

# Learning Within Scripted and Nonscripted Peer-Tutoring Sessions: The Malaysian Context

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**ABSTRACT** Malaysia is undergoing a large educational reform movement that is moving toward student-centered learning. To date, however, Malaysian students have had little experience with cooperative-learning strategies. The author examined how Malaysian student peer tutoring might be most effectively structured. They randomly assigned 48 students in pairs in 2 Form 4 (Grade 10) physics classes to 3 levels of peer-tutoring structure: (a) sequence-questioning-explanation (students received scripts and question stems), (b) questioning and explanation (stems without script), and (c) questioning (neither stems nor scripts). Twice a week for 3 weeks, students listened to their teachers lecture, then interacted in tutoring pairs for 20 min. Malaysian students benefited from the more structured peer tutoring in comprehension and level of questions, illustrating that having students simply work together is not as effective as more structured interactions in which students learn how to interact through use of question stems and scripts. The skills maintained at least 4 weeks. Theoretical and policy implications are discussed.

**Key words:** educational reform in Malaysia; scripted and non-scripted peer tutoring; student-centered learning

According to a sociocognitive view of the learning process, learning occurs within a social context (Mugny & Doise, 1978; Rogoff, 1990; Vygotsky, 1978). When an individual interacts with other individuals, the individual typically will learn, receive feedback, or glean information from something that contradicts the individual's beliefs or current understanding. That conflict or perturbation causes the individual to reorganize and reconstruct his or her existing knowledge base (Dimant & Bearison, 1991; Rogoff), thus resulting in a better understanding and retention of new information. Interaction, therefore, is the catalyst for cognitive growth.

Because interaction can occur only when a person is with other persons, and learning occurs through such interaction, putting learners together can lead to activities that produce knowledge construction or learning. Many learning and instructional approaches that manipulate the environment in which learners work and cooperate with each other have illustrated growth in cognitive, intellectual, social, and affective areas (Johnson, Johnson, & Maruyama, 1983;

Slavin, 1991). To date, however, uncertainty still exists as to the mechanism by which various types of peer tutoring facilitate learning. Is the interaction of two individuals discussing materials adequate to promote learning? Is scripting the peer interaction to ensure higher levels of thinking necessary? We sought to understand the effects of scripts and leading question stems on learning during an intervention in the classroom.

We also focused this study on the application of peer-tutoring techniques within an education system in Malaysia, which has relied on teacher-driven instruction for a large part of its history. The school environment in Malaysia is in the process of reform. As such, investigations of student-centered and interactive pedagogies applicable to the Malaysian system and students are particularly important for policy decisions.

## *Structure of Peer Tutoring*

One form of peer learning is peer tutoring, in which a learner tutors or teaches his or her peer or peers (Allen, 1976; Cohen, Kulik, & Kulik, 1982). Peer tutoring has proved effective for students to learn school-related materials (Fuchs, Fuchs, Bentz, Phillips, & Hamlett, 1994; Lepper, Aspinwall, Mumme, & Chabay, 1990; Wagner, 1982). Peer tutoring influences learning because it (a) fosters positive intrinsic motivation and enhances cognitive skills within participating peers (Damon, 1984; Enright & Axelrod, 1995; Fuchs et al., 1994), (b) improves tutor and tutee academic and social development (Gartner & Riessman, 1993), (c) enhances tutors' interpersonal skills (Webb, 1989), and (d) increases students' task persistence and feelings of competence and personal control (Lepper et al., 1990). In addition, Levin and Meister (1986) noted that peer tutoring is more cost

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effective in terms of achievement outcomes than are interventions such as reduced class size, computer-assisted instruction, or longer school days.

Cross-aged and cross-ability tutoring arrangements are used in some tutoring situations (Fantuzzo, Riggio, Connelly, & Dimeff, 1989; King, 1998; King, Staffieri, & Adelgais, 1998). However, such arrangements have problems. Initially, many parents of higher ability students complain that their children do not benefit as much as do lower ability students during tutoring sessions (Oakes, 1990) despite the fact that many studies have reported contradictory findings (Bargh & Schul, 1980; Lambiottee et al., 1987; Webb, 1989; Whitman, 1988). Also, the unequal ability-related status that exists in cross-ability tutoring often makes the lower ability students reluctant to engage in constructive argument or even to exchange ideas and opinions with their tutors (Cohen, 1994). Educators should be wary of those situations because mutual interaction or dialogue between learners is crucial for meaningful or higher level learning, yet appears to be missing when tutor and tutee have differing status (Johnson et al., 1983).

