Differential Effects of Traditional and Constructivist Instruction on Students’ Cognition, Motivation, and Achievement

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Abstract

This study examined the differential effects of constructivist and traditional instruction on students’ cognitive, motivational, and achievement outcomes in English classrooms, using a large representative sample of 3251 Grade 9 students from 117 classes in 39 schools. Results of hierarchical linear modeling (HLM) show differential cross-level effects: After controlling for students’ gender and socioeconomic status, constructivist instruction was a significant positive predictor of students’ deep processing strategies, task values, and English achievement, whereas traditional instruction was a significant positive predictor of students’ surface processing strategies and a negative predictor of English achievement. Our findings provide empirical evidence for the differential effects of constructivist and traditional instruction on multiple outcomes, including students’ achievement and psychological processes that are important for learning.
Differential Effects of Traditional and Constructivist Instruction on Students’ Cognition, Motivation, and Achievement

One of the key objectives of educators is to develop effective instruction to promote student outcomes. Two broad categories of instructional approach are generally adopted by teachers. The first is a set of traditional instructional practices derived largely from the knowledge transmission model and behaviorist psychology (Driscoll, 2000; Greeno, Collins, & Resnick, 1996; Martínez, Sauleda, & Huber, 2001; Sfard, 1998; Shuell, 1996). The second is a set of constructivist instructional practices derived largely from the knowledge construction model, cognitive psychology, and progressive pedagogy (Dewey, 1897; Gergen, 1985; Piaget, 1954; von Glasersfeld, 1995; Vygotsky, 1986).

Traditional Instruction: The Knowledge Transmission Model

Traditional views of teaching and learning are grounded in behaviorist psychology. In the behaviorist model, knowledge is a result of acquiring stimulus-response associations. Teaching focuses on transmission of knowledge and student learning focuses on the acquisition of knowledge and reinforcement through drill and practice. From a behaviorist perspective then, teachers are deliverers of knowledge as represented in curriculum and textbooks, and students are passive recipients of knowledge. Accordingly, traditional instruction shares the following elements: (a) academic tasks, defined by the curriculum and textbooks, are broken down into discrete units and presented to students in a systematic way; (b) rewards and progress through an ordered hierarchy of tasks are contingent on correct performance; (c) component skills are repeated through drill and practice until they are mastered; and (d) students’ performance is evaluated by their ability to retrieve basic knowledge and facts. In general, textbook focus, memorization, and drill and practice are some of the common features of traditional instruction.
Constructivist Instruction: The Knowledge Construction Model

Although there are various types of constructivism (e.g., Gergen, 1985; Piaget, 1954; von Glasersfeld, 1995; Vygotsky, 1986), they largely reject the knowledge transmission model of education (Gergen, 1995; McCarty & Schwandt, 2000). From a constructivist perspective, knowledge is actively constructed by the learner and knowledge construction is the process of meaning making through connection with prior knowledge and the real world (von Glasersfeld, 1991). Learning is not passively receiving knowledge but an active process of constructing meaningful representations. Teaching is concerned with guiding thinking toward a more complete understanding (Mayer, 1996). Although constructivists may share the same general view, they differ with respect to the mechanisms of knowledge construction (Phillips, 1995, 2000). Cognitive constructivists, such as Piaget and von Glasersfeld, stress that knowledge construction through cognitive processing of information is found in the individual learner, whereas social constructivists, such as Vygotsky and Gergen, focus on the social processes that mediate knowledge construction and emphasize conversation and interaction with others through language. However, they have more in common than is usually supposed. (Brown, Metz, & Campione, 1996). In general, there are several common elements of constructivist instruction: (a) knowledge construction and meaning making through students’ deep cognitive processing; (b) interaction with other persons using language; (c) making connections with real-world situations.

A variety of constructivist models of instruction have been proposed and tested, e.g., reciprocal teaching (RT) in reading comprehension (e.g., Brown & Palincsar, 1989; Hacker & Tenent, 2002; Palincsar & Brown, 1984), concept-oriented reading instruction (CORI) in English (e.g., Guthrie, Van Meter, Hancock et al., 1998; Guthrie, Van Meter, McCann et al., 1996; Guthrie, Wigfield, & VonSecker, 2000), problem solving and concept transfer in math and
science (e.g., Anderson & Roth, 1989; Resnick & Omanson, 1987), and authentic instruction in math and social studies (Newmann & Associates, 1996; Newmann & Wehlage, 1996).

Many studies since Palincsar and Brown’s (1984) seminal work have been conducted to test RT’s effectiveness. Rosenshine and Meister (1994) reviewed 16 experimental intervention studies of RT and found that when experimenter-developed comprehension tests were used, the differences between RT and control programs using traditional instruction were almost significant; when standardized tests were used, results were seldom significant. But generalization of these 16 studies also showed us some meaningful results: there was an overall effect size of .32 on standardized tests favoring RT over control programs and .88 on experimenter-developed comprehension test.

Guthrie et al. (1998) examined the effects of CORI on improving students’ use of cognitive strategies in Grades 3 and 5 classrooms. They found that, compared to control classrooms, CORI increased students’ ability to use the cognitive strategies of searching, comprehending, and note taking. In a follow-up study, Guthrie et al. (2000) explored the effects of CORI not only on strategy use but also on motivation. They found that fifth graders who received CORI scored higher on curiosity than children did in control classrooms.

