

Research Basis of the Underlying Premises of DynaNotes™ Plus App for Student iPads

Research supports the design of the course notes displayed within the *DynaNotes Plus* app for student iPads, including the use of

- text organization,
- graphic organizers,
- vocabulary development/reinforcement, and
- color usage.

Research in the form of case studies also exists on the instructional value of iPad use by students, including

- enriched, enhanced, and extended instruction for English Language Learners; and
- improved reading skills, time on-task, and academic performance for students with ADHD, emotional/behavioral disorders, and cognitive disabilities.

Text Organization

Good text organization is critical. McTigue and Slough (2010) state that informational texts must include the following features to enable comprehension: concreteness, clear author's voice, coherent writing structure, proper incorporation of visual aids, and integrated visual and verbal information. Researchers Lorch, Lemarie, and Grant (2011) found that using hierarchical organization and signaling devices like headings led to quicker text searches. Similarly, a 2010 study by Cauchard, Eryolle, Cellier, and Hyona supports the use of devices like topic headings to aid in the search process. DynaNotes course notes use headings, subheadings, and consistent formatting for easy signaling and information location. Additionally, the lack of distracting information, inclusion of strictly relevant information, and use of concrete examples and colorful visual aids also enable students to leverage the course notes effectively.

Graphic Organizers

Graphic organizers are visual representations of concepts and ideas. An expert panel from the U.S. Department of Education's National Center for Education Evaluation and Regional Assistance states that there is strong evidence to support the use of visual representations for students. The panel found that when instruction used multiple strategies, all of which included checklists and visual aids, students' mathematical procedural knowledge improved (Woodward et al., 2012). Researchers Roberts and Truwax (2013) believe that ambiguities in mathematics vocabulary can be even more challenging for English Language Learners. They recommend the use of graphic organizers and word walls to organize student learning. Sibold (2011) asserts that "because graphic organizers are visual images, they are particularly appropriate for English Language Learners. The use of graphic organizers such as word trees, concept maps, and relational charts, help students understand concepts and the related vocabulary" (p. 17). Additionally, a study found that the pairing of graphic organizers and explicit instruction improved science comprehension for students with autism spectrum

disorder (Knight et al., 2013). DynaNotes course notes incorporate graphic organizers, including tables, diagrams, models, graphs, maps, prompts, and lists of steps. The National Center for Education Evaluation and Regional Assistance recommends teachers provide such prompts and lists of steps to help students monitor and reflect when they are solving problems (Woodward et al., 2012).

Vocabulary Development/Reinforcement

Research studies and experts are in support of effective vocabulary development. For example, the National Center for Education Evaluation and Regional Assistance recommends that mathematics educators provide "a list of academic words and phrases (e.g., *addition, not greater than*) that are essential for teaching a given unit" (Woodward et al., 2012, p. 16). Jalongo and Sobolak (2011) assert that students need to be actively engaged in vocabulary development to show vocabulary gains. A study of 21 sixth-grade classrooms by Kelley, Lesaux, Kieffer, and Faller (2010) indicates that teaching academic vocabulary in meaningful and systematic ways helped to improve students' vocabulary and reading comprehension. Madeline Kovarik (2010) states that vocabulary instruction is critical, particularly for economically disadvantaged students who may come to school with limited background knowledge. The research of Burgoyne, Whiteley, and Spooner (2009) indicates that the difficulties that English Language Learners have in understanding texts are related to these students' significantly lower level of vocabulary knowledge. Sharilyn Daniels' 2009 study found that English Language Learners showed gains when they were provided with intervention that included exposure to vocabulary words, definitions, model sentences, and context. DynaNotes course notes provide concise definitions for academic vocabulary words. Their accompanying examples and images also help reinforce vocabulary in appropriate contexts.

Color Usage

The use of color benefits learners. Valerie Kirschenbaum (2006) states that today's texts must compete with more visually exciting media forms. Therefore, she suggests designing instructional materials with colored words, varied font sizes, and colorful imagery. Her ideas are supported by the research work of Ozcelik, Karakus, Kursun, and Cagiltay (2009). Their study of 52 participants showed that the use of color coding increased retention and performance. Color coding helped the participants more efficiently locate important information. DynaNotes course notes incorporate colorful vocabulary words, definitions, examples, visual models, images, and maps.

iPad Use in English Language Learner Programs

Jennifer Demski (2011) states in her *T.H.E. Journal* article that both Comal ISD in Texas and Township High School District 214 in Illinois transformed their English Language Learner programs by giving students access

to iPads or iPods. The Comal ISD instructional media specialist reports that the most-used app by English Language Learners was the free Dictionary.com app. Students reported that before they had their iPod or iPad, they would ask a teacher or do nothing if they did not know a word. DynaNotes course notes function as course-specific vocabulary and concept references for students. Keyword search allows students to find definitions and repeated usage of key terms. Definitions are appropriate to the grade level and course, as opposed to a dictionary's provision of multiple meanings and usages. Additionally, definitions are provided with related content and, thus, are in an appropriate context.

iPad Use with Students with ADHD, Emotional/Behavioral Disorders, and Cognitive Disabilities

McClanahan, Williams, Kennedy, and Tate (2012) report that iPad usage during tutoring sessions with a student with attention deficit hyperactivity disorder (ADHD) boosted reading skills, including metacognition by one grade level in six weeks' time. Gaining focus and interest in the lessons was cited as a key reason for the observed growth. A research review conducted by Raggi and Chronis (2006) supports the position that computer-aided instruction may be especially beneficial to students affected by ADHD. A 2014 case study involving students with emotional/behavioral disorders compared the students' time on-task when using an iPad versus normal independent practice conditions. The researchers concluded that the iPad increased time on-task, and both teachers and students viewed the iPads as effective and acceptable additions to the classroom (Flower, 2014). A different study of students found that the iPad was an effective intervention to increase basic math fluency for students with moderate to severe disabilities (O'Malley et al., 2013). Furthermore, these teachers viewed the iPads as having a positive effect on student engagement and interest in the subject matter (O'Malley et al., 2013). The *DynaNotes Plus* app for student iPads enables students to add their own notes to each section of course content via text (type or copy/paste) or using the iPad camera. They can use the notes section to add helpful links to computer games or other online content. This feature enables students or teachers to personalize the course content and extend the iPad experience to a variety of other online content.

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