We introduced a reciprocal or mutual peer-tutoring model in this study to alleviate the problems associated with ability-based tutoring (Cohen & Wills, 1985; Fantuzzo et al., 1989; Palinscar & Brown, 1984). According to the model, both partners are relatively equal in ability-related status and both children are responsible for providing tutoring. Studies of reciprocal peer tutoring illustrate that the equal nature of that learning process helps create social support between students, which helps participating students reduce academic stress or pressure that might otherwise exist within the tutoring environment (Wolfe, Fantuzzo, & Wolfe, 1986). Fantuzzo and colleagues reported evidence that classroom-based reciprocal tutoring can effectively increase students' academic productivity and course satisfaction.

Reviews of research on tutoring (Cohen et al., 1982; King, 1997) illustrate that structured or scripted peer-tutoring programs in which both children play vital tutoring roles more positively affect the children's ability to learn from one another than do unstructured tutoring sessions. Researchers are cautious, however, not to overstructure any tutoring session because such action can constrain the discussions between the students and can inhibit the freedom that the students need to pursue their thinking processes (King, 1997). Conversely, if students' interactions are not structured, the students tend to engage in low-level cognitive processes such as reviewing and retelling facts. By carefully structuring or scripting tutoring sessions, teachers can help participating students engage in interactions that include mutual exchange of ideas, elaborated explanations, justifications, and speculations. Those types of interactions promote higher levels of thinking in students and subsequently lead to learning (King, 1994). The exact amount or type of structuring, however, is still debated.

### *The Malaysian Context*

One important question remains: Will peer tutoring work within a school system that has relied heavily on teacher-driven instruction? The didactic approach to learning and instruction is ubiquitous within the Malaysian education system. Interaction between teachers and students is minimal, and questioning authority (e.g., the teacher), although not prohibited, is strange and often interpreted as a sign of disrespect. Moreover, as with most other Eastern cultures, students in Malaysia are not practiced in engaging in classroom activities that require active one-on-one interaction, let alone having constructive arguments among themselves. In contrast to the United States and many other Western cultures, Malaysian students are more reluctant to express their opinion in the classroom (Hassan, 1994). Consequently, Malaysian students have not had opportunities to develop the interpersonal skills necessary to function effectively in cooperative-learning groups. Thus, cross-cultural differences may render the previously presented findings about the effectiveness of peer-tutoring strategies irrelevant to education in Malaysia.

Malaysia also is in the process of making the transition from being an industrial economy to being a leader in the Information Age. To make their vision a reality, Malaysians are working to make a fundamental shift toward a more technology-literate and thinking workforce. One way to make this shift is for the education system to undergo a radical transformation. The schooling culture is being transformed from one that is predominantly memory based to one that is informed, thinking, creative, and empathetic. The transformation will be marked by the creation of an initial 91 constructivist-oriented schools known as "smart schools."

Through this massive billions Ringgit (Malaysian currency) project, announced by the nation's Minister of Education, Datuk Najib Tun Razak, Malaysia intends to introduce a new approach to teaching and learning while equipping Malaysian schools with technology such as computers and multimedia equipment (Razak, 1997). According to Razak, the emphasis will be on "developing the creative and critical thinking skills of students and giving them the tools to work and think independently" (p. 11). The schools will adopt a learner-centered approach (Onn, 1998) in which students will be expected to work cooperatively and collaboratively with each other on their classroom tasks and assignments with some guidance from the teachers. Furthermore, in smart schools, technology will be the prime enabler, playing an important role in the teaching and learning process (Ahmad, 1997). Technology enables a wide range of pedagogical approaches and provides a tool for collaborative inquiry conducive to learners' and teachers' academic and intellectual growth.

As the first step in the creation of the smart schools, selected teachers were trained through the Ministry of Education in an intensive 1-year course to prepare them to teach at these smart schools. During training, teachers were

exposed, among many other things, to instructional approaches that emphasize thinking. Teachers learned how to plan activities that involved problem solving, creative thinking, critical thinking, exploration, and decision making (Ahmad, 1997). The teachers also learned that in smart schools they will have to play the role of "guide by the side" rather than a "sage on the stage." In other words, a teacher is no longer the sole knowledge provider or fountain of knowledge in the classroom; rather, he or she takes the role of a coach and facilitator.