In addition to experimental evidence, there is also evidence based on correlational research. For example, in a synthesis of evaluation results of instructional reforms, Hamilton et al. (2003) found weak but consistent positive relations between “reform-oriented” (or constructivist-based) instruction and student achievement in both multiple-choice and open-response tests in math and science. They also found that the positive relations were stronger for open-response tests than for multiple-choice tests.

**Need to Consider Traditional and Constructivist Instruction Jointly**
A great deal of research on instructional effectiveness relies on experimental designs to establish the effectiveness of a particular instructional strategy relative to a control group. However, experimental studies, although strong in internal validity, often fail to consider the impact of different instructional methods jointly. Moreover, they often assume that control groups are classes using traditional instructional practices. However, this assumption is difficult to justify because teachers rarely, if ever, use traditional instruction or constructivist instruction alone. One key question, therefore, is to explore the effects of both instructional practices jointly on a variety of student outcomes rather than simply to compare the effectiveness of two instructional practices separately.

**Multiple Effects of Instruction**

There are two major lines of research on the psychological processes of student learning. One focuses on students’ cognitive processes such as how to remember, understand, and solve problems. Research has shown that use of cognitive strategies played an important role in learning and academic performance (Pintrich & De Groot, 1990; Wolters & Pintrich, 1998). The other focuses on students’ motivational beliefs such as goal orientation, self-efficacy, and task values. Research has shown the important role of motivational beliefs in explaining why and how students engage in academic tasks and their direct and indirect contributions to academic achievement (see Eccles, Wigfield, & Schiefele, 1998, for a review). Because neither cognitive model nor motivational model alone can explain students’ learning completely (Garcia & Pintrich, 1996; Snow, Corno, & Jackson, 1996), the current research emphasizes the conceptualization of student learning from both the cognitive and motivational perspectives.

Our dual focus on student motivation and cognition is consistent with the view of multiple effects of teaching (Shuell, 1996). Parallel to the two components of student learning,
there are two major effects of teaching: improving students’ cognitive skills and enhancing their motivation to learn. Accordingly, in addition to academic achievement, this study also examined the effects of different instructional practices on students’ cognitive strategies and motivational beliefs.

**Cognitive Strategies**

One of the cognitive components of learning involves the use of cognitive strategies to remember and understand curriculum content. Different cognitive strategies such as rehearsal, elaboration, and organization have been found to foster students’ learning and achievement (Elliot, McGregor, & Gable, 1999; Pintrich & De Groot., 1990; Weinstein & Mayer, 1986).

The distinction between surface and deep processing is widely recognized in the cognitive strategies literature (Elliot et al., 1999; Entwistle & Ramsden, 1983; Graham & Golan, 1991). In Elliot et al.’s (1999) definitions, surface processing involves the repetitive rehearsal and rote memorization of information and deep processing involves critical thinking and elaboration. This distinction is consistent with the one we used in present study to examine the effects of instructional practices on the depth of cognitive processing.

**Motivational Beliefs**

We drew upon two different social-cognitive theories of motivation that focus on domain-specific beliefs in an effort to conceptualize motivation. These theories include Bandura’s (1997) self-efficacy theory and Eccles-Parsons et al.’s (1983) expectancy-value theory.

Self-efficacy theory posits that a critical factor that contributes to individuals’ engagement in a task is their perceived capability to successfully achieve it. Bandura (1997) defined self-efficacy as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (p. 3). Perceived self-efficacy can contribute to
achievement outcomes directly or indirectly through diverse pathways such as effort, persistence, anxiety, and use of cognitive strategies. (Bandura, 1993; Pintrich & De Groot, 1990; Schunk, 1984; Wolters & Pintrich, 1998; Zimmerman, 2000). Expectancy-value theory posits that individuals’ task-related expectancies for success and values motivate them to engage in a task, to seek out task challenges, to persist in the face of difficulty, and to choose certain activities in their free time. Eccles-Parsons et al. (1983) defined values as individuals’ intrinsic reasons for engaging in a task (e.g., task enjoyment) and their extrinsic reasons for doing so (e.g., the perceived importance of the task for attaining other life goals). For purposes of this study, we used Bandura’s notion of self-efficacy and Eccles-Parsons et al.’s notion of task values as components of student motivation.

**Objectives of the Present Study**

There is a long history of tension between the knowledge transmission and knowledge construction model. The didactic approach to teaching has been the target of strong criticism by advocates of constructivist pedagogy. Advocates of the knowledge transmission model, however, maintain that traditional instruction is efficient in delivering a large amount of knowledge and is effective in boosting students’ test scores. These beliefs may partly explain why traditional instruction is still commonly practiced.

Given the direct implications for educational practices and reforms, the relative effectiveness of traditional instruction and constructivist instruction has been an issue of great interest and controversy (e.g., Applefield, Huber, & Moallem, 2001; Koziejoff, LaNunziata, Cowardin, & Bessellieu, 2001). The purpose of the present study is to examine the differential effectiveness of traditional instruction and constructivist instruction, derived from the knowledge transmission model and the knowledge construction model, respectively. We first examined the
factorial structure of instructional practices to determine the viability of identifying the two instructional approaches empirically. We then evaluated the differential effectiveness of the two sets of instructional practices by modeling their relations to multiple outcomes, including students’ achievement in English, cognitive strategies, and motivational beliefs. Finally, we examined how students’ family backgrounds would moderate the relations between instructional practices and student outcomes.

