out annotations make text structures visible, seven students from the green group, pointed out annotations make text structures visible, and seven students from the beige group pointed out annotations make text structures visible. More examples can be found in Appendices J and K.

Function	Group Response Representation
Make text structures visible	Blue + + + + Green + + + + + + + Beige + + + + + + +
Reduce confusion and promote understanding	Blue Green + Beige + +
Support summary writing	Blue ++ Green Beige
Aid recall	Blue + Green + Beige
Foster affinity for reading	Blue Green + Beige

Table 11: Group Response Representation for Annotation Function

Summary and Discussion Research Question 3. Based on the data it appears there were no awareness characteristics distinguishing successful and less successful students in the intervention. The results are discussed in the next chapter. Nevertheless, for this particular research question it is important to recall this study design since the results are limited. This study included 29 students who successfully recovered credit. The average final course grade for the revised summer course was 83.62% (Std. Error: 1.814; Std. Deviation: 7.594[24]). These students were placed into 3 groups based on final course grade. Students in the Blue group (n = 11) earned a final grade between 90 and 100. Students in the Green group (n = 9) earned a final grade between 80 and 89. Students in the Beige group earned a final grade between 70 and 79

[24] Minimum: 70 | Maximum: 94

(n=9). I did expect to see students in the Blue group to be more aware of strategic function than the green and beige group. This was not the case. A bigger sample or more performance variation could shed more light on this question.

Students were not overly represented within one performance cluster in relation their ability to articulate the affordances of the program components. This gives hope that some students can engage in strategy uptake relatively quickly in ways that are consequential for learning.

Summary. Performance in the intervention course appears related to support indicators (summarization and annotation). Some students were able to articulate the benefits of specific literacy supports. Patterns do not appear to exist in support function awareness amongst students by performance groups. No discernable awareness characteristics distinguished successful and less successful students in the intervention. In the next and final chapter, I will discuss the research contribution, the limitations of this research study, the delimitations of this research study, and recommendations for next steps.

5 CONCLUSION

This research explored a successful intervention in a high poverty context to determine whether the program design impacted course outcomes to facilitate the development of equitable learning environments. This is critical in urban education where often education innovations end up not producing their promised gains for underserved students. This includes English language learners who comprised at least half of the participants. Each student included in this study successfully earned previously forfeited a high school science credit. This program presented students an opportunity to recover credit due to course failure.

This dissertation sought to explore the intervention opportunity with students as the primary unit of analysis. This study sought to (1) To understand whether students differ in their strategic literacy use based on course performance descriptive information was analyzed; (2) To explore whether students are aware of the benefits of strategic literacy supports exit interviews were analyzed; and (3) To attempt to identify any common awareness characteristics of successful and less successful students function awareness was examined by group cluster. The findings from this study suggest that students' usage of strategic literacy support tools influenced positive course outcomes. In the sections that follow, I will the discuss: (1) the contribution of this research; (2) the limitations of this research study; (3) the delimitations of this research study; and (4) recommendations and possible next steps for research.

Research Contribution. The academic discourse and disciplinary concepts that characterize high school science reading *demand* different instructional approaches than those required by the narrative text students encountered in their earlier schooling (Biancarosa & Snow, 2006; Lee & Spratley, 2010; Snow & Biancarosa, 2003). Developing an awareness of text features, and how to use them to build content understanding is essential for learners. This study provides positive

support for disciplinary literacy (strategies and support tools) in high school science classrooms in the credit recovery context. As pointed out in Chapter 2, not much research has been done pertaining to remediating course failure in science. This study provides one rich example of how science and literacy were coupled in an intervention where most students ended up successfully recovering previously forfeited science course credit. Each student who participated in this study previously experienced science course failure and successfully recovered science credit during the intervention.

This study demonstrated that *students* who previously experienced failure with high school science coursework *can* benefit (and succeed) when strategic literacy is coupled to science content. In addition to benefiting, some students can articulate strategic function. The biggest lesson for practitioners in this study is students can simultaneously acquire content and learning strategies. This results suggest students do engage in some sense-making during strategy/tool utilization by highlighting students variably engage in strategy uptake.

This research does support previous research suggesting that providing students who previously failed biology access to science text can indeed be an effective strategy for increasing science achievement (Cooper et al., 2014; Gomez et al., 2014; Gomez et al., 2016). This study offers an alternative hybrid credit recovery method that can support students who have literacy challenges that hinder success in online environments due to the language demands and lack of access to physical teachers. Despite the large proliferation of credit recovery programs, credit recovery programs also face scrutiny relating to quality and rigor. Some critics argue that credit recovery classes allow students to accumulate credits without doing the same work required in the regular class context. I do not take a position on these issues because there exists great variation in the existing credit recovery programs thereby rendering any characterization

minimally useful. That said, I do support efforts to ensure quality and rigor in credit recovery frameworks. Not many detailed research accounts exist in the credit recovery domain.

This research provides the research and practice communities a window into how some traditionally underserved students were able to articulate learning processes after one four-week credit recovery course. This is important because sometimes learning environment designs break down when they are implemented. Additionally, time is a limited in schools. This is compounded by the reality that teachers and students sometimes both need strategic development (Goldmsn & Snow, 2015; Pearson, Moje, Greenleaf, 2010; Wilkinson & Gaffney, 2016). Developing students' metacognition in ways that allow students to regulate their learning may produce more equitable (and perhaps at a faster pace) learning and life outcomes for students while teachers are being recruited, trained, and developed to emphasize it (Schoenbach et al., 2003). Most of the programs mentioned in chapter 2 take months and years to implement starting with teacher professional development (example: reading apprenticeship). This study suggests it can be fruitful for learning for students to receive development simultaneously. This approach may provide students a window into the black box of teaching and learning in ways that promote students' long term success. Next, I discuss the limitations and delimitations of the study.

Limitations. A study of students' utilization and perception of strategic literacy supports potentially affords opportunities to identify themes about the larger population. Four limitations will be discussed. First, this study makes use of archival data that were collected in the summer of 2013. While I am familiar with the data as a member of the research team, the data were not completely analyzed immediately. This is a deviation from what is typically recommended with case study research. However, the research team has been actively engaged with thinking about the data from previous instantiations of the program.

Second, the sample was purposeful limited by a sampling of students from one California high school who previously failed to successfully complete Biology. Due to the sample size, results may not be generalizable beyond the specific study site.

Third, the participants all previously failed the course. This means that there is potential for test-retest effects. The goal of this research is to explore what the tools meant for student success and how students understood them. The fact that each student did not successfully complete the course previously does suggest students likely did not master the content previously. The assessments in the intervention did differ from those in the standard course format. To minimize impact to the scores due to instrumentation error, similar instruments were used for pre-and post-assessments (Creswell, 2008).

Finally, this study exclusively focuses on the student participants as the unit of analysis. Teacher effects (e.g., years of service, content area expertise, etc.) are not examined in this qualitative inquiry. I do recommend this analysis be completed as teaching and learning involves teachers and students working simultaneously.

Delimitations. Two factors have been intentionally controlled and may impact the study. First, in order to provide feasibility in collecting and managing data, the proposed study only includes students from one high school in California. Second, student participants are delimited to students who previously did not satisfactorily complete a high school Biology course.

Recommendations. Understanding connections students make between strategy used and their performance might enable practitioners and students harness more in their learning pursuits. In another study, Herman and colleagues found, strategy proficiency predicts unique variance in science achievement even when controlling for reading (Herman et al., 2010). They found that 26% to 40% of the variance in science achievement was explained by reading and strategy

proficiency collectively. They hypothesize that the inconsistency of annotation tool proficiency in predicting science achievement might be related to the variation in annotation use. Future work should interrogate this hypothesis while capturing data at strategic points to facilitate growth analyses for practices like summarization.

More research needs to be done to figure out ways to promote tool proficiency. In the future, I would like to do a more controlled experiment to determine the best ways to give students access to strategies. Based on this study, I believe a comparative study could be beneficial to understand how students engage in sense making upon introduction to various strategies. Specifically, a study with two conditions. In condition one, students would receive the course in the same way presented in this dissertation study. In condition two, students would participate in discussions about strategy functions and their impact on their success. This would allow us to understand better the negotiation process around learning that students often receive little support with navigating. In addition, this would allow for the interrogation of metacognition (metacognitive knowledge, metacognitive experiences, goals or task, and actions or strategies) more directly which is not so common explicitly in urban high school research (Flavell, 1979). I also recommend that studies be conducted to examine the spread of strategies within and across context in the lives of students.

Based on the result, policy makers and practitioners should consider finding ways to integrate student and teacher professional development. Practitioners should continue to grapple with how to integrate literacy within science and credit recovery contexts. Finally, researchers and practitioners may need to explicitly instruct students in strategic language approaches to ensure students understand the intended function of literacy support strategies and tools since not all students were able to demonstrate awareness. This recommendation advocates a guided approach

with a gradual release of responsibility as opposed to commonly advocated discovery approaches. High schools are not always structured to promote discovery methods. Students accomplished a lot in this intervention in 4 weeks using a guided approach. I wonder if more explicitness would yield even more learning.

Appendix A: IRB Approval Notice

University of California Los Angeles
10889 Wilshire Blvd, Suite 830
Los Angeles, CA 90095-1406

http://ora.research.ucla.edu/ohrpp
General Campus IRB: (310) 825-7122
Medical IRB: (310) 825-5344

APPROVAL NOTICE

DATE:	2/15/2017
TO:	LOUIS GOMEZ, Ph.D EDUCATION
FROM:	TODD FRANKE, PhD Chair, NGIRB
RE:	IRB#12-000759-CR-00003 2017 Review for IRB#12-000759 Intensive Language Support for Credit Recovery in Biology

The UCLA Institutional Review Board (UCLA IRB) has approved the submission listed below. UCLA's Federalwide Assurance (FWA) with Department of Health and Human Services is FWA00004642.

Submission and Review Information

Type of Submission	Continuing Review
Type of Review	Expedited Review
Approval Date for this Submission	2/15/2017
Expiration Date of the Study	2/14/2020
Funding Source(s)	1) Other: Pearson Publishing Company *Grant PI*: LOUIS GOMEZ

Specific Conditions for Approval

-- **Data Analysis Only** - the remaining research activities are limited to data analysis.

Regulatory Determinations

-- The UCLA IRB determined that the research meets the requirements for expedited review per 45 CFR 46.110 categories 6 and 7.

-- The IRB has determined that this study meets the criteria for a 3 year extended approval. (For reference, please see the OHRPP guidance document "Extended Approval for Minimal Risk Research Not Subject to Federal Oversight" at http://ora.research.ucla.edu/OHRPP/Documents/Policy/4/Extended_Approval.pdf)

Important Note: Approval by the Institutional Review Board does not, in and of itself, constitute approval for the implementation of this research. Other UCLA clearances and approvals or other external agency or collaborating institutional approvals may be required before study activities are initiated. Research undertaken in conjunction with outside entities, such as drug or device companies, are typically contractual in nature and require an agreement between the University and the entity.

