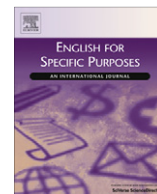




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## Modeling the relationships between test-taking strategies and test performance on a graph-writing task: Implications for EAP

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## ABSTRACT

With the increasing use of integrated tasks in assessing writing, more and more research studies have been conducted to examine the construct validity of such tasks. Previous studies have largely focused on reading–writing tasks, while relatively little is known about graph-writing tasks. This study examines second language (L2) writers' test-taking strategies in relation to their performance on a graph-writing test administered to English learners in health science and medical majors. Data from a strategy inventory and open-ended questions were collected and analyzed to determine if the task elicited academic writing strategies and to identify construct-related issues. The results from structural equation modeling analyses indicated that writers were engaged in graph comprehension, graph interpretation, and graph translation strategies during the task, and each type of strategy use generally had a positive impact on their test performance. The qualitative results pointed to L2 writers' difficulties in lexical knowledge and use, as well as possible sources of construct-irrelevant variance including graph familiarity, topical knowledge, and test-wiseness strategy use. The findings have theoretical and practical implications for the development and use of graph-writing tasks.

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### 1. Introduction

In academic contexts, the ability to write from sources is highly valued (Campbell, 1990; Leki & Carson, 1997). Therefore, a growing number of language tests have included in their assessment batteries integrated tasks designed to elicit writers' ability to incorporate multiple sources for writing (e.g., The Internet-based Test of English as a Foreign Language – iBT TOEFL, International English Language Testing System – IELTS, General English Proficiency Test – GEPT). The use of these tasks is considered to improve validity, enhance test fairness, and provide positive washback effects on language learning and instruction (Cumming, Grant, Mulcahy-Ernt, & Powers, 2004; Feak & Dobson, 1996; Fox, 2004; Read, 1990). Despite the many advantages integrated tasks have to offer, some construct validity issues have been raised due to the multifaceted nature of these tasks (Charge & Taylor, 1997; Fox, 2003; Upshur & Turner, 1999). To explore the validity of integrated writing tasks, a number of studies have investigated products (Cumming et al., 2005; Watanabe, 2001) and the processes or strategies of reading–writing tasks (Asención, 2004; Esmaeili, 2002; Plakans, 2009). Yet another type of integrated writing task, a graph writing task that requires the dual abilities of comprehension of graph input and transformation of visual information into written discourse, is less well researched, although the skills to analyze and interpret graphs or visual cues are also important for success in many academic studies (Hyland, 2006).

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The present study explores the underlying construct of a graph writing task in a writing section of an English achievement test administered to health science and medical majors enrolled in a course of Freshman English at a university in Taiwan. For these students, textbooks written in English are extensively used in their academic disciplines and much information is presented in graphs (e.g., statistical tables, line graphs, pie charts). Hence, graph comprehension and interpretation skills are indispensable for L2 education. One goal of the Freshman English course is to prepare students for the English demands of their academic areas and thus it is necessary to obtain information about students' current abilities to use graphs in written communications. The purpose of the test is to indicate a mastery of the course materials and determine if subsequent English for Academic Purpose (EAP) coursework is necessary. Considering the growing importance of students' graphicacy in English, a graph description and interpretation unit was recently implemented in response to the perceived need to enhance students' ability to describe, analyze, and comment on graphs in English. As a result, a graph writing task has been considered for possible inclusion in the test battery. However, more validity-related information is needed for such a decision. This study sought to address the validity issue of graph writing tasks by examining the nature of writers' strategy use and test performance on a graph writing task, and then modeling the relationships between strategy use and performance.

## 2. Background

### 2.1. Validity

Validity is considered the most fundamental criterion in designing and evaluating tests (American Educational Research Association & National Council on Measurement in Education, 1999). It refers to the degree to which theory and evidence substantiate test construct and use. The process of validation involves the development of both an interpretive argument and a validity argument (Chapelle, Enright, & Jamieson, 2008; Kane, 2006). An interpretive argument is intended to provide rationales for the inferences drawn from the test results and decisions made based on these results. Kane (2004) describes *evaluation*, *generalization*, *extrapolation*, and *test use* as a chain of movements that link grounds, or observations, with claims, the conclusions about test score use. A validity argument, on the other hand, may be considered "an interpretive argument in which backing has been provided for the assumptions" (Chapelle, Enright, & Jamieson, 2010, p. 5). In other words, a *validity argument* is established through evaluating the plausibility of theoretical claims and empirical evidence to support or refute the proposed interpretive argument. In formulating a validity argument, it is important to understand the extent to which empirical data are consistent with theoretical expectations, whether the language proficiency construct is connected to the target score, and ultimately whether the target score is linked to test use. This study gathers evidence of test-takers strategic behaviors and test scores in order to understand what the graph writing test is actually measuring and whether valid inferences can be drawn from the graph writing test scores. Such evidence may provide construct-validity support for the intended interpretation of test scores and uses.

### 2.2. Studies on test-taking strategies of integrated writing

Test-taking strategy research has been seen to provide insights for test validation (Bachman, 1990, 2002; Cohen, 1998, 2006). By assuring test-takers approach a test in a way pertinent to the construct or strategies employed in real-life communication situations, test users may make more direct inferences about the test results. Thus, data on test-takers' strategy use may lend support to test use and inferences (Bachman, 2002).

Previous validation studies on integrated writing have generally focused on test-taking processes or strategies elicited by reading–writing tasks. For example, a few researchers (Asención, 2004; Plakans, 2009) studied processes involved in reading–writing tasks, drawing on a discourse synthesis model (Spivey, 1984, 1990, 1997; Spivey & King, 1989) that considers *organizing*, *selecting*, and *connecting* three key operations involved. During *organizing*, writers comprehend texts by relying on their schemata of logical text organization. *Selecting* is when writers isolate important from less important information based on task purposes. *Connecting* occurs when writers link and integrate different pieces of source information for writing.

Three other operations, *monitoring*, *planning*, and *evaluating* were also found in integrated writing research (Asención, 2004; Esmaeili, 2002). *Monitoring* plays an administrative function in ensuring the effectiveness of writing progress and task fulfillment. *Planning* refers to systematic generation of ideas and transformation of abstract concepts into words. *Evaluating* involves the examination of progress being made toward a goal and may lead to modifications of written texts. Asención (2004) compared native and nonnative English speakers' composing processes in response to two reading–writing tasks and found that *monitoring* and *planning* appeared to occur most frequently across the two groups, followed by *selecting*, *organizing*, and *connecting*. In Esmaeili's (2002) study that examined 34 intermediate ESL adult learners' writing strategies in thematically-related reading–writing assessment tasks, *evaluating* strategies were found to be constantly employed by writers to support specific revision needs.

Although these studies contribute to an understanding of key operations involved in reading–writing tasks, those elicited by graph writing tasks have rarely been studied, particularly in L2 writing and language assessment literature. Cognitive psychology theories, therefore, may provide valuable perspectives in understanding interactions between visual inputs and test-takers. Carswell, Emery, and Lonon (1993) investigated thought processes during interpretation of line graphs and found viewers were engaged in both *global integrations* (i.e., identification of trends) and *local integrations* (i.e., identification of

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