**Research Questions**

The research questions of this study include: (a) What is the factorial structure of instructional practices in Grade 9 English classrooms? (b) How much of the total variance in student outcomes (English achievement, cognition, and motivation) is accounted for by between-class differences and within-class differences? (c) What are the cross-level effects of constructivist and traditional instruction on students’ achievement in English, use of cognitive strategies, and motivational beliefs? (d) What are the interaction patterns between students’ family backgrounds and instructional practices in predicting student outcomes?

**Method**

**Participants**

The participants were 3251 Grade 9 students from 117 classrooms in 39 secondary schools in Singapore. The ethnic distribution of the sample was as follows: 2426 Chinese (75%), 574 Malay (18 %), 174 Indian (5 %), and 77 others (2%). The gender distribution of the sample was even (51% female, 49% male). The mean age of the students was 15.5 years. English is the medium of instruction in Singapore and all students formally start learning English in Grade 1.

**Sampling Design**
The sample was drawn using a stratified random sampling technique. Schools were divided into three strata based on their prior aggregate school achievement and 13 schools were randomly selected from each stratum. About half of the Grade 9 classrooms in each participating school were randomly selected to do the English survey and assessment.

**Procedure**

The study had two parts. Part 1 was an online survey that included two forms. Half of students in each class were randomly selected to complete survey form 1 in which students reported their cognitive and motivational processes related to learning English. The other half of the students in the same class completed survey form 2 in which students reported the instructional practices of their English teachers. In other words, half of the students provided student-level (L1) data and the other half provided class-level (L2) data. The average numbers of students completing forms 1 and 2 per class were 14.2 and 13.6, respectively. Because different groups of students provided information on variables at different levels, the inflation of cross-level relations would be reduced. In Part 2 of the study, an English achievement test was administered to all the students who had completed either form 1 or form 2 of the survey.

**Measures**

Before the main study, two pilots were run to develop and validate the scales so that they are psychometrically sound and appropriate for the Singaporean context. Items for the scales described below were selected for analysis. All items on the survey were rated on 5-point Likert scales (1 = never to 5 = always; or 1 = strongly disagree to 5 = strongly agree).

**Instructional practices.** Two broad categories of instructional practice were assessed—constructivist and traditional. The constructivist instruction scale included items on frequency of classroom discussion, frequency of extended writing, and teachers’ emphasis on depth of
understanding and application of English to everything life. The traditional instruction scale included items on frequency of textbook use, frequency of drill and practice on basic skills, and teachers’ emphasis on memorization of factual information (Anderson et al., 2001; Hamilton et al., 2003; Newmann, Marks, & Gamoran, 1996; Smerdon, Burkam, & Lee, 1999).

Confirmatory factor analysis was conducted to examine the factorial structure of the two constructs. A two-factor structure provided a good fit for the data, $\chi^2 (34, N = 1592) = 316.31$, TLI = .95, CFI = .97, RMSEA = .07. Each scale showed high internal consistency ($\alpha = .91$ for constructivist instruction and $\alpha = .80$ for traditional instruction). Interfactor correlation is .58.

The two-factor structure is consistent with findings reported by other researchers using survey methodology (Cohen & Hill, 2000; Hamilton et al., 2003; Smerdon, Burkam, & Lee, 1999).

**Motivational processes.** Two broad sets of students’ motivational processes were assessed—students’ self-efficacy and task values. Specifically, we assessed (a) students’ self-efficacy in their ability to master the skills taught in English class (Motivated Strategies and Learning Questionnaire, MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1993); and (b) students’ task values related to English, including their sense that English was interesting, useful to learn, and important to learn (Eccles & Wigfield, 1995).

Confirmatory factor analysis was conducted to examine the factor structure of the two constructs. A two-factor structure provided a good fit for the data, $\chi^2 (26, N = 1659) = 241.04$, TLI = .94, CFI = .96, RMSEA = .07. Each scale showed high internal consistency ($\alpha = .85$ for self-efficacy and $\alpha = .79$ for task values). The interfactor correlation is .58.

**Cognitive strategies.** Students’ reported use of different cognitive strategies was assessed by items derived and revised from those originally created by Pintrich et al. (1993). The original
scales included 4 subscales: rehearsal, elaboration, organization, and critical thinking. Before the main study, two pilots were run to revise the scales to make them appropriate for the Singaporean context. The data supported a two-factor structure instead of a four-factor structure in the pilots and this study. The two factors were labeled as surface processing and deep processing, which is consistent with the distinction used by Elliot et al.’s (1999).

Confirmatory factor analysis was conducted to examine the factorial structure of the two constructs. A two-factor structure provided a good fit for the data, \( \chi^2 (24, N = 1659) = 278.08, \) TLI = .93, CFI = .97, RMSEA = .08. Surface cognitive strategies scale included 3 items and deep cognitive strategies scale included 6 items. Each scale showed high internal consistency (\( \alpha = .83 \) for surface processing and \( \alpha = .87 \) for deep processing). The interfactor correlation is .61.