General Conditions of Approval
As indicated in the PI Assurances as part of the IRB requirements for approval, the PI has ultimate responsibility for the conduct of the study, the ethical performance of the project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the IRB.

The PI and study team will comply with all UCLA policies and procedures, as well as with all applicable Federal, State, and local laws regarding the protection of human subjects in research, including, but not limited to, the following:

- Ensuring that the personnel performing the project are qualified, appropriately trained, and will adhere to the provisions of the approved protocol,
- Implementing no changes in the approved protocol or consent process or documents without prior IRB approval (except in an emergency, if necessary to safeguard the well-being of human subjects and then notifying the IRB as soon as possible afterwards),
- Obtaining the legally effective informed consent from human subjects of their legally responsible representative, and using only the currently approved consent process and stamped consent documents, as appropriate, with human subjects,
- Reporting serious or unexpected adverse events as well as protocol violations or other incidents related to the protocol to the IRB according to the OHRPP reporting requirements.
- Assuring that adequate resources to protect research participants (i.e., personnel, funding, time, equipment and space) are in place before implementing the research project, and that the research will stop if adequate resources become unavailable.
- Arranging for a co-investigator to assume direct responsibility of the study if the PI will be unavailable to direct this research personally, for example, when on sabbatical leave or vacation or other absences. Either this person is named as co-investigator in this application, or advising IRB via webIRB in advance of such arrangements.

APPENDIX B: Teacher Consent Form
UNIVERSITY OF CALIFORNIA, LOS ANGELES

Teacher Consent Form

Intensive Language Support for Credit Recovery in Biology

INVESTIGATORS:
Louis Gomez, Ph.D. and Kimberley Gomez, Ph.D., University of California, Los Angeles

Introduction/Purpose

You are being asked to participate in a research study. You are being asked to participate because your school is working with researchers at the University of California, Los Angeles. The purpose of this research study is to better understand and support students' reading in science classrooms. This study will focus specifically on biology.

Procedures

If you volunteer to participate in this study, I will ask you to do the following:

Participate in one interview.

The interview will take between 20-30 minutes. The interview will be scheduled at your convenience. During this interview, a member of the research team will ask you questions about your teaching experiences, science instruction, and your experience supporting students' reading in the biology course. These interviews will be audio recorded.

Risks
There are no anticipated risks or discomforts.

Benefits

There may be no direct benefit to you as a result of your participation in this research study. The potential benefits to you from participation in this study may include an increased understanding of the development of students' literacy skills.

Alternatives

You have the alternative to choose not to participate in this research study.

Confidentiality

Participation in this research study may result in a loss of privacy, since persons other than the investigator(s) might view your study records. Unless required by law, only the study investigator, members of the investigator's staff, and the University of California, Los Angeles Institutional Review Board will have the authority to view your study records. They are required to maintain confidentiality regarding your identity. Results of this study may be used for teaching, research, publications, or presentations at scientific meetings. If your individual results are discussed, your identity will be protected by using a number or alias rather than your name or other identifying information. Your name will never be used in any report. Personal information about you will never be reported to your school administrators.

Financial Information

You will not be charged for any study-related procedures.

Subjects' Rights

Your participation in this research study is voluntary and you are free to withdraw at any time. You may ask not to be audio recorded at any time for any reason. If you feel uncomfortable, you may stop the audio recording at any time. You may ask to review, edit, and delete audio tapes of your participation in whole or in part.

Contact Persons

Any questions you have about this study may be directed Louis Gomez or Kimberley Gomez, Project Directors, at 310-825-0978 or 310-825-0991. Any questions about research subjects' rights may be directed to the Office of the Human Protection Program of University of California, Los Angeles, at 310-825-5344.

Consent

"I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered to my satisfaction. If I have additional questions, I have been told who to contact. I agree to participate in the research study described above."

_____ _____

Teacher's Signature Date

Please print your name clearly: _____

Please print the name of your school: _____

_____ _____

Investigator's Signature Date

APPENDIX C: Parent Information Letter (English Version)
Parent Information Letter

May 2012

Dear Parent:

We are writing you to inform you about a research study that is taking place in your child's school, the UCLA Community School, over the summer. Your child has the opportunity to attend a four-week summer biology program where your child's will work with a teacher that is working in partnership with researchers at the University of California, Los Angeles. The purpose of the program, and the study, is to better support students' reading in biology classrooms. Many students do not do as well as they can in science. Often it is because they need help with reading difficult science texts. For example, sometimes science words, science textbook questions, charts and graphs are hard to understand. Your child's school is very interested in helping students read better so that both their reading and science achievement increases. We are working to help your child's school, teachers, and your child, by using reading strategies and tools based on these strategies to help students gain better and deeper understandings of science when they read science textbooks and articles.

We have enclosed a permission form for you and your child to read over together. It explains what kind of research we will be conducting in your child's classroom and asks permission of you and your child to participate. None of this research is dangerous at all. If you agree to participate, we may interview your child about their classroom, about reading, and about what they feel are the best ways that they learn in school. We may also videotape and/or audio-record these interviews so that we can study them later. Your child will never be mentioned by name in any report that comes from this work. We want to know if all children are benefiting from the new ways of teaching reading that your child's biology teacher is using during this summer program. We will protect your child's confidentiality. We ask that you consider giving permission for your child to participate. If you agree, sign the last page of the enclosed form and give it to your child to return to your child's science teacher. If you do not agree, please have your child return the blank permission form in any case. If you have any questions about this process, please call us at 310-825-0978 or 310-825-0991.

Best,

Louis Gomez, Ph.D. and Kimberley Gomez, Ph.D.
University of California, Los Angeles

APPENDIX D: Parent Information Letter (Spanish Version)
Parent Information Letter

May 2012

Estimado padre:

Estamos escribiendo para informarle sobre una investigación que se llevará acabo en la escuela de su hijo/a, UCLA Community School, durante el verano. Su hijo/a tiene la oportunidad de asistir a un programa escolar de biología que durará cuatro semanas. Su hijo/a trabajará con un maestro que estará trabajando en colaboración con investigadores de la Universidad de California, Los Angeles. El propósito de este programa, y la investigación, es mejorar el apoyo de lectura y aprendizaje en clases de biología. Muchos estudiantes no alcanzan el nivel en ciencia que deberían. En muchas ocasiones esto se debe a que necesitan ayuda al leer textos de ciencia que son difíciles. Por ejemplo, a veces palabras de ciencia, preguntas dentro de textos en materias de ciencia, tablas y gráficos son dificiles de comprender. La escuela de su hijo/a esta sumamente interesada en ayudar a estudiantes a leer mejor para que sus logros en lectura y ciencia aumenten. Nosotros estamos trabajando para ayudar a la escuela, los maestros, y su hijo/a, a utilizar estrategias de lectura y desarrollar herramientas basadas en estas estrategias para que los estudiantes puedan lograr comprender los conceptos de ciencia cuando lean textos y artículos en esta materia.

Hemos incluido un permiso para que usted y su hijo/a puedan leerlo y repasarlo juntos. El permiso explica el tipo de investigación que llevaremos acabo en el salón de su hijo/a y pide el permiso suyo y de su hijo para participar. Ninguna parte de la investigación es peligrosa. Si usted accede a participar, podríamos entrevistar a su hijo/a sobre actividades que ocurren en su salón, su lectura, y sus sentimientos acerca de las mejores maneras que cree que aprende en la escuela. Tambien existe la posibilidad de que grabemos estas entrevistas para que podamos estudiarlas más tarde. Su hijo/a nunca será mencionado/a por nombre en ningún informe que provenga de esta investigación. Queremos saber si todos los estudiantes se estan beneficiando de las nuevas maneras de enseñar que el maestro de su hijo/a estará utilizando durante el programa de verano. Protegeremos la confidencialidad de su hijo/a. Le pedimos que considere otorgar permiso para que su hijo/a participe. Si usted está de acuerdo, por favor firme la última página de la forma adjunta y regresela a el maestro de ciencia de su hijo/a. Si usted no está de acuerdo, por favor regrese la última página de la forma adjunta sin firmar de todas maneras. Si usted tiene alguna pregunta sobre este proceso, por favor llamenos al 310-825-0978 or 310-825-0991.

Sinceramente,

Louis Gomez, Ph.D. y Kimberley Gomez, Ph.D.
Universidad de California, Los Angeles

APPENDIX E: Parent Consent Form English Version

University of California, Los Angeles
Consent Form for Parent of Minor

May 2013

Description
Your child is invited to participate in a research study that is taking place in your child's school, the UCLA Community School, over the summer. Your child has the opportunity to attend a four-week summer biology program where your child's will work with a teacher that is working in partnership with researchers at the University of California, Los Angeles. The purpose of the program, and the study, is to better support students' reading in biology classrooms. Many students do not do as well as they can in science. Often it is because they need help with reading difficult science texts. For example, sometimes science words, science textbook questions, charts and graphs are hard to understand. Your child's school is very interested in helping students read better so that both their reading and science achievement increases. We are working to help your child's school, teachers, and your child, by using reading strategies and tools based on these strategies to help students gain better and deeper understandings of science when they read science textbooks and articles.

If you decide to let your child participate in the study, his/her participation would be during the summer program at the end of this school year. However, you can decide at anytime to remove your child from this study. Your child's participation includes interviews, observations, and collection of student work.

Risks
We see no foreseeable risks to your child due to participation in this study. Your child does not have to participate in any part of the study that makes him/her feel uncomfortable. Your decision whether or not to permit your child to participate in this study will not affect your child's grades in school.

Benefits
The benefits of this study are that it will help lead to a better understanding of effective teaching methods. We cannot and do not guarantee or promise that your child will receive any benefits from this study.

Confidentiality
Your child's participation in the study is entirely voluntary and you have the right to withdraw your consent or discontinue your child's participation at any time. The names of all participants will be kept completely confidential at all times. Individual privacy will be maintained at all times. As part of this research project, we may ask to videotape or audiotape interviews and class activities. The tapes will primarily be used to further understand students' work processes and feelings about their projects. However, if you allow it we may also use the videotapes to share with other educators and researchers who are interested in learning about students' work. In these cases your child would not be identified by name. We would like you to indicate what uses of this videotape you consent to on the consent form portion of this letter. You are free to initial any number of spaces, from none to all. We will only use the tape in ways that you agree to.

I have attached a consent form. Please sign the form to indicate whether or not you are willing to consent and allow your child to participate in the study.