The transformation of Malaysian schools also will result in major changes in the nation's well-established assessment system in the coming years. For example, several standardized national examinations like Sijil Pelajaran Malaysia (SPM, Malaysian Certificate of Education) and Sijil Tinggi Persekolahan (STP, Higher School Certificate) will be revamped (Onn, 1998). According to Deputy Education Minister Fong Chan Onn, the new assessment system will be based less on tests and more on performance.

### *The Present Study*

A number of important factors will help us play an invaluable role in understanding peer tutoring and the Malaysian school transformation. First, we examine the optimal amount of structure necessary for peer-tutoring-based learning sessions to productively increase student learning. We were specifically interested in whether providing structure to the peer-tutoring sessions (with guidance about how to sequence questions from lower order to higher order) might help students move beyond knowledge-level questions to more "thinking" or higher order questions. Second, we examine whether the adoption of learner-centered approaches will work within the context of Malaysia's educational system transformation. Because of differences in contextual factors, we cannot generalize the current findings obtained from research conducted in the United States to Malaysia without empirical support. Therefore, we investigate how best to structure peer-tutoring sessions in Malaysian schools.

In short, we hope to shed light on an area of research that has been, and continues to be, carried out extensively in the United States but has not received much attention in Malaysia, an education system that has relied heavily on teacher-directed instruction. Findings from this study will not only help advance our understanding of peer-tutoring strategies in general but also help policy makers discover an efficient pedagogical approach or model for the future smart schools of Malaysia.

### **Method**

We discuss the methodology that we used in this 3-week (plus a follow-up session) study in the following paragraphs. Because everyday classroom instruction and all reading materials (except for the English subject) used in the par-

ticipating school were in the national language, Bahasa Malaysia (Malay language), the first author (researcher) translated all instruments used in this study into Bahasa Malaysia. The participating school, like most schools in Malaysia, was still operating under a teacher-directed model at the time of this study.

### *Participants*

Forty-eight students (34 boys) in two Form 4 (equivalent to Grade 10) physics classes of a suburban high school on the west coast of Malaysia participated in this study. Each of the classes had 24 students and was taught by the same teacher. The average age of the students in both classes was approximately 16.5 (range 16.0–17.1) years.<sup>1</sup> Students were of relatively homogeneous socioeconomic status and ethnicity throughout the school, including the present samples. We placed students in tutoring pairs according to the similarity of their pretest scores for the unit and randomly assigned them to the three experimental conditions (sequence-questioning-explanation, SQE; questioning and explanation, QE; and questioning, Q; see Table 1). We assigned a partner of the same gender to the students to increase comfort (King, 1998). Both the SQE and QE conditions contained 2 male and 2 female pairs. The Q group contained only male pairs. We randomly selected 12 of the tutoring pairs (equally distributed between the two classes and pretest scores, 4 female and 8 male pairs) and audio recorded and analyzed their interactions at four times (Sessions 1, 5, 6, 7).

The class met for 70 min twice a week at the school's physics laboratory. The participating teacher had taught high school physics for approximately 5 years, the last 3 years at the participating school. Consent was received from all 48 students and their parents.

### *Experimental Conditions*

In each class, we randomly assigned pairs of students to three different experimental groups: (a) SQE with question stems and script, (b) QE with question stems but no script, or (c) Q with no question stems or script (see Figure 1). We partially derived those conditions from research by King and colleagues (1998); they represent, to some extent, a replication and extension of the authors' work.