**Socioeconomic status and gender.** Gender was coded 0 = male and 1 = female. Our measure of socioeconomic status (SES) included five indicators: father’s educational level, mother’s educational level, family resources, family learning resources, and type of residence. Parents’ education was measured on a 7-point scale (1 = “Primary or below” to 7 = “Master or PhD”). Family resources and family learning resources were measured by dichotomous items, such as “Do you have a maid at home?” (family resources) and “Do you have dictionary at home?” (family learning resources). Yes was coded as 1 and No as 0. The sum of the item scores of each scale was used as the indicator of family resources and family learning resources. Type of residence was measured on a 5-point scale (1 = “One or two bedroom government-subsidized flat” to 5 = “Condominium or private property”). Because the units of measurement of the five indicators were not the same, all the scores of the indicators were standardized before further analyses.
Confirmatory factor analysis was conducted to examine the factorial structure of the construct. A one-factor structure provided a good fit for the data, $\chi^2 (4, N = 1659) = 8.05$, TLI = .99, CFI = 1.00, RMSEA = .03. The scale showed adequate internal consistency ($\alpha = .77$).

**Achievement.** A multiple-choice English achievement test was developed for this study because a standardized test of English achievement was not available at Grade 9 in Singapore. The test was intended to assess Grade 9 students’ basic skills in the English language. It included items on grammar, vocabulary, and reading comprehension. A panel of researchers and school teachers who had experience teaching English constructed and reviewed the items to ensure the content validity, clarity, and grade-level appropriateness of the assessment instrument. Two pilots were conducted to select items from the item pool on the basis of their psychometric quality such as item difficulty, item discrimination, and functioning of distracters. A final set of 70 items was selected and administered in this (main) study. In the final scoring, two items that did not perform well psychometrically in the main study sample were dropped. The 68 items that were used for final scoring and analysis had high reliability ($\alpha = 0.93$).

**Analyses and Results**

**Analytic Approach to Modeling Student Outcomes**

All independent and dependent variables (except gender) were standardized before running HLM. The one-way ANOVA with random effects model (Model 0) was used to estimate the proportion of within- and between-class variances in the dependent variables (Raudenbush & Bryk, 2002).

Model 0

\[ Y_{ij} = \beta_{0j} + r_{ij} \]

\[ \beta_{0j} = \gamma_{00} + u_{0j} \]
Results of random effects ANOVA are presented under Model 0 in Tables 1 to 5.

The intraclass correlation coefficient (ICC) measures the proportion of total variance in the dependent variable explained by between-class differences. For English achievement, between-class differences accounted for 71% of the total variance; for other dependent variables, ICCs ranged from 4% to 9%. Chi-square tests were also performed to examine the significance of between-class variances. We found that between-class variances were significant for all the dependent variables \( \chi^2(s) (116, N=1659) = 180.12 \) to \( 4087.49, ps < .01 \).

The next set of HLM analyses was performed to evaluate the predictive relations between instructional practices and student outcomes, controlling for students’ gender and SES. For this purpose, gender and SES were entered into the models as control variables. SES was group-mean centered at level 1 and grand-mean centered at level 2, such that SES was partitioned into within-class effect (SES\(_w\)) and between-class effect (SES\(_b\)) (Raudenbush & Bryk, 2002). Model 1 was used to examine whether SES\(_w\) and gender predicted student outcomes at level 1. Model 2 was used to examine the contribution of SES\(_b\) to predicting adjusted average student outcomes (the adjusted intercept), controlling for the effects of SES\(_w\) and gender. Model 3 was used to examine whether constructivist and traditional instruction predicted English achievement, use of cognitive strategies (surface processing and deep processing), and motivational beliefs (self-efficacy and task values), controlling for the effects of gender, SES\(_w\), and SES\(_b\).

Model 1

\[
Y_{ij} = \beta_{0j} + \beta_{1j} \text{(Gender)} + \beta_{2j} \text{(SES\(_w\))} + r_{ij}
\]

\[
\beta_{0j} = \gamma_{00} + u_{0j}
\]
\[
\begin{align*}
\beta_{ij} &= \gamma_{i0} \\
\beta_{2j} &= \gamma_{20}
\end{align*}
\]

Model 2
\[
Y_{ij} = \beta_{0j} + \beta_{1j} \text{(Gender)} + \beta_{2j} \text{(SES}_w) + r_{ij}
\]
\[
\beta_{0j} = \gamma_{00} + \gamma_{01} \text{(SES}_b) + u_{0j}
\]
\[
\beta_{1j} = \gamma_{10}
\]
\[
\beta_{2j} = \gamma_{20}
\]

Model 3
\[
Y_{ij} = \beta_{0j} + \beta_{1j} \text{(Gender)} + \beta_{2j} \text{(SES}_w) + r_{ij}
\]
\[
\beta_{0j} = \gamma_{00} + \gamma_{01} \text{(SES}_b) + \gamma_{02} \text{(CI)} + \gamma_{03} \text{(TI)} + u_{0j}
\]
\[
\beta_{1j} = \gamma_{10}
\]
\[
\beta_{2j} = \gamma_{20}
\]

\(Y_{ij}\) is the dependent variable; CI is constructivist instruction (aggregated from individual students’ ratings to the class level); TI is traditional instruction (aggregated from individual students’ ratings to the class level). \(r_{ij}\) is the level 1 residual term; \(u_{0j}\) is the level 2 residual term for the intercept.

In all the HLM analyses, we tested whether the slope parameters for gender and \(\text{SES}_w\) were random or not. For all the dependent variables, the random effects for the slopes were not significant at \(\alpha = .05\). Thus, both \(\beta_{1j}\) and \(\beta_{2j}\) were treated as fixed parameters in models 1 to 3.