University of California, Los Angeles
Consent Form for Parent of Minor

Contact Information
If you have any questions about the study please contact: Dr. Louis M. Gomez, University of California, Los Angeles at 310.825.0978 or Dr. Kimberley Gomez, University of California, Los Angeles at 310.825.0991.

If you have questions about your rights while taking part in this study, or you have concerns or suggestions and you want to talk to someone other than the researchers about the study, please call the OHRPP at (310) 825-7122 or write to:

UCLA Office of the Human Research Protection Program
11000 Kinross Avenue, Suite 211, Box 951694
Los Angeles, CA 90095-1694

Your child's rights
If you or your child decides that you don't want him/her participate in this study, you can stop at any time.

Signature
Please indicate below if you are willing to allow your child to participate in our research study. If you choose not to allow your child to participate, it will not affect their participation in school activities. If you do decide to participate, participation will not affect your child's class grade or standing in the class in any way.

If you have read this form and have decided to allow your child to participate in this project, please understand participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty. Individual privacy will be maintained in all published and written data resulting from the study.

_____ I AM willing to give consent so that my child may participate in this study.

_____ I am NOT willing to give consent so that my child may participate in this study.

Your name (please print) _____

Signature _____

Date _____

I give consent for my child to be audio taped/videotaped during this study:

Please initial: _____Yes _____No

I have read and understand the language in the consent form pertaining to videotaping and audio taping and give my consent for the use of videotape or audiotape as indicated below:
<u>After the tapes have been used in the ways you allow as indicated below, they will be erased.</u>

I give consent for tapes resulting from this study to be used for scientific publication in which no names are used and the interview is translated into text:

University of California, Los Angeles
Consent Form for Parent of Minor

Please initial: _____Yes _____No

I give consent for tapes resulting from this study to be used for in presentations to other educators:

Please initial: _____Yes _____No

I give consent for tapes resulting from this study to be used in presentations at meetings of scientists interested in education:

Please initial: _____Yes _____No

I give consent for tapes resulting from this study to be used in a website or CD-ROM that illustrates student learning:

Please initial: _____Yes _____No

The extra copy of this consent form is for you to keep.

APPENDIX F: Parent Consent Form Spanish Version

Universidad de California, Los Angeles
Consentimiento Informado para padre del menor de edad

mayo 2013

Descripción
Su hijo/a es invitado a participar en una investigación que se llevará acabo en la escuela de su hijo/a, UCLA Community School, durante el verano. Su hijo/a tiene la oportunidad de asistir a un programa escolar de biología que durará cuatro semanas. Su hijo/a trabajará con un maestro que estará trabajando en colaboración con investigadores de la Universidad de California, Los Angeles. El propósito de este programa, y la investigación, es mejorar el apoyo de lectura y aprendizaje en clases de biología. Muchos estudiantes no alcanzan el nivel en ciencia que deberían. En muchas ocasiones esto se debe a que necesitan ayuda al leer textos de ciencia que son difíciles. Por ejemplo, a veces palabras de ciencia, preguntas dentro de textos en materias de ciencia, tablas y gráficos son dificiles de comprender. La escuela de su hijo/a esta sumamente interesada en ayudar a estudiantes a leer mejor para que sus logros en lectura y ciencia aumenten. Nosotros estamos trabajando para ayudar a la escuela, los maestros, y su hijo/a, a utilizar estrategias de lectura y desarrollar herramientas basadas en estas estrategias para que los estudiantes puedan lograr comprender los conceptos de ciencia cuando lean textos y artículos en esta materia.

Si usted otorga su consentimiento, su hijo/a será parte de esta investigación durante el programa de verano al fin de este año escolar. Sin embargo, usted puede decidir que su hijo/a deje de participar en cualquier momento. La participación de su hijo/a incluye entrevistas, observaciones, y colección de trabajos escolares.

Riesgos
No anticipamos que existan riesgos para su hijo/a debido a su participación en esta investigación. Su hijo/a no tiene obligación de participar en cualquier parte del estudio que lo/a haga sentir incómodo. Su decisión de permitir o no la participación de su hijo/a en esta investigación no tendrá ningún efecto sobre las calificaciones de su hijo/a.

Beneficios
Los beneficios de esta investigación son el ayudar a alcanzar una mejor comprensión de los métodos más eficaces de enseñanza. No puedo garantizarle que su hizo/a recibirá alguno otro beneficio de este estudio.

Confidencialidad
La participación de su hijo en esta investigación es totalmente voluntaria y usted tiene el derecho de retirar sus consentimiento o suspender la participación de su hijo/a en cualquier momento. Los nombres de todos los participantes se mantendrán en estricta confidencialidad en todo momento. Privacidad individual se mantendrá en todo momento. Como parte de este proyecto existe la posibilidad que grabemos entrevistas y actividades que ocurran en el salón. Estas grabaciones se utilizarán principalmente para entender mejor los procesos de trabajo de los estudiantes y comprender los sentimientos acerca de sus proyectors. Sin embargo, si usted lo permite, las grabaciones también se utilizarán para compartir con otros docentes e investigadores que estén interesados en aprender sobre el trabajo de los estudiantes. En estos casos, su hijo/a no será identificado por nombre. En la sección indicada de este consentimiento, por favor indique en qué formas podríamos utilizar las grabaciones. Usted es libre de poner sus iniciales en cualquier número de espacios, de ninguno a todos. Sólo utilizaremos las grabaciones en las maneras en las cuales usted está de acuerdo.

Universidad de California, Los Angeles
Consentimiento Informado para padre del menor de edad

He adjuntado el consentimiento. Por favor, firme el consentimiento para indicar si está o no está dispuesto a otorgar consentimiento y permitir que su hijo/a participe en este estudio.

Información de contacto
Si usted tiene alguna pregunta sobre este estudio, puede contactar a el Dr. Louis M. Gomez, Universidad de California, Los Angeles al teléfono 310.825.0978 ó a la Dra. Kimberley Gomez, Universidad de California, Los Angeles al teléfono 310.825.0991.

Si usted tiene preguntas sobre sus derechos durante su participación en este estudio, o si tiene inquietudes o sugerencias y desea hablar con alguién que no sea parte del equipo de investigación sobre el estudio, porf favor llame al OHRPP al (310) 825-7122 or escriba a:

UCLA Oficina del Programa de Investigación de Protección Humana
11000 Kinross Avenue, Suite 211, Box 951694
Los Angeles, CA 90095-1694

Los derechos de su hijo/a
Si usted o su hijo/a deciden que no ya no desean formar parte de este estudio, pueden dejar de participar en cualquier momento.

Firma
Por favor indique si usted está dispuesto a permitir que su hijo/a participe en nuestra investigacón. Si decide no permitir que su hijo/a participe, esto no afectará su participación en actividades escolares. Si usted decide que su hijo/a participe, su participación no afectará la calificación o el nivel en la clase en ninguna manera.

Si usted ha leído este consentimiento y ha decidido permitir que su hijo/a participe en este proyecto, por favor entienda que pariticipación es voluntaria y que usted tiene derecho de retirar su consentimiento o suspender participación en cualquier momento sin sanción alguna. Privacidad individual se mantendrá en todos los datos publicados y escritos que resulten de este estudio.

_____ SI estoy dispuesto a dar consentimieto para que mi hijo/a participe en este estudio.
_____ NO estoy dispuesto a dar consentimiento para que mi hijo/a participe en este estudio.

Su nombre (letra de molde) _____

Firma _____

Fecha _____

Doy mi consentimiento de que mi hijo/a sea audio y/o video grabado/a en este estudio.
Por favor, escriba sus iniciales aquí: _____Si _____No

Universidad de California, Los Angeles
Consentimiento Informado para padre del menor de edad

Yo he leído y entendido el lenguaje en este consentimiento con respecto a las grabaciones. Doy my consentimiento para el uso de video grabaciones o audio grabaciones como es indicado a continuación:
Después de que las grabaciones hayan sido utilizadas de las maneras en las cuales usted haya indicado a continuación, seran borradas.

Doy mi consentimiento de que las grabaciones de mi hijo/a derivados de este estudio se utilicen en publicaciones científicas en las cuales no se utilizarán nombres y las entrevistas seran traducidas en texto:
Por favor, escriba sus iniciales aquí: _____Si _____No

Doy mi consentimiento de que las grabaciones de mi hijo/a derivados de este estudio se utilicen en reuniones profesionales con académicos interesados en educación:
Por favor, escriba sus iniciales aquí: _____Si _____No

Doy mi consentimiento de que las grabaciones de mi hijo/a derivados de este estudio se utilicen en un sitio de la red (web) o unidad de CD-ROM que ilustra el aprendizaje estudiantil:
Por favor, escriba sus iniciales aquí: _____Si _____No

La copia extra de este consentimiento es para usted.

APPENDIX G: Minor Assent

Minor Assent

May 2013

Dear Student,

We are researchers at the University of California, Los Angeles collaborating with the UCLA Community School science program teachers. Our goals are to help students be successful in science classrooms, and to learn how to improve other programs at the school.

What will happen to me in this study?
You are invited to participate in a study about how students can use reading strategies to improve their learning and understanding in science classrooms. If you agree to participate in this project, we may interview you about your learning. We may also collect examples of the work you do on the iPad or computer. We may also videotape or audiotape interviews and some of the learning activities that take place in the classroom. The research will not have anything to do with your class grade, although researches may look at your grades and test scores only to understand the impact of the strategies learned in the course. The research will take place during the summer.

Can anything bad happen to me?
We don't think there is anything in the research study that will cause you any discomfort, but if you ever feel like you do not want to participate for any reason, you should tell your parents and/or the teacher. You do not have to participate in any part of the study or answer any questions that make you feel uncomfortable.

Can anything good happen to me?
The benefits of this study are that you will be able to talk with researchers about the things you are interested in about science. The project may help make better science programs in the future for other students in your school and at other schools.

Will anyone know I am in the study?
Your name and the names of all students will be kept completely confidential at all times. That is, we will not share your name and information you tell us. We will keep your name and other information private. During interviews you will have the right to refuse to answer questions. If we videotape you, you would not be identified by name.

Who can I talk to about the study?
If you have any questions about the study please contact: Dr. Louis M. Gomez, University of California, Los Angeles at 310.825.0978 or Dr. Kimberley Gomez, University of California, Los Angeles at 310.825.0991.

If you have questions about your rights while taking part in this study, or you have concerns or suggestions and you want to talk to someone other than the researchers about the study, please call the OHRPP at (310) 825-7122 or write to:

UCLA Office of the Human Research Protection Program
11000 Kinross Avenue, Suite 211, Box 951694
Los Angeles, CA 90095-1694

What if I do not want to do this?