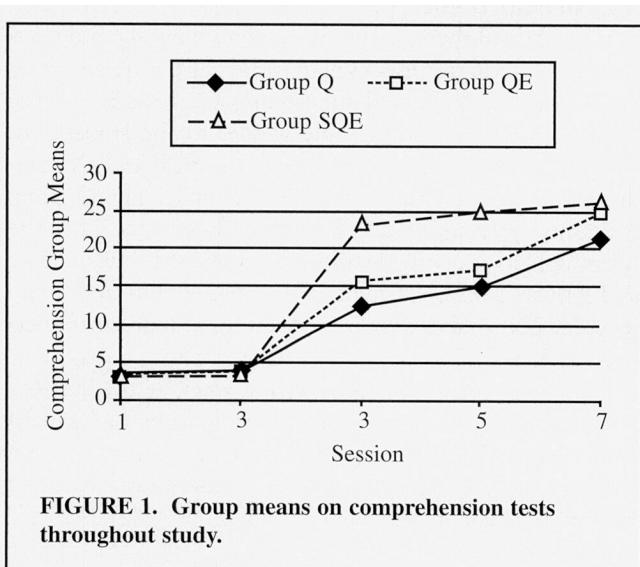
All pairs worked collaboratively throughout the duration of the study. We asked students in each group not to discuss or share their groups' strategy with students from the other two groups during the duration of this study.

### *Instruments and Materials*

The instructional materials that we used on heat and energy were derived from the curriculum of the ongoing physics course that was designed by the participating school under the Ministry of Education guidelines for all Form 4

TABLE 1. Description of the Three Treatment Groups

Sequence-questioning-explanation (SQE)	Questioning and explanation with stems (QE)	Questioning without stems (Q)
Interaction in pairs Students take turns asking each other questions and provide elaborate responses	Interaction in pairs Students take turns asking each other questions and provide elaborate responses	Interaction in pairs Students take turns asking each other questions and provide elaborate responses
Question stems provided To help students construct their questions	Question stems provided To help students construct their questions	Without question stems
Script provided The sequence of question-asking activity	Without script	Without script



students nationwide. The teacher presented all lectures from a written script to ensure that all participating students in both classes received the same quantity and quality of lecture materials. Each class day, the teacher exposed students in both classes to about 25–30 min of material. Students were then given approximately 20 min to complete their peer-tutoring activity.

**Tutorial skills.** We provided students with a handout adapted from a manual by DeMarco (1993). Helping was defined as being nonjudgmental, accepting, and genuine. Good listening skills were described (attentive, eye contact, nodding), along with effective responding skills (paraphrasing, clarifying). We also introduced students to the skills of suggesting alternatives, providing sufficient wait time, and encouragement (see description of training session below).

**Prompt cards.** Similar to King et al. (1998), we developed three sets of prompt cards, one for each experimental group. The participants used the cards to guide them when

they were engaged in tutorial sessions. Each group's prompt cards contained different instructions and materials. For example, prompt cards for the SQE group contained generic open-ended question stems (adapted from King, 1989) that we classified into four kinds of questions, namely (a) review (e.g., "What does . . . mean?"), (b) thinking (e.g., "What would happen if . . .?"), (c) probing (e.g., "I don't understand. What do you mean by that?"), and (d) hinting questions (e.g., "Have you thought about . . .?"). We specifically instructed students in that group to construct the four types of questions according to the content of that day's lecture. We also instructed students to deliberately sequence or script the order of the questions asked, beginning with review questions, then progressing to thinking questions by using probing or hinting as necessary.

Prompt cards for the QE group contained basically the same generic open-ended question stems, although the stems were not classified into any category, nor was any order of questioning suggested. Prompt cards for the Q group did not contain any question stems (no guidelines on how to construct questions). We instructed students in that group simply to construct three or four questions based on the lecture for that day and then to ask their partners those questions. All students were instructed by their corresponding prompt cards to ensure that each person in the dyad (a) took a turn becoming a tutor and tutee, (b) continued to work until the end of the time period, (c) provided feedback to their partners' responses to their questions, and (d) followed the guidelines from the tutorial skills handout.

**Written comprehension tests.** The teacher, in collaboration with the researcher, constructed three different written comprehension tests based on the materials presented in the classroom (see Table 2). Test A was a comprehensive unit test that covered material presented in Sessions 1 through 5; it was given as a pretest and at the end of Session 5 as a posttest. Because students discussed the test during preparation for a

TABLE 2. Group Means for Written Comprehension Tests at Sessions 1, 3, 5, and 7

Session	Q group		QE group		SQE group		Post-hoc analysis
	M	SD	M	SD	M	SD	
1 (pretreatment)	3.13	0.92	3.25	1.33	3.23	1.17	
3 (pretest)	4.06	1.97	3.56	1.02	3.38	1.89	
Posttest	12.50	2.92	15.78	4.73	23.31	3.02	SQE > QE; Q*
5 (posttreatment)	15.00	2.94	17.06	4.54	24.69	2.22	SQE > QE; Q*
7 (retention)	21.47	1.19	24.88	2.36	26.06	2.11	SQE; QE > Q*

Note. Q = questioning; QE = questioning and explanation; SQE = sequence-questioning-explanation.  $n = 8$  for Q, QE, and SQE.

