Research Basis of the Underlying Premises of the *DynaNotes™ TexMatch, MathMatch, ScienceMatch, AmeriMatch,* and *OrderUp* Card Decks

Research supports the underlying premises of the *DynaNotes TexMatch, MathMatch*, *ScienceMatch*, *AmeriMatch, and OrderUp* card decks, including the use of

- vocabulary and concept reinforcement,
- visual representations, and
- games.

Vocabulary and Concept Reinforcement

Research recommends vocabulary development and reinforcement for all students. One way to accomplish this is through the use of games and flashcards. The research of Austermuehle, Kautz, and Sprenzels (2007) found that elementary students showed a growth in vocabulary knowledge after using such techniques as flashcards and vocabulary dictionaries. A study of 21 sixth-grade classrooms by Kelley, Lesaux, Kieffer, and Faller (2010) showed 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 in content areas, and particularly so for economically disadvantaged students who may come to school with limited background knowledge. The research of Burgoyne, Kelly, Whiteley, and Spooner (2009) showed that the difficulties that English Language Learners have in understanding texts are related to these students' significantly lower level of vocabulary knowledge. Likewise, Jalongo and Sobolak (2011) assert that students need to be actively engaged in vocabulary development to show vocabulary gains. Those students who speak English as a second language and those who are economically disadvantaged are particularly at risk of not making vocabulary gains. 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. The DynaNotes card decks reinforce critical vocabulary and concepts in a student-friendly format.

Visual Representations

Visual representations, including diagrams, maps, models, photographs, graphs, and artwork, can enhance student learning and engagement. For example, an expert panel from the U.S. Department of Education's National Center for Education Evaluation and Regional Assistance determined that there is strong evidence in support of selecting appropriate visual representations for math students (Woodward et al., 2012). The panel based its recommendation on several middle school studies that "consistently found that using visual representations improved achievement" (p. 26). Another study found that physics students who used visual representation tools outperformed those who did not use them when identifying forces and constructing free-body diagrams (Savinainen et al., 2013). In terms of history courses, David Lindquist (2012) suggests that teachers who include iconic photographs into historical studies can increase student engagement and learning. The DynaNotes card decks include a variety of colorful visual representations, including diagrams, photographs, models, and graphs, to enhance student learning and engagement.

Games

Boredom has been shown to result in negative academic performance (Pekrun et al., 2014). Chow, Woodford, and Maes (2011) state that "student understanding and retention can be enhanced and improved by providing alternative learning activities and environments" (p. 259). They propose that repetitive games can enhance problem-solving skills and the ability to process information and reach logical decisions. Educators have described how using games and other means of actively engaging students increases students' level of motivation, interest, and effort. Furthermore, Williamson, Land, Butler, and Ndahi (2004) state that there is "no doubt that one way to generate children's interest in mathematics and science is through their favorite activities and games." Daniel Fishman (2010) believes that games allow unengaged students who do not enjoy math to experience the exhilaration that comes with the hard work and accomplishment in math. Klara Pinter (2011) states that math games allow opportunities for all levels of students to develop strategies, ask questions, and formulate hypotheses. Carl Smith (2003) states that learning vocabulary should be an "active process that engages students in entertaining activities." Researchers Terzian and Moore (2009) evaluated 11 summer learning programs involving economically disadvantaged urban students and found that the effective programs included hands-on, enjoyable activities that had real-world applications. The DynaNotes *TexMatch, MathMatch, ScienceMatch, AmeriMatch,* and *OrderUp* card decks are a fun, interactive way to motivate students to learn grade-level vocabulary and concepts. To add an element of competition, the decks can be used as a memory style card game.

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