Minor Assent

You can stop your participation in the study at any time for any reason. If you participate or decide not to participate your grade will not be affected nor will anything else about your regular participation in the summer program. Even if your parents give their consent for you to participate in the study, it is still up to you whether or not you actually participate.

Signing your name at the bottom means that you agree to be in this study. You and your parents will be given a copy of this form. Please return the form to your science teacher.

Sincerely,

Dr. Louis M. Gomez, University of California, Los Angeles

Dr. Kimberley Gomez, University of California Los Angeles

Signature
I have read the assent form and understand that a survey, interviews and audio and videotaping will be going on in my classroom. I am willing to participate and I understand that I may stop my participation at any time with no penalty. I agree to be audio or videotaped. It is okay for parts of these tapes to be shown to other researchers and educators, and interested members of the public in the community.

Do you understand this study and are you willing to participate? ☐ YES ☐ NO

Please print your name: _____

Your signature: _____

Date: _____

The extra copy of this assent form is for you to keep.

APPENDIX H: Exit Interview Protocol

This summer you have participated in a biology b credit recovery class. We have done several things as part of this class. Today I'm going to be asking you a few questions about your experience. Do you have any questions before we begin?

You used a few different learning tools this summer including: annotation, double-entry journals, summary writing on the computer, pre and post tests/assessments, and discussion prompts during lecture (for example, TEACHER question "What is evolution" during class today).

REMINDER: *GO BACK AND ASK WHY AFTER YOU'VE ASKED A-F (or 1-8). THAT IS, SAY "YOU TOLD ME THAT YOU LIKED X THE BEST. TELL ME A BIT MORE. WHY DID YOU LIKE IT THE BEST?*

1. Which tool did you like the best?
2. Which tool did you like the least?
3. Which tool do you think helped you the most with your reading?
4. Give me an example of how [tool] helped you with reading.
5. Which tool was the hardest to use?
6. Which, if any of the tools, did you tell your friends, parents, or family members about? What did you tell them? Why?
7. Which tool do you think helped you the most with learning science?
8. Give me an example of how [tool] helped you with learning science.
9. You read every day in this science class. What was hard about the reading? What was easy about the reading?
10. In this class we did a lot of reading and writing.
11. What is one thing that you learned in this biology class that you were able to understand because you had a reading that you could review to help you?
12. How did a focus on reading (annotation, DEJ – main idea/supporting evidence, summary writing) help you?
13. Your teachers tried a new approach to the science lectures. Your teachers used discussions, group work, guided annotations, double/triple-entry journals, and videos to help you learn about science.

For example:
Teacher A did not use powerpoints this summer. Instead of lectures, she used labs (Reebop and DNA Structure), activities (QEJs for vocabulary, annotations, solving genetics problems as a group and presenting to the class), and note taking (replication, transcription, translation)
Teacher B used powerpoints, videos (Darwin and Evolution), and activities (transgenic animals, Evidence of Evolution group work and presentation to the class, activity for finding food)

14. Do you feel like this approach did or didn't help you to learn science? Why?

15. Every day we gave you a pre and/or a post assessment. We asked you how confident you felt about your knowledge of the science topics you were studying (genes, DNA, chromosomes, evolution, etc.). Now we are at the end of the summer program. How confident were you at the beginning of the summer in your understanding of Genes and Evolution? How confident are you now? Why?

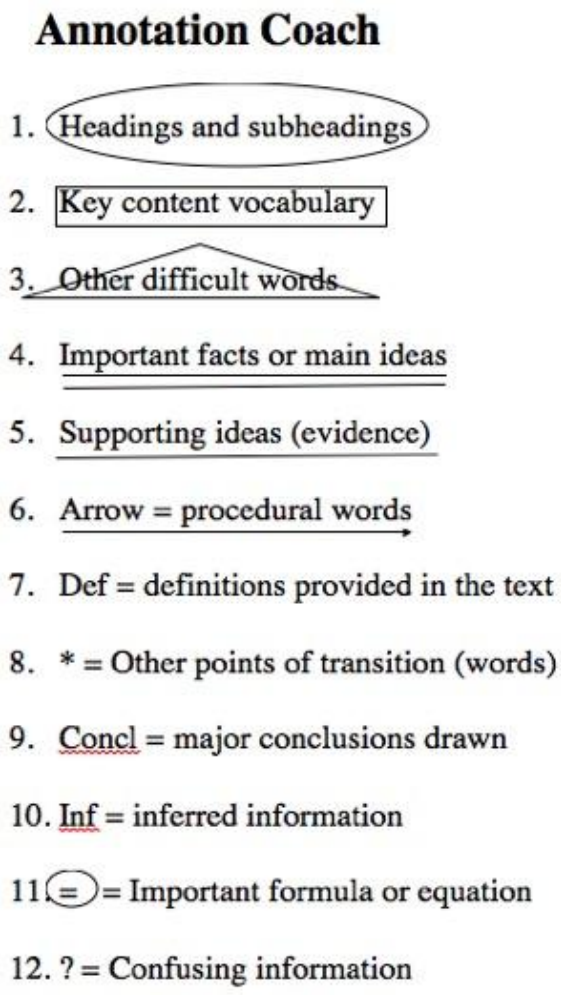
16. You have been using the Write To Learn program to write summaries in this summer class. How confident were you at the beginning of the summer, in writing summaries? How confident are you now? Why?

17. Every Thursday your class celebrated the end of the week with a special lunch (pizza party, sandwiches and chips). How did this celebration make you feel?

18. Did the celebrations make you feel like you wanted to attend class? If so, why? If not, what did make you feel like you wanted to attend class?

19. Is there anything else you want to share about the summer program? Anything you want to let us know about your experience?

APPENDIX I: Annotation Coach



APPENDIX J: DATA TABLES

Overall Descriptive Statistics for Summarization

	N	Range	Min	Max	Mean		Std. Deviation
						Std. Error	
Total Number of Activities	29	10	1	11	6.24	.457	2.459
Total Number with Passing Scores	29	11	0	11	3.41	.560	3.018
Total Percent Passed (0-100)	29	100	0	100	50.45	6.430	34.628
Average Number of Attempts	29	5	1	7	3.96	.345	1.860
Average Minutes on First Task	29	144	46	190	100.00	6.527	35.150
Averge Number of	29	188	60	248	134.9	9.60	51.743

Blue Group Descriptive Statistics

	N	Range	Min	Max	Mean		Std. Deviation
						Std. Error	
Total Number of Activities	9	5	6	11	7.89	.611	1.833
Total Number with Passing Scores	9	8	3	11	5.78	.983	2.949
Total Percent Passed (0-100)	9	57	43	100	70.56	7.383	22.148
Average Number of Attempts	9	5	2	7	4.92	.490	1.470
Average Minutes on First Task	9	42	57	99	85.44	4.631	13.893
Average Number of Words on First Attempt	9	176	72	248	149.33	22.356	67.069
Average % Copied on First Attempt	9	8	0	8	3.11	1.033	3.100
Average Number of Words on Last Attempt	9	156	120	276	200.78	14.677	44.031
Average % Copied on Last Attempt	9	2	0	2	.44	.242	.726
Valid N (listwise)	9						

Descriptive Statistics for Write-To-Learn Grade Group = 90-100 Final Grade Group

Green Group Descriptive Statistics

	N	Range	Min	Max	Mean		Std. Deviation
						Std. Error	
Total Number of Activities	11	7	3	10	5.73	.589	1.954
Total Number with Passing Scores	11	9	0	9	2.91	.899	2.982
Total Percent Passed (0-100)	11	100	0	100	45.82	11.706	38.825
Average Number of Attempts	11	4	1	6	3.63	.587	1.946
Average Minutes on First Task	11	129	46	175	95.64	11.600	38.471
Average Number of Words on First Attempt	11	99	83	182	128.45	11.945	39.617
Average % Copied on First Attempt	11	12	0	12	5.73	1.287	4.268
Average Number of Words on Last Attempt	11	119	114	233	179.36	10.738	35.615
Average % Copied on Last Attempt	11	6	0	6	1.36	.678	2.248
Valid N (listwise)	11						

Descriptive Statistics for Write-To-Learn Grade Group = 80-89 Final Grade Group

Beige Group Descriptive Statistics

	N	Range	Min	Max	Mean		Std. Deviation
						Std. Error	
Total Number of Activities	9	10	1	11	5.22	.969	2.906
Total Number with Passing Scores	9	4	0	4	1.67	.471	1.414
Total Percent Passed (0-100)	9	100	0	100	36.00	11.070	33.211
Average Number of Attempts	9	5	1	7	3.40	.638	1.915
Average Minutes on First Task	9	121	69	190	119.89	13.215	39.644
Average Number of Words on First Attempt	9	154	60	214	128.44	16.906	50.718
Average % Copied on First Attempt	9	8	0	8	2.33	.898	2.693
Average Number of Words on Last Attempt	9	105	111	216	166.00	12.765	38.295
Average % Copied on Last Attempt	9	18	0	18	4.11	2.031	6.092
Valid N (listwise)	9						

Descriptive Statistics for Write-To-Learn Grade Group = 70-79 Final Grade Group

Overall Descriptive Statistics

	N	Range	Min	Max	Mean		Std. Deviation
						Std. Error	
Main Idea	29	38.00	2.00	40.00	12.3793	1.65155	8.89387
Supporting Evidence	29	52.00	1.00	53.00	23.1724	2.24655	12.09802
Key Content Vocabulary	29	33.00	3.00	36.00	19.4828	1.77185	9.54172
Other Difficult Words	29	5.00	.00	5.00	1.1724	.29390	1.58270
Valid N (listwise)	29						

Overall Annotation Descriptive

Blue Group Descriptive Statistics

	N	Range	Min	Max	Mean		Std. Deviation
						Std. Error	
Main Idea	9	37.00	3.00	40.00	16.6667	4.32049	12.96148
Supporting Evidence	9	43.00	10.00	53.00	32.0000	3.76386	11.29159
Key Content Vocabulary	9	25.00	6.00	31.00	18.1111	3.04797	9.14391
Other Difficult Words	9	4.00	.00	4.00	.8889	.45474	1.36423
Valid N (listwise)	9						

Descriptive Statistics for Annotation, Grade Group = 90-100 Final Grade

Green Group Descriptive Statistics

	N	Range	Min	Max	Mean		Std. Deviation
						Std. Error	
Main Idea	11	20.00	3.00	23.00	11.2727	1.56141	5.17863
Supporting Evidence	11	29.00	8.00	37.00	20.0909	2.73846	9.08245
Key Content Vocabulary	11	33.00	3.00	36.00	17.9091	3.25982	10.81161
Other Difficult Words	11	4.00	.00	4.00	1.0000	.44721	1.48324
Valid N (listwise)	11						