\* $p < .05$ .

scheduled midterm prior to Session 7, the teacher constructed a new comprehensive unit examination by using the same guidelines to assess long-term comprehension (Test C). Test B was based only on the materials that were presented during Session 3; students completed the test as a pretest to Session 3 and as a posttest to Session 3. The single session pre- and posttest permitted examination of the differential effects of the peer-tutoring structures on learning in only one session. To be considered effective, however, the peer-tutoring structuring differences had to maintain any differences in learning beyond one session through the delayed posttest.

All three written comprehension tests (Tests A, B, and C) consisted of 10 open-ended higher level questions; each question was worth 3 points, for a maximum of 30 points. Questions required students to advance beyond presenting facts and elaborate on their answers. The participating teacher and another physics teacher graded the tests. The interrater reliability was measured at  $\alpha = .93$ . Any discrepancy between the two graders was reconciled through discussion.

*Peer interaction coding.* We audiotaped the discussions during the peer question-answer activity of four randomly selected pairs from each treatment group (two pairs from each class) during Sessions 1, 5, 6, and 7. We analyzed the transcripts of the interaction with King's (1994) coding scheme categories, which included type of questions, type of explanation or response, and supportive communication comments.<sup>2</sup> We coded the question type as either *knowledge review* (i.e., definition, summary, or description) or *thinking* (i.e., making prediction, asking for information beyond that given). We coded the type of answers or explanations as either *low-level* (i.e., facts listing and mere definition) or *high-level* comments (i.e., making connections between ideas, explaining why and how, and using own words rather than those of the teacher). We coded the interactions with 96% agreement. Discrepancies were resolved through discussion.

#### Procedure

The teacher and researcher worked together to determine the appropriate unit of the Form 4 physics course. Together the teacher and researcher then developed all lec-

tures and comprehension tests on the basis of the unit. We used Session 1 pretest scores to pair students of relatively equal academic competency into same-sex dyads. These dyads were then randomly assigned to one of the three treatment groups. Over the next 3 weeks, students interacted in their peer-tutoring pairs each time the physics class met (twice each week) for six peer tutoring sessions. Four weeks later, we completed an additional session to assess long-term retention of the peer-tutoring skills and the material from the lectures.

*Session 1 (pretest/pretreatment).* Students individually completed Test A. Students then heard a 20–25 min lecture by the teacher that the researcher videotaped for use during the subsequent training sessions. During the lecture, the researcher scored Comprehension Test A, and students were paired on the basis of their achievement. After completion of the lecture, the teacher instructed each dyad to interact in the tutoring (question asking–answering) activity for the next 20 min. The researcher gave dyads the appropriate prompt card for guidance during the tutoring session. Meanwhile, the researcher audiotaped the interactions of two selected pairs from each treatment group. All prompt cards were collected from the students. No training in the use of any peer strategies occurred during the session.

*Practice sessions.* We anticipated that these out-of-class sessions would give students practice working with the tutoring strategy that we introduced to them during Session 1. The researcher conducted two 45-min training sessions during study hall time; all students attended both training sessions. The first practice session was conducted before Session 2; the second practice session was held before Session 5. The sessions were conducted separately for each treatment group.

At the beginning of the first practice session, students watched the videotape of their teacher's lecture that was presented that day (Session 1) and examined the peer-helping skills handout. Then, using the same prompt card given to them during Session 1, the students practiced following the strategy's procedures described on the prompt card. During that session, the researcher continuously

answered questions from students and provided feedback about their use of the peer-tutoring strategy.

The researcher instructed all students in all training sessions to take turns as tutor and tutee. When assuming the questioner role, students were asked to stay in that role rather than provide the answer. The researcher reviewed skills on the peer-helping handout as necessary.