Furthermore, we estimated the proportion of variance reduction as a result of adding predictors in successive models. Besides conceptual considerations in relation to our research
objectives, the sequence of model building is based on Randaubush and Bryk’s (2002) recommendation on the proper use of proportion reduction in variance statistics—“the variance explained in a level-2 parameter, such as $\beta_{0j}$, is conditional on a fixed level-1 specification” (p. 150). Thus, each preceding model is a nested model of the more complex model that follows. Parameter estimates and variance reduction results from the series of HLM analyses are presented in Tables 1 to 5. Of most interest to our research objectives pertain to the comparisons between model 3 and model 2.

**Instructional Practices Predicting Achievement**

As shown in model 3 of Table 1, at level 1, the within-class SES was a significant positive predictor of achievement ($\gamma = .103, p < .01$), whereas gender was not a significant predictor ($\gamma = .059, p > .05$). At level 2, between-class SES was positively related to achievement ($\gamma = .517, p < .01$). Of most interest are the findings that constructivist instruction was a positive predictor of achievement ($\gamma = .233, p < .01$), whereas traditional instruction was a negative predictor ($\gamma = -.396, p < .01$). Comparison between model 3 and model 2 yielded a 29% reduction in between-class variance in achievement.

**Instructional Practices Predicting Cognitive Strategies**

As shown in model 3 of Tables 2 and 3, at level 1, there were no gender differences in the use of surface processing strategies, but males tended to use more deep processing strategies than did females ($\gamma = -.184, p < .01$). Within-class SES was positively related to the use of deep processing strategies ($\gamma = .085, p < .01$), but not surface processing strategies. At level 2, between-class SES was negatively related to surface processing strategies ($\gamma = -.084, p < .05$), but it was not a significant predictor of deep processing strategies. Moreover, traditional instruction was positively related to the use of surface processing strategies ($\gamma = .179, p < .01$),
but not deep processing strategies. On the contrary, constructivist instruction was positively related to the use of deep processing strategies ($\gamma = .099, p < .01$), but not to surface processing strategies. Comparison between model 3 and model 2 yielded 36% and 28% reduction in between-class variance in surface processing strategies and deep processing strategies, respectively.

**Instructional Practices Predicting Motivational Beliefs**

As shown in model 3 of Tables 4 and 5, at level 1, gender differences were not significant for self-efficacy and task values. Within-class SES was positively related to both self-efficacy ($\gamma = .181, p < .01$) and task values ($\gamma = .109, p < .01$). At level 2, between-class SES was not a significant predictor of self-efficacy or task values. In addition, neither constructivist instruction nor traditional instruction was significantly related to self-efficacy. Constructivist instruction was a significant positive predictor of task values ($\gamma = .086, p < .05$), whereas traditional instruction was not a significant predictor ($\gamma = .027, p > .05$). Comparison between model 3 and model 2 yielded 11% and 21% reduction in between-class variance in self-efficacy and task values, respectively.

**Interaction Between Class-Level SES and Instructional Practices**

In the final set of analyses, we explored whether instructional effectiveness would differ by aggregate (class-level) characteristics of students. We tested the interaction between class-level SES (SES$_b$) and instruction by entering two product terms, SES$_b \times$ constructivist instruction and SES$_b \times$ traditional instruction, into the HLM model for each of the dependent variable.

Model 4 (Interaction Model)

$$Y_{ij} = \beta_{0j} + \beta_{1j}(\text{Gender}) + \beta_{2j}(\text{SES}_w) + r_j$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{SES}_b) + \gamma_{02}(\text{CI}) + \gamma_{03}(\text{TI}) + \gamma_{04}(\text{SES}_b \times \text{CI}) + \gamma_{05}(\text{SES}_b \times \text{TI}) + u_{0j}$$
We found significant interactions only when self-efficacy was used as the dependent variable. Specifically, the $\text{SES}_b \times \text{CI}$ interaction was positive and significant ($\gamma_{04} = .093$, $p < .01$), whereas the $\text{SES}_b \times \text{TI}$ interaction was negative and significant ($\gamma_{05} = -.140$, $p < .01$).

Furthermore, the addition of the interaction terms to the HLM model (model 4 vs. model 3) resulted in a 24% reduction in between-class variance in self-efficacy.

**Discussion**

*Dimensionality and Structure of Instructional Practices*

Results of confirmatory factor analysis confirm the existence of a two-factor structure of instructional practices in Grade 9 English classrooms in Singapore. The distinction between traditional and constructivist instruction reported in this study is consistent with the findings reported in other studies using U.S. samples (e.g., Cohen & Hill, 2000; Hamilton et al., 2003; Smerdon et al., 1999).

The positive correlation between the two instructional practices suggests that they are not mutually exclusive approaches to teaching; rather, the adoption of constructivist instruction can go hand in hand with the adoption of traditional instruction. Hence, it is important to consider the conjoint contributions of the two types of instructional practices to student outcomes.

*Instructional Practices and Academic Achievement*

The present study enriches our understanding of the predictive relations between instructional practices and student achievement in two ways. First, there is a popular view among teachers that traditional instruction, which focuses on memorization, drill, and practice, is an effective method to improve conventional measures of academic achievement. Our results do not
support this idea, at least for Grade 9 English. We found that traditional instruction was negatively related to English achievement. Second, the findings show that constructivist instruction, which focuses on elaboration, discussion, deep understanding, and real world connectedness, was positively related to student achievement in English. It is remarkable that the relation was positive even though we used conventional measures of English achievement in multiple-choice format and controlled for the influences of SES and gender.