Descriptive Statistics for Annotation, Grade Group = 80-89 Final Grade

Beige Group Descriptive Statistics

	N	Range	Min	Max	Mean		Std. Deviation
						Std. Error	
Main Idea	9	21.00	2.00	23.00	9.4444	2.19286	6.57858
Supporting Evidence	9	38.00	1.00	39.00	18.1111	4.11111	12.33333
Key Content Vocabulary	9	24.00	12.00	36.00	22.7778	2.81256	8.43768
Other Difficult Words	9	5.00	.00	5.00	1.6667	.64550	1.93649
Valid N (listwise)	9						

Descriptive Statistics for Annotation, Grade Group = 70-79 Final Grade

APPENDIX K: RAW Data Tables

	Identification Code	*sex, ethnicity, final grade*	*final exam*
90 – 100 [1] or [Blue] BLUE	55064-[Blue]	1, 2, 94	100
	44950-[Blue]	1,1, 93	100
	~~45440~~	~~1,1,93~~	~~100~~
	92011-[Blue]	2,1,93	100
	17332-[Blue]	1,1,92	100
	19849-[Blue]	2,1,91	100
	~~60455~~	~~1,1,91~~	~~100~~
	~~64142~~	~~1,1,91~~	~~100~~
	78979-[Blue]	2,1,91	100
	98288-[Blue]	2,1,91	100
	53075-[Blue]	2,1,91	96
	19872-[Blue]	2,1,91	85
		3 females 6 males 1 Asian 8 Hispanic	
80 – 89 [2] or [Green] GREEN	99043-[Green]	2,1,89	100
	46974-[Green]	2,1,88	86
	78930-[Green]	2,1,87	86
	~~41102~~	~~1,1,86~~	~~100~~
	32724-[Green]	2,1,85	100
	91508-[Green]	2,1,83	100
	97606-[Green]	2,1,82	100
	72555-[Green]	2,1,82	86
	~~50494~~	~~2,1,81~~	~~96~~
	54759-[Green]	2,1,81	86
	25083-[Green]	1,1,81	71
	~~90468~~	~~2,1,81~~	~~71~~
	15847-[Green]	2,1,80	100
	41148-[Green]	2,1,80	86
		10 males 1 female 11 Hispanic	
70-79 [3] or [Beige] BEIGE	67152-[Beige]	2,1,79	57
	31629-[Beige]	1,2, 78	100
	66916-[Beige]	2,1,76	96
	57938-[Beige]	2,1,76	89
	56986-[Beige]	2,1,75	100
	71241-[Beige]	2,1,73	64
	42954-[Beige]	2,1,71	75
	28891-[Beige]	2,1,70	100
	62240-[Beige]	2,2,70	43
		1 female 8 males 7 Hispanic 2 Asian	
Other	~~18172~~	~~2,1, 63~~	~~86~~
	~~70770~~	~~1,3,63~~	~~64~~
	45175*	2,1,62	86
	~~77764~~	~~2,1,59~~	~~71~~
	~~19472~~	~~2,1,42~~	~~ABSENT NG~~

Sex
1 Female
2 Male

Ethnicity
1 Hispanic
2 Asian
3 Black

{1}	Identifying supporting details Annotations Finding the main ideas Help from the teacher - annotating	Narrow down main ideas?	*[Blue]* 17332-[Blue] Uh reading is, was finding the supporting details because uh there was more details then you didn't know what was the main idea you had different ones to choose. *[Green]* 78930-[Green], *[Blue]* 92011-[Blue], *[Green]* 99043-[Green] *[Green]* 91508-[Green] *[Blue]* 78979-[Blue]
{2}	Everything	Laughter Annotation complicated – reading simple Easy	*[Blue]* 19849-[Blue], *[Beige]* 31629-[Beige], *[Green]* 25083-[Green] *[Beige]* 28891-[Beige] *[Green]* 32724-[Green] Just reading and annotating and putting it on packs.
{3}	Working Independently		*[Blue]* 98288-[Blue] JG Okay, what was easy about the readings? 98288-[Blue] Um doing it by yourself. JG Okay, why was that easy? 98288-[Blue] Because you know you can you um know what you are reading and focus and you can actually process the information better. 4:20

{4}	Teacher reading for you		*[Green]* 41148-[Green] *[Beige]* 71241-[Beige]
{5}	Showed steps		*[Blue]* 44950-[Blue] [prompted] ex diagrams
{6}	Non answer Non responsive Not sure Preparing for test Understood it better		*[Green]* 46974-[Green] SM Okay. What was easy about the reading? 46974-[Green] The reading part. SM Just reading it? Okay. 46974-[Green] Yeah. *[Green]* 54759-[Green] *[Blue]* 55064-[Blue] *[Beige]* 66916-[Beige] *[Blue]* 19872-[Blue] *[Beige]* 62240-[Beige] BC Well, what was easy about it? 62240-[Beige] The hard thing was I think only the test. BC Ok. So the hard thing about the reading was preparing for the test? 62240-[Beige] Yeah. *[*]*45175 BC Nothing hard about the reading? What was easy about the reading? 42954-[Beige] I don't know. Just, like you understood it better…?

			*45175 How it makes sense
{7}	Learn new things Content		*[1]* 53075-[Blue] SM Understanding? Okay… Um, what was easy about the reading? 03:04 53075-[Blue] You l- you learn new things. *[3]* 56986-[Beige] BC And what was easy about the reading? 56986-[Beige] Uhm… the topic that we were

			learning. BC Cool, so you found the content to be easy? 56986-[Beige] Yeah.
{8}	Vocabulary		*[3]* 57938-[Beige] Reference 1: 1.73% coverage SM What was easy about the reading? 57938-[Beige] Understanding the vocabulary of it. SM That was easy for you? 57938-[Beige] Yeah.
{9}	Prior Course Knowledge	Retaking class	*[3]* 67152-[Beige] G Okay, the words. So what was easy about the readings? 67152-[Beige] Uh [pause] when the easiest.[pause] well maybe like cause I retook the class again, so before I knew things like but not everything, but some names I would remember. *[Green]* 72555-[Green] *[Green]* **97606-[Green]** 7:00 What was easy about the reading? 97606-[Green] For me, nothing. JG Nothing was easy about the reading? Why not? 97606-[Green] It was the first time taking this class.

Note: Have an interview for 45175* (2,1,62 | 86) but he failed the course – does not meet selection criteria. |28891-[Beige] 56986-[Beige] 31629-[Beige] suggest missing work largely explains how students could earn 100 on final exam but end up in the 70-79 category.

What was easy about reading every day?
28 Sources / 29 References NVIVO
The following features are identified as contributing to the ease of reading: {1} annotation, {5} diagram representations, {7} new content, {8} vocabulary, {4} teacher-guided practice, {3} independent work, {9} prior knowledge from previously taking the course.

What was difficult about reading every day?
29 Sources / 32 References NVIVO
The following features are identified as contributing to the increased difficulty of reading: {1} annotation, {3} vocabulary. {4} Learning environment concerns were also identified, by students, as barriers. The evidence suggests some students believe annotation complicated the reading process.

{1}	Annotation		[2] 15847-[Green] [3] 28891-[Beige] Um. Just having to, like, when you're done with the reading, you have to go back and find what was important to you and you have to annotate.
	Main Ideas		[1] 17332-[Blue] [1] 78979-[Blue] JG Okay, so in this class we read a lot. What was easy about the reading? 78979-[Blue] The readings? JG Yeah, the readings that we did. 78979-[Blue] Hmmm. Annotating JG Annotating was

			the hardest part? Why would you say annotating was the hardest part? 78979-[Blue] [pause] finding the main ideas um it is like hard and um and I I need more help finding the main ideas.
{2}	Summarizing		[1] 19872-[Blue]
{3}	Vocabulary		[2] 32724-[Green] JG Okay, so you read every day in this science class. What was hard about the reading? 32724-[Green] Some words that I couldn't like understand. That was it. [1] 44950-[Blue] SM Okay, umm you read every day in this science class. What was hard about the reading? 44950-[Blue] Some words. They were probably too big, or like figuring out ***how the process*** works.

			[*] 45175 JG Okay, you read every day in this science class. What was hard about the reading? 45175 Um some words. [3] 56986-[Beige] BC And you read everyday in this science class, what was hard about the reading? 56986-[Beige] Hmm… uh.. like some.. some type of vocabulary. [3] 67152-[Beige] JG Okay, you read every day in the class. What was hard about the readings? 67152-[Beige] Some words that I didn't understand. [2] 78930-[Green] 04:04 [GRADUATE STUDENT] Okay. Um in- in this science class you read every day. What was hard about the reading? 78930-[Green] Mmm well there was some words that we really didn't understand in the reading, and yeah that's mostly it. [GRADUATE STUDENT] Ok. 78930-[Green] The some words that people don't understand.

{4}	Learning Environment		[3] 31629-[Beige] 1,2,78 |SM Okay. Um, so in this class you read every day. What was hard about the reading? 31629-[Beige] Uh I couldn't concentrate. SM Why couldn't you concentrate? 31629-[Beige] Because of the people around me. SM So…? 04:02 31629-[Beige] They were really loud. [2] 46974-[Green] 03:14 SM Okay. That's good. Um, which tool- oh wait I already said that. So let's move on. You read every day in this class. What was hard about the reading? 46974-[Green] Explain that again, what do you mean? SM What did you find hard or difficult about the reading? 46974-[Green] The annotations. (the annotations) Like with Ms. Herrera you know it was pretty decent, you know, she didn't go crazy [unclear] keeps on yelling about it, she [unclear] gonna kick us all out or whatever just to redo

			it, it's just complicated. [2] 54759-[Green] [GRADUATE STUDENT] Okay. It's an opportunity to show what you've learned? Okay. Okay so in this class you read everyday. What was hard about the reading? 04:07 54759-[Green] Keeping up with the annotations, I guess. [GRADUATE STUDENT] Keeping up with the annotations? Can you say more about that? 54759-[Green] Um, we annotated a lot and it was hard to [inaudible] keep up with her. [GRADUATE STUDENT] Keep up with the teacher? Okay. What was easy about the reading? [3] 71241-[Beige] JG Okay, so you read every day in the science class. What was hard about the readings? 71241-[Beige] The um it was like hard to concentrate because its like when you read sometimes you go to another planet

			or something. So it was like hard. [1] 98288-[Blue] JG Okay, so you read every day in the science class what was hard about the reading? 98288-[Blue] Um doing it kind of when it's not quiet. JG Okay, why was that hard? 98288-[Blue] It kind of gets you confused 4:00
{5}	Understanding		[1] 53075-[Blue] SM Okay. Um, so in this class you read every day. What was hard about the reading? 53075-[Blue] [pause] understanding. SM Understanding? Okay… Um, what was easy about the reading? [2] 91508-[Green] [GRADUATE STUDENT] And so then uhm you read everyday in this science class, what was hard about the reading? 04:22 91508-[Green] Well there was like some parts like I don't really understand but [pauses] yeah.