During the practice session with the Q group, the researcher did not provide instruction on how the students should construct and ask questions, provide answers, or give feedback. The researcher told students to construct three or four questions based on the day's lecture. Students were reminded that each person needed to play the tutor and tutee roles. Tutors were reminded to listen carefully and not give answers away immediately but instead to provide hints to help partners produce the correct answers. Tutees were reminded to link their answers to something the partner had knowledge of (i.e., use analogies). Finally, students were reminded that they should think about the peer-helping skills handout but that they had the freedom to decide how they wanted to execute these instructions during their tutoring sessions.

At the beginning of their peer-tutoring practice session, the researcher asked students in the QE group training session to construct three or four questions with the stems (King, 1989) printed on the back page of their prompt cards. The practice session with the SQE group was structurally similar to that of the QE group, but students were told to construct two knowledge-review questions and two thinking questions (based on the lesson materials in the videotape that they had watched earlier) by using the generic question stems as a guide. In addition, each time students switched topics, they were reminded to begin with a knowledge-review question followed by thinking questions.

During each practice session, and with each group, the researcher explained the rationale for doing each of the steps on the prompt cards. That step is important because, according to Palinscar and Brown (1984), providing a rationale or reason for doing a particular action (i.e., responding to the "Why do we do this?" question) during strategy training will increase the likelihood that the students will continue to use the strategy outside of training.

During the second practice session, the researcher emphasized learning tutorial and communication skills appropriate for each group, which was discussed during the first practice session. The researcher again entertained students' questions and discussed the peer-helping skills handout with the students. In addition, the researcher conducted role-playing activities by using a few selected student interactions (audiotaped transcripts) from the Session 1 practice session to model correct use of the peer-tutoring strategy. Finally, the researcher conducted a debriefing at the end of the session to allow students to give each other feedback and to express opinions about effective and productive ways to interact with their partners.

*Sessions 2 through 4 (treatment).* During each of the treatment Sessions 2 through 4, the teacher started the class by giving a 20–25 min lecture. The teacher then distributed appropriate prompt cards to the students and instructed them to work in their dyads and tutor (question asking–answering activity) each other for the next 20 min. Prompt cards were subsequently collected from the students.

At the beginning of the Session 3 class period, the teacher asked the students to complete a written comprehension test (Test B). The teacher gave the exact test to the students at the end of the session. The test was based exclusively on the materials presented during that day's lecture. We refer to the pretest as Test 3A and the posttest as Test 3B.

*Session 5 (posttest/posttreatment).* The teacher repeated the sequence of activities from Sessions 2 through 4 during Session 5 and the researcher audiotaped the 12 selected peer dyads. Students completed the comprehensive written test (Test A) at the end of the class period.

*Session 6 (without prompt cards).* During Session 6, the prompt cards were not distributed to the students. The teacher instructed the students to tutor each other following the classroom lecture without the guidelines from the prompt cards. Interactions of the 12 selected tutoring pairs were audiotaped. In Session 6, we examined whether students had internalized or adopted the learning strategy that had been introduced to them during the previous sessions.

*Session 7 (strategy and comprehension retention).* The researcher conducted Session 7 four weeks after Session 6. In Session 7, we identified how well the students retained the tutoring skills and lecture materials presented during Sessions 1 through 6. The students received a comprehensive test (Test C) at the beginning of Session 7, and the interactions of 12 selected tutoring pairs were again audiotaped. Students completed Test C before the peer-tutoring session to minimize the effects that peer tutoring would have on prompted recall.

## Results

We conducted a series of one-way analyses of variance (ANOVAs) on pretreatment data collected from both participating classes. The results indicated no significant differences between the two classes for all variables ( $F_s < 1$ ). As such, we combined the data for both classes for subsequent analyses. In addition, we found no significant differences between experimental groups on pretest scores nor any differences in the number or types of questions asked between experimental groups in Session 1 (before peer-tutoring training began;  $F_s < 1$ ).

Tutoring pair was the unit of analysis that we used throughout this study for written comprehension tests and verbal interactions. We chose this unit of analysis because of the co-dependent nature of the learning and knowledge-building process that occurs during reciprocal peer-tutoring activities. Although students completed the written com-

prehension tests individually, we averaged the scores of a tutoring pair for subsequent analyses.