Our findings are consistent with previous work reported by Hamilton et al. (2003) who found that “reform-oriented” instruction (similar to our constructivist instruction) was positively related to math and science achievement using both multiple-choice and open-ended questions. In their study, the patterns of relation between traditional instruction and student achievement were not reported.

The lack of interaction between the instructional practices and class-level SES in the prediction of achievement suggests that the relations between instructional practices and English achievement are consistent across classrooms with different aggregate SES. One implication is that the constructivist approach to instruction would work equally well for students of varying family backgrounds, including students from disadvantaged families. Moreover, our finding does not support the view that traditional instruction, which focuses on memorization, drill and practice, would benefit disadvantaged students in terms of their achievement outcomes. Rather, traditional instruction appears to be uniformly ineffective regardless of students’ family backgrounds.

**Instructional Practices and Use of Cognitive Strategies**

Most research on teacher effects has focused exclusively on achievement outcomes. However, a focus on achievement outcomes alone fails to capture the rich array of psychological
processes that instructional practices generate (or suppress). Our findings extend previous work by including psychological processes as dependent variables. We found that traditional instruction predicted surface processing strategies but not deep processing strategies. In contrast, constructivist instruction predicted deep processing strategies but not surface processing strategies. These results are consistent with results from some of the experimental research (De Corte, Verschaffel, & Van De Ven, 2001; Guthrie Van Meter et al., 1998; Guthrie, Wigfield et al., 2000). From a cognitive perspective, the mapping of instructional practices to students’ cognitive processes suggests that different instructional approaches can have different cognitive consequences for students in terms of their depth of cognitive strategies (Driscoll, 2000; Shuell, 1996). By directly modeling the relations between instructional practices and cognitive processes involved in learning, we obtain empirical support for the notion of teaching for understanding, which is often emphasized in pedagogical reforms (Cohen, McLaughlin, & Talbert, 1993; Newmann & Associates, 1996; Wiggins & McTighe, 2005).

Similar to the result for English achievement, there is no interaction between instructional practices and class-level SES in predicting the use of cognitive strategies. This finding indicates that cognitive benefits of constructivist instruction could be generalized to students of different family backgrounds.

**Instructional Practices and Motivational Beliefs**

The positive relation between constructivist instruction and task values suggests that when English teachers use more constructivist instruction in class, students tend to perceive their learning tasks as more important, interesting, and useful. Because constructivist instruction emphasizes authenticity and meaningfulness of learning tasks, it is expected to arouse students’ interests by helping them see the value of the knowledge they learn. This finding is consistent
with results from some of the experimental studies, which showed that constructivist instruction enhanced students’ curiosity and interests (Guthrie, Van Meter et al., 1996; Guthrie, Wigfield et al., 2000). This result also confirms teachers’ general beliefs about the benefits of using tasks that are connected to the real world. For example, Sweet, Guthrie and Ng (1998) found that teachers believed that experiences of real-world interactions were correlated with students’ intrinsic motivation.

Although the main effects of instructional practices on self-efficacy were not significant, we found interactive relations between instructional practices and class-level SES in the prediction of self-efficacy. Specifically, the effects of constructivist and traditional instruction on self-efficacy depend on the average SES of students in their class. Our findings show that when the average SES of students is higher, the relation between constructivist instruction and self-efficacy tends to be more positive, whereas the relation between traditional instruction and self-efficacy tends to be more negative. One explanation might be that constructivist instruction, which emphasizes active learning and elaborate communication, would tend to foster a sense of agency in learning English among high-SES students, whose family environments and practices are likely to match the ethos of constructivist classrooms. In contrast, traditional instruction may undermine high-SES students’ sense of efficacy in learning English due to the mismatch between their home environments and the didactic approach to teaching.

**Implications**

Our findings raise important questions about the relative effectiveness of different instructional strategies. We obtain empirical support for the conclusion that constructivist, rather than traditional, instructional practices have positive and significant effects on a range of cognitive, motivational and achievement outcomes. For parents and educators who are concerned
about the possible negative impact of constructivist instruction on students’ test scores, in the belief that constructivist instruction is not “teaching to the test,” our data suggest that there is no cause for alarm. In fact, constructivist instruction can lead to positive achievement outcomes, at least for Grade 9 English. On the other hand, traditional instruction appears to lead to negative achievement outcomes, even when a conventional measure of English achievement was used.

The analytic approach adopted in this study underscores the importance of an empirical focus on the relations between instructional practices and cognitive processes involved in student learning (Bransford, Brown, & Cocking, 1999; Richardson, 2003). Although it is generally assumed that constructivist instruction provides students with opportunities to actively construct knowledge, the links between instructional practices and student learning needs to be empirically verified. Our findings provide empirical support for such a teaching-learning link.

**Limitations**

Several limitations of this study should be noted. First, we relied on students’ self-report measures as a primary source of data. Second, the correlational nature of the study does not allow us to infer causal relations between instructional practices and student outcomes. Third, the cross-sectional design would likely lead to an underestimation of instructional effects on student outcomes (Rowan, Correnti, & Miller, 2002). Fourth, this study does not permit generalization beyond Grade 9 English.