			[2] 97606-[Green] 6:35 JG Okay um, so we are going to go to question number 2. You read every day in the science class what was hard about the reading? 97606-[Green] Um, for me its hard to understand the the what they are trying to say.
{6}	Preparing for the test		[3] 62240-[Beige] BC Alright and you read everyday for this class, what was hard about the reading? 03:50 62240-[Beige] Hmm.. [pauses] Probably nothing much. BC Well, what was easy about it? 62240-[Beige] The hard thing was I think only the test. BC Ok. So the hard thing about the reading was preparing for the test? 62240-[Beige] Yeah.
{7}	Nothing		[1] 19849-[Blue] [2] 41148-[Green] [3] 42954-[Beige] [1] 55064-[Blue] [3] 57938-[Beige] [2] 72555-[Green] [1] 92011-[Blue]

	Annotation Complicated		[2] [25083-[Green]] I don't know… there wasn't anything hard about it. [pauses] I think it was, well, I think hard it could've been like the underlining and stuff like<u>... *like triangles and like that was a bit complicated*</u>. Uhm.. and what was easy about the reading? I don't know… it's [pauses] it's just simple. Like I don't know.

ANNOTATION

Student perceived that annotations {1} {4}{7} make text structures visible (notably main idea and supporting details), {2} promote vocabulary, {3} reduce confusion, {6} supported summary writing, and {8} aid recall. Several students acknowledge annotation was helpful in helping them get through large amounts of information.

{1}	Make text structures visible		[1] 19849-[Blue] Because I can see the evidence and the supporting detail and all that. [1] 19872-[Blue] 'Cause I had to read it, so, uh, it um, made me find the main ideas and stuff like that. And the supporting ideas. [GRADUATE STUDENT] Mmm

			hmm. Can you give me an, um, an example of how it helped you with your reading? 19872-[Blue] At first I didn't know what to do with the readings, like, how to find the main ideas. Stuff like that. Then, like, later on you guys teach me how to, find it. [GRADUATE STUDENT] Mmm hmmm. And so then… 19872-[Blue] I guess that's all. [GRADUATE STUDENT] Okay. Can you give me an example of how the annotation helped you learn something in science? 19872-[Blue] By underlin-underlining the main ideas. [GRADUATE STUDENT] The main ideas? 19872-[Blue] Yeah. [2] BC Alright, and why did you specifically liked the annotation? 25083-[Green] Because it uhm… made like them important sections of the reading stand out the most and that is basically what you need to know. Reference 2: 2.79% coverage

			BC Alright. And why do you think that was the annotations that helped you in reading? 25083-[Green] Hm… because like I said, it made the reading stand out to me and like I was only looking for important sections as well. Like that was my focus. [2] 41148-[Green] Oh because like words that I didn't know I would have to like circle it? right? And I- I would find the definition about it in the reading, and like I would- I didn't like really know that I could find the main idea and supporting evidence in the- the same article, and it gives you everything. [1] JG Which tool do you think helped you the most with learning science? 98288-[Blue] Um. I think that would be the one annotation examples, and yeah the annotations example. 3:26 JG Okay, can you give me an example of how it helped you? 98288-[Blue] Um cause um. Like I said we have to annotate

			in order for me to know what supports and evidences for the statement. 3:50
{2}	Promote vocabulary		[3] 31629-[Beige] Like let's say I didn't know a vocabulary word or what if there was a definition but I didn't know what it's about- what it's used for I would read, I could read it [GRADUATE STUDENT] Mmm. Okay. Um, which tool do you think helped you the most with your reading? 01:58 [2] 72555-[Green] Was it the, what? The, ugh, the one with the annotation, the one, the one Ms. Herrera had over here. [GRADUATE STUDENT] Oh, the annotation coach? 72555-[Green] Yeah. [GRADUATE STUDENT] That really helped you? 72555-[Green] Yeah. [GRADUATE STUDENT] Okay. Why did it help you? 72555-[Green] 'Cause I know which, I kn-, I know how to underline the specific

			words that I needed to know. [GRADUATE STUDENT] Mmm. Okay. 72555-[Green] The vocabulary. [GRADUATE STUDENT] Can you give me an example of how you used it? 72555-[Green] There was, let me see, was it on this one? I think, was it on this one? There was something I actually did on this one. [GRADUATE STUDENT] That was the color one that you got. 72555-[Green] Yeah. The color one! That was, yeah, there was the one that I triangle, the what the triangle - [GRADUATE STUDENT] - Mmm! Mmm hmm - 72555-[Green] - that I used- [GRADUATE STUDENT] - Mmm hmm - 72555-[Green] - for the word that I didn't, that I didn't, I didn't know until Ms. Herrera told me, - what it meant- [GRADUATE STUDENT] - Mmm – Oh, okay. So, difficult words. 72555-[Green] Yes! [GRADUATE STUDENT] Yeah. Okay. That makes sense. Um, which

			tool was the hardest to use?
{3}	Reduce confusion		[1] 78930-[Green] It's like back then like I didn't, I really didn't know how to like uhm like I was, sometimes I didn't understand what I was reading, but after we started doing this I started getting it a little bit more. [3] 03:03 SM Okay. Which tool do you think helped you the most with learning science? 31629-[Beige] Science? SM Mhmm. 31629-[Beige] The annotations. SM The annotations? Can you give me an example of that, of how it helped you? 31629-[Beige] (chuckles) I don't- uh it just did. Cuz science has a lot of information in it and then if you just read the thing and the teacher teaches you don't- we don't know what's what and we get all confused. [3] 56986-[Beige] Because when I read it, I .. and I annotate I actually understand what it's saying instead of just reading it and not

			understanding nothing.
{4}	Identify main point		[2] 32724-[Green] Cause you can read and annotate what's the reading point and this um they show you examples about the sections that you are going to need. 32724-[Green] Like for example, they give you how DNA, what's DNA, what's cloning, what's like different sections that I really didn't understand. By reading I understand what's DNA and what is cloning. [2] 91508-[Green]
{5}	Foster reading affinity		[2] 32724-[Green] Well cause I didn't like to read now since I like annotating I started liking to read.
{6}	Make summary writing easier		[1] 44950-[Blue] Cuz you just, you don't have to read ev-, well you just read it and you pick out the main ideas. And then it makes it easier for if you wanna write a summary or something.

			44950-[Blue] When I read a paragraph like I would just pick out like the thing that Miss taught us, the main idea and then an example that supported that idea, and then wrote like a little sentence or two about it.
{7}	Identify key parts of topics		[1] 53075-[Blue] The… annotating. SM The annotations? Okay, why? 01:00 53075-[Blue] It, it helped, it helped me [pause] it helped me figure out the important parts of the topic. [2] 99043-[Green] Yeah, because like you get a lot clues and you find main ideas and the evidence to them and like I don't know, it's a better way.
{8}	Made recall easier		[2] 54759-[Green] Because, it was, easier, easier to remember the stuff. [1] 55064-[Blue] Like if there's like a main idea while I'm reading and I highlight it and then later when I need it, like you get what it was. It's right there.

{9}	Get a lot of information out		[3] 57938-[Beige] Well because it helps you a lot to get the information out of the pages, and getting the main idea, the suporti- supporting evidence of it. 57938-[Beige] Oh. Underlining the- underlining a specific sentence, getting the main idea out of it, and it helps me all doing that. [3] 62240-[Beige] Well, this one helps a lot. You're like… highlighting the certain things that you have to learn about. BC Mhmm. 62240-[Beige] So you could just go back to the highlighting part and then… and read it again. SM Why did you like the annotations? [3] 66916-[Beige] Cuz I read, and I get more information. Reference 2: 2.94% coverage SM Okay. Uh can you give me an example of how it

			helped you? 66916-[Beige] Oh cuz I don't read that much I don't like it (uh huh), but with this and I highlight the-the reading (mhmm) so it helps me to understand read more. [3] JG Um [pause] so [pause] which tool do you think helped you the most with learning science? 3:00 67152-[Beige] [pause] umm maybe the annotations. Even though, it is too much information and so. JG [laughs] okay 67152-[Beige] But reading has a lot of information so. JG Okay, which tool did you like the least? [3] 71241-[Beige] [pause] the um annotations JG Why? 71241-[Beige] Because it was too much reading. JG Too much reading? 71241-[Beige] Yeah JG Okay, which tool was the hardest to use? 71241-[Beige] Of the thing annotations JG Annotations. Why is that? 71241-[Beige] Because there was a lot of reading.

			Sometimes you can't concentrate with that much reading. [2] JG Um. So out of these tools which one do you, did you like the best? 97606-[Green] This one. Annotations. JG Annotations. 97606-[Green] Yeah. JG Can you tell me why? 97606-[Green] Um, I don't know. 1:23 JG What did you like about it? 97606-[Green] Because um you can find a lot of important information. JG Important information, okay.

SM Okay. Um, how did a focus on reading such as, annotation, DEJs, and summary writing, help you? 46974-[Green] Annotations it helps cuz like um, it just points it out, like tells you what's the main idea and what's the parts you're supposed to be looking at. Not just reading the- the you know the non important stuff and. The DEJs well they just broke down it down for you, you know, shows you the point, and what supports it, so you don't look like a fool when you're writing your summaries or whatever. Eh what was the other one? 05:06 SM The summaries. 46974-[Green] Yeah, the summaries well, they just helps you improve it so, you make it sound more your grade level not so like your barely learning this. Just makes it sound more professional.