### Written Comprehension Tests

To examine the effect of different peer-interaction tutoring instructions on written comprehension, we conducted a  $3 \times 5$  (Treatment Group  $\times$  Sessions 1, 3A, 3B, 5, 7) repeated-measures ANOVA. Results revealed significant main effects of time,  $F(4, 63) = 348.09, p < .001$ , treatment group,  $F(2, 21) = 21.74, p < .001$ , and a significant interaction,  $F(8, 63) = 11.42, p < .001, \omega^2 = .53$  (see Figure 1).

It is clear that all three groups had relatively similar comprehension scores on the first two pretests (Session 1 and Session 3A). Follow-up one-way ANOVAs at each time revealed no significant difference between treatment groups at Session 1,  $F(2, 21) = .05, ns$  nor at Session 3A,  $F(2, 21) = .36, ns$ .

Although comprehension scores showed marked improvement over each of the next three sessions, improvement varied by peer-tutoring instructions. A one-way ANOVA at Session 3B revealed a main effect of treatment,  $F(2, 21) = 18.42, p < .001, \omega^2 = .69$ . A Tukey post-hoc analysis (appropriate because of equal cell sizes; Hinkle & McLaughlin, 1984) indicated that SQE comprehension scores were significantly higher than were scores for QE or Q group participants. We obtained similar results for Session 5,  $F(2, 21) = 18.24, p < .001, \omega^2 = .69$ . Tukey post-hoc analyses again revealed that the SQE mean (24.69) was significantly higher than the means for QE (17.06) and Q (15.00) participants, which did not differ from each other.

We administered a comprehension test at Session 7 primarily to assess how long-term knowledge retention might vary by treatment groups. A follow-up ANOVA on comprehension scores at Session 7 shows that students in the SQE group ( $M = 26.06$ ) performed better, although not significantly better, than did students in the QE group ( $M =$

24.88). According to the Tukey post-hoc analysis, both groups performed significantly better than did the Q group,  $F(2, 21) = 11.92, p < .001, \omega^2 = .50$ . That result suggests that the strategies used by the tutoring pairs in the SQE group and the QE group helped students remember the materials presented to them 4 weeks earlier.

### Student Interactions

To examine whether scripted peer interactions prompted students to move beyond knowledge-level questions to higher level thinking questions, we used a series of repeated-measures ANOVAs to analyze the frequencies of question types and responses made during the peer sessions by the 12 selected audiotaped pairs (4 tutoring pairs from each group). The results are summarized in Table 3, which indicates that knowledge-review and thinking questions increased in frequency over time ( $ps < .001$ ), illustrating that students became more comfortable with peer interaction methods over time. Results also revealed significant treatment-group differences beginning in Session 5; SQE groups typically provided higher level responses and thinking questions during the tutoring sessions (see Table 4), except for number of higher levels responses in Session 7.

For thinking questions, in addition to the two main effects of treatment group and session, we obtained a significant interaction,  $\omega^2 = .27$ . Figure 2 shows that the SQE-group students had a significant change in thinking question-asking behavior between Sessions 1 and 5 that maintained over time. Thinking question-asking behavior stayed relatively constant for the other two groups, although at a much lower level. We found a moderately strong correlation between thinking questions and high-level responses ( $r = .52, p = .08$ ). As we expected, knowledge-review questions were not related to high-level responses ( $r = .31, ns$ ).

TABLE 3. Results From Repeated Measures Analyses of Variance on Question Types and Response Levels

Question type	F ratio	p
Knowledge review	Time, $F(3, 27) = 21.98$	$< .001$
	Group, $F(2, 9) = 27.40$	$< .001$
	Interaction, $F(6, 27) = 2.93$	$< .05$
Thinking	Time, $F(3, 27) = 28.05$	$< .001$
	Group, $F(2, 9) = 27.44$	$< .001$
	Interaction, $F(6, 27) = 4.21$	$< .01$
Low-level responses	Time, $F(3, 27) = 1.23$	<i>ns</i>
	Group, $F(2, 9) = 9.23$	$< .05$
	Interaction, $F(6, 27) = 1.41$	<i>ns</i>
High-level responses	Time, $F(3, 27) = 5.33$	$< .05$
	Group, $F(2, 9) = 7.46$	$.01$
	Interaction, $F(6, 27) = 2.22$	$< .05$