Future research could triangulate our findings by using classroom observation and teachers’ reports as sources of data. Generalization of our results would be enhanced by replicating our study with different grade levels and curriculum domains. Furthermore, a longitudinal design would be useful to assess the cumulative effects of different instructional practices on student outcomes and to model the change of student outcomes over time.
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Associates.


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Table 1

**Results From HLM Analyses Predicting Students’ Achievement in English**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 0</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>( \gamma_{00} )</td>
<td>-.042</td>
<td>-.075</td>
<td>-.077</td>
</tr>
<tr>
<td></td>
<td>( SE )</td>
<td>.079</td>
<td>.080</td>
<td>.053</td>
</tr>
<tr>
<td>SESb (( \gamma_{01} ))</td>
<td></td>
<td>.652**</td>
<td>.517**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( CI (\gamma_{02}) )</td>
<td>.233**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI (( \gamma_{03} ))</td>
<td></td>
<td>-.396**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope</td>
<td>( \gamma_{10} )</td>
<td>.063*</td>
<td>.061*</td>
<td>.059</td>
</tr>
<tr>
<td></td>
<td>( SE_{sw}(\gamma_{20}) )</td>
<td>.103**</td>
<td>.103**</td>
<td>.103**</td>
</tr>
<tr>
<td>Random effect</td>
<td>Variance</td>
<td>Variance</td>
<td>Variance</td>
<td>Variance</td>
</tr>
<tr>
<td>( u_{0j} )</td>
<td>.709</td>
<td>.703</td>
<td>.283</td>
<td>.201</td>
</tr>
<tr>
<td>( r_{ij} )</td>
<td>.295</td>
<td>.287</td>
<td>.287</td>
<td>.287</td>
</tr>
<tr>
<td>Proportion reduction in variance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICC M1 vs. M0 (L1)</td>
<td>M2 vs. M1 (L2)</td>
<td>M3 vs. M2 (L2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.71</td>
<td>3%</td>
<td>60%</td>
<td>29%</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Gender was coded 1 = female and 0 = male. CI = constructivist instruction; TI = traditional instruction. ICC = intraclass correlation coefficient. M0 to M3 = model 0 to model 3, respectively. L1 and L2 indicate that the calculation of proportion reduction in variance is based on level 1 and level 2 variance, respectively.

*\( p < .05 \).* \( **p < .01 \).*
Table 2

Results From HLM Analyses Predicting Students’ Surface Processing Strategies

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 0</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>γ</td>
<td>SE</td>
<td>γ</td>
<td>SE</td>
</tr>
<tr>
<td>Fixed effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \gamma_{00} )</td>
<td>.005</td>
<td>.036</td>
<td>.040</td>
<td>.046</td>
</tr>
<tr>
<td>SESb (( \gamma_{01} ))</td>
<td>(-.144^{* *} )</td>
<td>.032</td>
<td>(-.084^{*} )</td>
<td>.033</td>
</tr>
<tr>
<td>CI (( \gamma_{02} ))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI (( \gamma_{03} ))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GENDER (( \gamma_{10} ))</td>
<td>(-.069 )</td>
<td>.050</td>
<td>(-.056 )</td>
<td>.050</td>
</tr>
<tr>
<td>SESw (( \gamma_{20} ))</td>
<td>(-.014 )</td>
<td>.031</td>
<td>(-.014 )</td>
<td>.031</td>
</tr>
<tr>
<td>Random effect</td>
<td>Variance</td>
<td>Variance</td>
<td>Variance</td>
<td>Variance</td>
</tr>
<tr>
<td>( u_{0j} )</td>
<td>.087</td>
<td>.086</td>
<td>.066</td>
<td>.042</td>
</tr>
<tr>
<td>( r_{ij} )</td>
<td>.912</td>
<td>.913</td>
<td>.913</td>
<td>.913</td>
</tr>
<tr>
<td>Proportion reduction in variance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Gender was coded 1 = female and 0 = male. CI = constructivist instruction; TI = traditional instruction. ICC = intraclass correlation coefficient. M0 to M3 = model 0 to model 3, respectively. L1 and L2 indicate that the calculation of proportion reduction in variance is based on level 1 and level 2 variance, respectively.

*\( p < .05 \). **\( p < .01 \).
Table 3

Results From HLM Analyses Predicting Students’ Deep Processing Strategies

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 0</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>$\gamma$</td>
<td>$SE$</td>
<td>$\gamma$</td>
<td>$SE$</td>
</tr>
<tr>
<td>Fixed effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-.004</td>
<td>.032</td>
<td>.094*</td>
<td>.041</td>
</tr>
<tr>
<td>$\gamma_{00}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES$<em>b$ ($\gamma</em>{01}$)</td>
<td>.016</td>
<td>.031</td>
<td>.029</td>
<td>.033</td>
</tr>
<tr>
<td>CI ($\gamma_{02}$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI ($\gamma_{03}$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GENDER ($\gamma_{10}$)</td>
<td>-.188**</td>
<td>.050</td>
<td>-.190**</td>
<td>.050</td>
</tr>
<tr>
<td>SES$<em>w$ ($\gamma</em>{20}$)</td>
<td>.085**</td>
<td>.031</td>
<td>.085**</td>
<td>.031</td>
</tr>
<tr>
<td>Random effect</td>
<td>Variance</td>
<td>Variance</td>
<td>Variance</td>
<td>Variance</td>
</tr>
<tr>
<td>$u_{0j}$</td>
<td>.052</td>
<td>.053</td>
<td>.054</td>
<td>.039</td>
</tr>
<tr>
<td>$r_{ij}$</td>
<td>.948</td>
<td>.935</td>
<td>.935</td>
<td>.935</td>
</tr>
<tr>
<td>Proportion reduction in variance</td>
<td>ICC</td>
<td>M1 vs. M0 (L1)</td>
<td>M2 vs. M1 (L2)</td>
<td>M3 vs. M2 (L2)</td>
</tr>
<tr>
<td>.05</td>
<td>1%</td>
<td>0%</td>
<td>28%</td>
<td></td>
</tr>
</tbody>
</table>