[GRADUATE STUDENT] Which tool did you like the best? 01:15 [2] 78930-[Green] The annotate. Annotations. [GRADUATE STUDENT] Why did you like? 78930-[Green] It's like back then like I didn't, I really didn't know how to like uhm like I was, sometimes I didn't understand what I was reading, but after we started doing this I started getting it a little bit more.
Reference 2: 7.70% coverage
[GRADUATE STUDENT] Ok. Um which tool do you think helped you the most with your reading? 78930-[Green] The, the… annotation. [GRADUATE STUDENT] The annotations? Why? 78930-[Green] Because I, I go highlight and underline everything and then it's like we get the main ideas out of the… out of the paragraphs and that's when we can understand more. 02:02

[GRADUATE STUDENT] Can you give me an example? 78930-[Green] Like right here for diagnosis of disease, [GRADUATE STUDENT] Mhmm 78930-[Green] Like it's kind of like the main thing of the paragraph. [GRADUATE STUDENT] Mhmm 78930-[Green] And all the double underlined words it says um "what the diagnosis of infectious disease have been opened by DNA… [GRADUATE STUDENT] Mhmm 78930-[Green] …technology in particular the use of PCR and label nucleic acids prone to check unknown um pathogens." [GRADUATE STUDENT] Mhmm 78930-[Green] That's what's telling me what they do to diagnosis the disease.
Reference 3: 1.55% coverage
[GRADUATE STUDENT] Okay. What was easy about the reading? 78930-[Green] Uhmm, the annotations (chuckles) [GRADUATE STUDENT] The annotations? 78930-[Green] It's what made it easier. [GRADUATE STUDENT] Okay. 78930-[Green] Yeah.
Reference 4: 7.08% coverage
[GRADUATE STUDENT] Okay. how did a focus on reading, so these are different tools right? 78930-[Green] Mhmm [GRADUATE STUDENT] But they're really focusing on helping you understand when you read… 78930-[Green] Yeah. [GRADUATE STUDENT] …something. How did that help you? 78930-[Green] It did helped a lot. It's like I really dunna kno- like really didn't understand like in the beginning like when we began this program I really didn't understand until Ms. Herrera introduced us to that and now its kinda easier for me. [GRADUATE STUDENT] Mhmm. Do you think that this is something that you'll continue using? 78930-[Green] Oh yeah. Its- that's for sure. Imma keep continue using this. Imma show my sister too. 06:00 [GRADUATE STUDENT] Ok. 78930-[Green] This. My little sister… [GRADUATE STUDENT] Mhmm. 78930-[Green] Imma show her this too. It's pretty cool.

Summary
Students talk largely about the technological benefits of wtl

	Technology Benefits		[3] 28891-[Beige] Oh, I think it was easier 'cause, like, instead of having to write it with paper, like, you could do it with technology. [GRADUATE STUDENT] Mmm hmmm 28891-[Beige] And plus you could, like, you could have it opened up to the, to where you're typing the journal entry in and you could also have the summary opened up. You could also

			highlight it, explain, you could have it read to you- [GRADUATE STUDENT] - Mmm…- 28891- [Beige] -It shows you the definitions and stuff. [GRADUATE STUDENT] Okay. So you liked all of those parts of that particular tool- 28891-[Beige] - Yeah- [GRADUATE STUDENT] -You found them helpful? 28891-[Beige] Yeah 28891-[Beige] Like, I feel a little more confident about it than I did before. [GRADUATE STUDENT] Why? 28891-[Beige] 'Cause like now if we have, like, a certain topic I could just go to Write To Learn, look it up, like, have 'em read it to me. SM Okay. Um, how did a focus on reading such as, annotation, DEJs, and summary writing, help you? 46974- [Green] Annotations it helps cuz like um, it just points it out, like tells you what's the main idea and what's the parts you're supposed to be

			looking at. Not just reading the- the you know the non important stuff and. The DEJs well they just broke down it down for you, you know, shows you the point, and what supports it, so you don't look like a fool when you're writing your summaries or whatever. Eh what was the other one? 05:06 SM The summaries. 46974- [Green] Yeah, the summaries well, they just helps you improve it so, you make it sound more your grade level not so like your barely learning this. Just makes it sound more professional. [3] JG Okay, so we used a few learning tools this summer including annotations, double entry journals, summary writing on the computer, pre and post test assesments, and discussion prompts during lecture. Um. For example, Ms. Esparza question yesterday was what is evolution, during the class. Um which tool did you like the best

			out of the double entry journals, annotations, the pre and post assessment, or even the write to learn in the computer. 71241-[Beige] Uh I think um the um write to learn. JG Why? 71241-[Beige] Cause we [pause] I don't know cause it was more interesting. JG What made it interesting? 71241-[Beige] Uh because um like we didn't have to like do that much. Reference 2: 4.47% coverage JG Which tool do you think helped you the most with your reading? 71241-[Beige] [pause] the write to learn JG Write to learn? Can you give an example of how write to learn helped you with your reading? 71241-[Beige] Uh uh uh cause uh cause uh because um I got to read about all the stuff like evolution, DNA, RNA and all that stuff. [GRADUATE STUDENT] Can you give me an example how the write to learn helped you with reading? [2] 91508-

			[Green] Well cause now I have to like be carefully like to make my summaries like good and stuff. [GRADUATE STUDENT] Mhmm. 91508-[Green] To make it better not like whatevers. 02:40 [GRADUATE STUDENT] Ok. BC And give me an example of how summaries helped you with reading? [2] 15847-[Green] Uhm… [pauses] examples? BC Yeah, so how did it help with your reading? 15847-[Green] Well, it helped me how to like how to like type good like good English
			BC Cool, and why did you like the summaries specifically? [3] 42954-[Beige] Because like it wasn't hard like they had like they had like passage to read and you just had some main ideas and then you just make it in your own words.
	ease		[1] 98288-[Blue] Because it's um easier to kind of gives

			you information. You kind of have to read articles and it gives you the information and you also have to focus on main ideas and main certain key concepts.

			[2] 15847-[Green] Uh… cause we'll be able to like get supporting evidence, look for main ideas in the text. [1] 17332-[Blue] DEJs helped me understand um what was the main ideas and supporting details and like know more definitions and vocabulary. [3] 67152-[Beige] Oh, with reading. Cause it has all like the important things. Like the main idea and supporting evidence, so I used both of them. [3] 71241-[Beige] Because we got like the main ideas and then like supporting evidence for it. [1] 78979-[Blue] Um because we have to find the main ideas and about something and the thing and then um find the supporting evidence that will help us to understand better. 2:00 [1] 92011-[Blue] Because it helps us to look for the main idea

			and supporting evidence.
	Writing promoted understanding		[2] 32724-[Green] Cause um after reading you could write all your information down so that would help me understand the reading. JG Can you give me an example 32724-[Green] Like for example, um cloning if I read the packet or I annotate and write the information down. I could understand cloning now. [GRADUATE STUDENT] Ok. Fair enough. Uhm, which tool do you think helped you the most with learning science? 03:22 [1] 55064-[Blue] [pauses] This. The TEJ, DEJ. [GRADUATE STUDENT] Mhmm, why do you think that helped you the most? 55064-[Blue] Cause like since like science is kind of like difficult that liked helps like get it, I guess. [GRADUATE STUDENT] Helps get it? Could you give me an example

			of how it was helpful with learning science? 55064-[Blue] Like if there's something difficult, like in my previous science classes, there would be like really confusing graphs and pictures and we always have to draw it and like … like… and then like write down what it means. [GRADUATE STUDENT] And so this was a different way of organizing information? Or… ? 55064-[Blue] Mhmm. 3] 28891-[Beige] Mmm. [Pause] I don't know. Probably this 'cause you have to write, you have to write more in it so it would probably help me more. 28891-[Beige] Yeah. 'Cause like you're able to like take out, take out what it said. A=Or actually it gives you the main ideas and then all you have to do is just find the supporting evidence and like if you could agree or disagree. [GRADUATE STUDENT] Okay 28891-[Beige] So yeah.

			[2] 46974-[Green] The DEJs well they just broke down it down for you, you know, shows you the point, and what supports it, so you don't look like a fool when you're writing your summaries or whatever.
	Ease		[2] 54759-[Green] It was easier to write. [GRADUATE STUDENT] It was easier to write? 54759-[Green] Write the stuff there. ~~BC And why did you like that one specifically? 01:01 [3] 56986-[Beige] Uhm, because you get to recap on your… like your… like you get to like … like back up your evidence and everything like that.~~

DEJ Function

Students perceived that the DEJ supported text structure (ex. main idea) identification and promoted understanding. Some students suggest that increased writing load with DEJ's fostered learning and promoted understanding

[GRADUATE STUDENT] Oh, okay. Um, and which tool do you think helped you the most with learning science? 03:11 72555-[Green] (pause) Um. The double entry journal the most.

[GRADUATE STUDENT] Why? 72555-[Green] ‘Cause I knew, ‘cause then, the, there was a easy question to like, um, to answer and then, you just, you all you need is your evidence to do, to support it and then so the work would we be easier saying your information is, is plain and simple. It wouldn’t be, like, such a long sentence to - [GRADUATE STUDENT] - Mmmm - 72555-[Green] - to write. [GRADUATE STUDENT] Okay. Can you give me an example (pause) of how it helped you with learning science? 72555-[Green] Let’s see. (chuckles) I think I don’t have an example. [GRADUATE STUDENT] Mmm. Okay - 72555-[Green] - Um - [GRADUATE STUDENT] - That’s okay if you - 03:52 72555-[Green] (Pause) An example. (pause) I’m not sure of an example but I know, there’s plenty. Hold on. Let’s see. (pause) 04:11 72555-[Green] Oh! There you go. Uh, the mRNA was different than the DNA - [GRADUATE STUDENT] - Mmm hmmm - 72555-[Green] - and then, so you would have to use different letters, so you would exchange the, the U, no no, the A for the U - [GRADUATE STUDENT] - Mmm hmmm - 72555-[Green] - and the-, and then DNA would be A-T and then T-A but then with the mRNA you would change, it would be A – T but then A would be U. [GRADUATE STUDENT] Mmm 72555-[Green] So that’s, it would be easier for that.

Which tool did you like the best?

Support	Student Interview Response
WritetoLearn 5	42954-[Beige], 98288-[Blue], 28891-[Beige], 62240-[Beige], 71241-[Beige]
PrePost Assessments 7	19872-[Blue], 55064-[Blue], 91508-[Green],78979-[Blue]***, 41148-[Green], 46974-[Green], 67152-[Beige]
DEJ ~~9~~ | 8	72555-[Green], 92011-[Blue], 15847-[Green], 17332-[Blue], ~~45175~~, 78979-[Blue]***, 56986-[Beige], 31629-[Beige], 54759-[Green]
Annotation 10 *** indicates student expressed two choices	53075-[Blue], 99043-[Green], 57938-[Beige], 32724-[Green], 66916-[Beige], 97606-[Green], 44950-[Blue], 78930-[Green], 19849-[Blue], 25083-[Green]

Tool helped the most with reading?

Support	Student Interview Response
WritetoLearn 5	97606-[Green], 44950-[Blue], 56986-[Beige], 54759-[Green], 25083-[Green]
PrePost Assessments 10 ● "used term test did not specify pre or post singularly"	72555-[Green], 57938-[Beige], 32724-[Green], 66916-[Beige], 92011-[Blue], 45175, 62240-[Beige]*, 78930-[Green]*, 31629-[Beige]*, 19849-[Blue]
DEJ 5	53075-[Blue], 98288-[Blue], 28891-[Beige], 41148-[Green], 46974-[Green]
Annotation 9	19872-[Blue], 55064-[Blue], 91508-[Green], 15847-[Green], 17332-[Blue], 42954-[Beige], 78979-[Blue], 71241-[Beige], 67152-[Beige]
None of these 1	99043-[Green]

Which tool did you like the least?