Note. Gender was coded 1 = female and 0 = male. CI = constructivist instruction; TI = traditional instruction. ICC = intraclass correlation coefficient. M0 to M3 = model 0 to model 3, respectively. L1 and L2 indicate that the calculation of proportion reduction in variance is based on level 1 and level 2 variance, respectively.

*p < .05.  **p < .01.
### Table 4

*Results From HLM Analyses Predicting Students’ Self-efficacy*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 0</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\gamma$</td>
<td>SE</td>
<td>$\gamma$</td>
<td>SE</td>
</tr>
<tr>
<td>Fixed effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-.001</td>
<td>.030</td>
<td>.039</td>
<td>.041</td>
</tr>
<tr>
<td>SESb ($\gamma_{01}$)</td>
<td>.052</td>
<td>.028</td>
<td>.056</td>
<td>.031</td>
</tr>
<tr>
<td>CI ($\gamma_{02}$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI ($\gamma_{03}$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GENDER ($\gamma_{10}$)</td>
<td>-.066</td>
<td>.052</td>
<td>-.072</td>
<td>.052</td>
</tr>
<tr>
<td>SES_w ($\gamma_{20}$)</td>
<td>.181**</td>
<td>.030</td>
<td>.181**</td>
<td>.030</td>
</tr>
<tr>
<td>Random effect</td>
<td>Variance</td>
<td></td>
<td>Variance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$u_{0j}$</td>
<td>.038</td>
<td></td>
<td>.040</td>
<td></td>
</tr>
<tr>
<td>$r_{ij}$</td>
<td>.963</td>
<td></td>
<td>.939</td>
<td></td>
</tr>
<tr>
<td>Proportion reduction in variance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICC</td>
<td>M1 vs. M0 (L1)</td>
<td>.04</td>
<td>2%</td>
<td>M2 vs. M1 (L2)</td>
</tr>
</tbody>
</table>

*Note.* Gender was coded 1 = female and 0 = male. CI = constructivist instruction; TI = traditional instruction. ICC = intraclass correlation coefficient. M0 to M3 = model 0 to model 3, respectively. L1 and L2 indicate that the calculation of proportion reduction in variance is based on level 1 and level 2 variance, respectively.

*p < .05.  **p < .01.
Table 5

Results From HLM Analyses Predicting Students’ Task Values

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 0</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed effect</td>
<td>$\gamma$</td>
<td>$SE$</td>
<td>$\gamma$</td>
<td>$SE$</td>
</tr>
<tr>
<td>Intercept</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\gamma_{00}$</td>
<td>.003</td>
<td>.032</td>
<td>.004</td>
<td>.041</td>
</tr>
<tr>
<td>SES$<em>b$ ($\gamma</em>{01}$)</td>
<td></td>
<td></td>
<td>-$0.054$</td>
<td>.029</td>
</tr>
<tr>
<td>CI ($\gamma_{02}$)</td>
<td></td>
<td></td>
<td>.086*</td>
<td>.036</td>
</tr>
<tr>
<td>TI ($\gamma_{03}$)</td>
<td></td>
<td></td>
<td>.027</td>
<td>.045</td>
</tr>
<tr>
<td>Slope</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GENDER ($\gamma_{10}$)</td>
<td></td>
<td>-$0.003$</td>
<td>.052</td>
<td>.004</td>
</tr>
<tr>
<td>SES$<em>w$ ($\gamma</em>{20}$)</td>
<td></td>
<td>.109**</td>
<td>.032</td>
<td>.109**</td>
</tr>
<tr>
<td>Random effect</td>
<td>Variance</td>
<td>Variance</td>
<td>Variance</td>
<td>Variance</td>
</tr>
<tr>
<td>$u_{0j}$</td>
<td>.049</td>
<td>.049</td>
<td>.048</td>
<td>.038</td>
</tr>
<tr>
<td>$r_{ij}$</td>
<td>.952</td>
<td>.945</td>
<td>.945</td>
<td>.945</td>
</tr>
<tr>
<td>Proportion reduction in variance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICC</td>
<td>M1 vs. M0 (L1)</td>
<td>M2 vs. M1 (L2)</td>
<td>M3 vs. M2 (L2)</td>
<td></td>
</tr>
<tr>
<td>.05</td>
<td>1%</td>
<td>2%</td>
<td>21%</td>
<td></td>
</tr>
</tbody>
</table>

Note. Gender was coded 1 = female and 0 = male. CI = constructivist instruction; TI = traditional instruction. ICC = intraclass correlation coefficient. M0 to M3 = model 0 to model 3, respectively. L1 and L2 indicate that the calculation of proportion reduction in variance is based on level 1 and level 2 variance, respectively.

*p < .05. **p < .01.