Support	Student Interview Response
WritetoLearn 9	91508-[Green], 92011-[Blue], 15847-[Green], 17332-[Blue]***, 45175, 98288-[Blue], 28891-[Beige], 62240-[Beige], 71241-[Beige]
PrePost Assessments 2	42954-[Beige], 97606-[Green]
DEJ 4	99043-[Green], 32724-[Green], 17332-[Blue]***, 67152-[Beige]
Annotation 15	72555-[Green], 53075-[Blue], 19872-[Blue], 57938-[Beige], 55064-[Blue], 66916-[Beige], 41148-[Green], 44950-[Blue], 56986-[Beige], 78930-[Green], 31629-[Beige], 54759-

	[Green], 19849-[Blue], 46974-[Green], 25083-[Green]
No answer (“I don’t know”) 1	78979-[Blue]

Hardest Tool to use? **Support**	**Student Interview Response**
WritetoLearn 2	66916-[Beige], 31629-[Beige]
Pre Post Assessments 4	99043-[Green], 19872-[Blue], 45175, 62240-[Beige]
DEJ 8	32724-[Green], 97606-[Green], 98288-[Blue], 41148-[Green], 78930-[Green], 19849-[Blue], 67152-[Beige], 25083-[Green]
Annotation 6	53075-[Blue], 55064-[Blue], 15847-[Green], 78979-[Blue],44950-[Blue], 71241-[Beige]
None 8	72555-[Green], 57938-[Beige], 91508-[Green], 92011-[Blue], 17332-[Blue], 42954-[Beige], 56986-[Beige], 46974-[Green]
Can’t Identify One 2	28891-[Beige], 54759-[Green]

Tool Helped Learn Science? **Support**	**Student Interview Response**
WritetoLearn 1	62240-[Beige]
PrePost Assessments 11	99043-[Green], 57938-[Beige], 66916-[Beige], 92011-[Blue], 17332-[Blue], 42954-[Beige], 78979-[Blue], 56986-[Beige], 78930-[Green], 54759-[Green], 46974-[Green],
DEJ 6	72555-[Green], 55064-[Blue], 15847-[Green], 45175, 28891-[Beige], 71241-[Beige]
Annotation 9	53075-[Blue], 19872-[Blue], 32724-[Green], 91508-[Green], 97606-[Green], 98288-[Blue], 41148-[Green], 31629-[Beige], 67152-[Beige]
Videos and Reading 1	44950-[Blue]
Group Discussions 1	19849-[Blue]
Lab 1	25083-[Green]

APPENDIX L

Guide to WriteToLearn… for Students!

Here is your quick guide to writing a good summary on Summary Street. If you need help, see inside for more details on how to make your summary better or how to use different features of WriteToLearn.

The basic steps (see details inside):

1. Log in at http://pearsonkt.com/WriteToLearn/ca/ucla

   ID = First and last name with NO SPACES!

   Password = Student ID number
2. Choose your article and type your summary. Save often. When you're ***done***, click "Get Feedback."
3. Revise your article. Summary Street grades on six major things. Make sure you have Green or "Excellent" in all of them. WriteToLearn looks for:
   a. Section coverage—How well you summarized each section of the text
   b. Length—Tells if you wrote too little or too much about the text
   c. Copying—Tells if you copied phrases or sentences from the text
   d. Spelling
   e. Repeated—Tells if you repeat yourself
   f. Unimportant—Tells if you have sentences that don't have much to do with the text
4. Fix your topic sentence.
5. Make sure your sentences come in an order that makes sense.
6. Fix your grammar and punctuation.
7. Save and log out when you are finished.

Two tips to avoid deleting your summary:

SAVE FREQUENTLY!!!! THERE IS A SAVE BUTTON ON THE BOTTOM OF THE PAGE.

DON'T HIT THE "BACK" BUTTON ON THE TOP OF YOUR WEB BROWSER. THERE ARE BUTTONS ON YOUR PAGE THAT WILL TAKE YOU BACK TO YOUR SUMMARY. ASK SOMEONE IF YOU DON'T KNOW HOW.

(This guide was created by teachers during a ROLE/ALSP professional development session, February 2007)

Guide to WriteToLearn… for Students!

FIRST THINGS FIRST: Get your summary into Summary Street.

1. Log onto the computer. Use the school ID and password that you were given to do this.

2. Open up a webpage. (Safari should be on your computer.)

3. Go to the Web site. www.pearsonkt.com/scienceSummary

4. Enter in your ID, password, and school.
   - ID= Your first name and last name with no spaces.
     Example: Adam Williams
   - Password= Your student ID number for school.
     Example: 12345678

   If you have a problem logging in, try again and type very carefully. Then ask your teacher for help if it still doesn't work.

5. Read the guidelines. This will help you remember what makes a good summary! Then press the "continue" button in the bottom of the page.

6. Read the directions. This will show you how the feedback process works on Summary Street. Then press the "Continue" button in the bottom of the page.

7. Choose the reading that you are writing a summary for. *If it's not on the list, double check, then ask a teacher for help.*

8. On the next page, you might be able to see the article on the screen. You can use this if you want to see the article again, or you can use your book. It's the same thing. When you're ready to type in your summary, click "Start New Summary" in the top right-hand corner of the page.

9. An empty box will appear where you can type your summary. Above the box, it will tell you how long your summary should be. Below the box, you can check spelling, save, print, or log out. ***SAVE IT OFTEN!!!*** When you are done typing, click the "Get Feedback" button on the bottom of the page.

STEP TWO: MAKE YOUR SUMMARY BETTER!

Once your summary is entered into WriteToLearn, there are several things that WriteToLearn is going to check for. Try working on your own. Your teacher is there to help you, but WriteToLearn is there to help you do it on your own! **Try working on your summary in this order for the best results!**

1. SPELLING—If you misspelled words, WriteToLearn will help you fix them. Get "Excellent" in this category. THEN SAVE!!!

What do I do if I don't know how to spell a word?

Try looking back in the book or asking your neighbor first. If there is a dictionary in the room, try that. If none of that works, then ask your teacher for help.

Get more help on the next page >>

2. SECTION COVERAGE—For each heading or section in the text, WriteToLearn will tell you if you summarized all of the important information. Get green in every section before you move on! THEN SAVE!!!

How do I get green in a section?

If you don't have green, WriteToLearn wants more information. Reread that section. Are there other important things you should have included? Look at the main and supporting ideas you noted if you did a DEJ or annotation. Did you include all of these in your summary? Did you write enough? Your summary length should be in green, too.

You might also not have green because you need to fix other stuff, so if you're still having trouble, keep going to other steps and then come back.

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3. COPYING—You have to use your own words in summary writing. If you copied the words from the textbook, WriteToLearn will tell you which phrases or sentences you copied. Click on the **Copying** link under "Tools" if you don't have an "Excellent" score in this category and rewrite where necessary. THEN SAVE!!!

I don't know how to write this part in my own words. What do I do?

Well, the WORST thing you should do is just change every word to something else. That doesn't help make your writing better. Close your book and close your eyes. Think about what that sentence means to you. How would you say it to your teachers or someone who has never read the article if they asked you what it means? Use those words instead.

Also, next time you write ANY summary, remember that you have to use your own words. So don't copy from the book when you do a double-entry journal (DEJ) or when you're doing your first draft. Your teacher is going to make you rewrite it anyway!

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4. REPEATED— WriteToLearn doesn't like when you say the same thing more than once. That's because summaries are supposed to be short and to the point! If two sentences are similar, they're redundant and need to be fixed. Click on the **Repeated** link under Tools and get "Excellent" here before you move on. THEN SAVE!!!

My sentences aren't repeated—they mean different things! What do I do?

Remember: WriteToLearn is a computer program. Humans are smarter, and it is not always right! If you think your sentences mean different things, then you're probably right.

Try these two tips:

- **Rephrase your sentences.** Let's pretend you said, "It was bad." Then rewrite it to be more specific. What was bad? Try to avoid too many pronouns (like it, she, and they), because it's hard to know what you're talking about. BE SPECIFIC!!

- **Add details or combine sentences.** If you said, "it was bad," what else did the article say? Why was it bad? Who was it bad for? If you said this stuff in another sentence, then put those two sentences together into one longer sentence. "It was bad because it killed organisms in the ocean" is much better.

Get more help on the next page >>

5. UNIMPORTANT— WriteToLearn also doesn't like it when you include sentences that are not in the text. If the text is about ice cream, don't write about pizza! It's *irrelevant*, or unimportant, to that article and you have to fix those sentences. If you have unimportant sentences, click on the link under "Tools" and get "Excellent: in that category. THEN SAVE!!!

My sentences are relevant to this article. WriteToLearn is wrong again. What do I do?

You may be right. WriteToLearn sometimes thinks that what you wrote is irrelevant, but maybe the program is not understanding what you wrote. If you think it is an important and relevant sentence, do NOT delete it. Remember, a good test is, did you annotate that information?

Try these tips for fixing irrelevancy:

- **Rephrase your sentence.** If it's important, then it may not be clear. Avoid pronouns like "it" and "they" because the computer might not know what you're talking about.
- **Be specific.** Write it as if you were telling someone unfamiliar—including ALL the important information.
- **Don't include your own thoughts.** WriteToLearn looks for you to talk about the key points of the article, so if you said, "I think this article was about..." or "I am going to talk about this topic, which was about…" then Summary Street might say that sentence is irrelevant.

PART THREE: EVERYTHING IS GREEN—NOW WHAT?

As you fix things, you can monitor your progress on Summary Street by clicking "Get Feedback at any time." When everything is fixed to Summary Street's liking, you're almost done. Here are the last steps:

1. Save!!!

2. Read your first sentence. This should be a *topic sentence* that sums the whole article. It should talk about who, what, where, when, why and how. If you don't have a topic sentence at all, write on. Then SAVE.

3. Does your topic sentence start with "This article is about…" or "I'm going to talk about…" or something like that? Don't do that. Delete that sentence and rewrite a new topic sentence that gets to the point!

4. Read your article (out loud if you can). Does it make sense? Are there any sentences that don't sound natural? If not, you may need to rewrite it.

5. Is your article in good order? A good summary about favorite foods talks about ice cream, then pizza, then chicken. It doesn't talk about pizza, then chicken, then pizza some more. Make sure you say everything about one main idea before you talk about a different one! Your DEJ helps you make these categories. And the most important ideas go first.

6. Do you have good punctuation? Do you have capital letters where I'm supposed to have them? Fix your writing so that it's readable for others.

7. SAVE IT. Show it to your teacher for more suggestions. SAVE again and then log out!

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