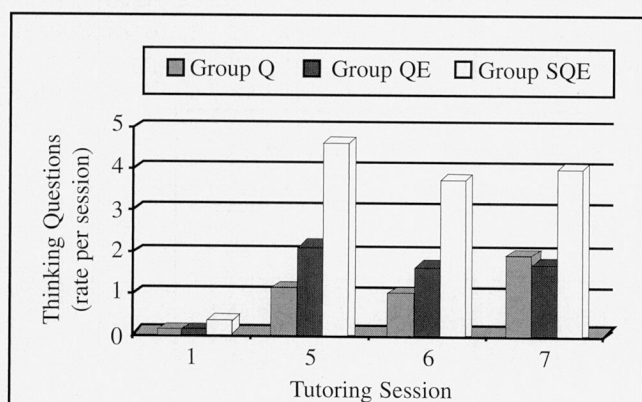


**TABLE 4. Students' Interaction During Four Peer-Tutoring Sessions**

Interaction	Q group		QE group		SQE group		Tukey post-hoc analysis
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Session 1							
Question type							
Knowledge review	1.25	0.50	1.75	1.26	1.25	0.50	
Thinking	0.25	0.50	0.25	0.50	0.50	0.58	
Response/answer type							
Low	5.25	0.96	4.50	0.58	1.00	0.82	
High	1.25	0.96	1.25	1.50	1.00	0.82	
Session 5							
Question type							
Knowledge review	2.00	0.82	5.75	0.96	3.25	0.50	QE > SQE; Q*
Thinking	1.25	0.50	2.25	0.50	4.75	0.96	SQE > QE; Q*
Response/answer type							
Low	6.25	1.26	4.00	1.83	2.25	1.26	Q > SQE*
High	1.25	0.96	1.75	1.26	4.00	0.82	SQE > QE; Q*
Session 6							
Question type							
Knowledge review	2.25	0.50	4.25	0.96	3.50	1.00	QE > Q*
Thinking	1.00	0.82	1.75	0.50	3.75	0.96	SQE > QE; Q*
Response/answer type							
Low	5.75	1.70	4.75	2.06	3.75	2.06	
High	1.00	0.00	2.00	0.82	3.75	1.70	SQE > Q*
Session 7							
Question type							
Knowledge review	2.50	1.73	5.75	0.50	4.25	0.50	QE > Q*
Thinking	2.00	0.82	1.75	1.26	4.00	0.82	SQE > QE; Q*
Response/answer type							
Low	4.50	1.29	4.25	0.50	3.25	0.96	
High	3.00	1.83	3.25	0.96	3.00	0.82	

Note. Q = questioning; QE = questioning and explanation; SQE = sequence-questioning-explanation. *n* = 4 pairs for Q, QE, and SQE.

\**p* < .05.



**FIGURE 2. Differences in rate of thinking questions during peer interactions, by treatment group.**

Therefore, our results suggest that students learned to use scripted order of questions to invoke high-level responses from their partners and maintained this ability without the use of prompt cards after only five sessions. That finding is

important because the literature suggests that the production of higher level responses during tutoring can promote learning for both tutor and tutee.

## Discussion

The findings from this study illustrate that the reciprocal-questioning peer-tutoring method has the potential for being effectively implemented in Malaysian classrooms. It seems, however, that Malaysian students may benefit most from more structured peer interactions.

## Lesson Comprehension

Although the comprehension level of students in all three treatment groups improved over time, students who used the SQE tutoring strategy clearly attained a better understanding of the classroom lessons as measured by higher level test questions than were students who used QE and Q strategies (see Figure 1). The SQE-group students significantly outscored students who used QE and Q strategies for com-



prehension tests at Sessions 3B and 5, although their scores were not significantly higher than those of students in the QE group at Session 7. The differences between Sessions 3A and 3B are particularly interesting because they illustrate the effectiveness of structured peer-tutoring sessions on just one lesson over students simply working together.

During Session 7, students from the QE and Q peer-interaction treatment groups increased their comprehension scores. One possible explanation for the increase may be that the tutoring strategy affected the way that the students approached subsequent lectures. The students knew that they would be asked to generate questions following the lecture. During the intervening 4 weeks, the students may have been able to focus on the lecture and encode subsequent lectures more effectively, making the information more meaningful. A second plausible explanation is that students may have shared study strategies during the 4 intervening weeks between Sessions 6 and 7. The factors responsible for the increase, however, are simply conjecture in the present study and should be investigated more thoroughly in future studies. Notably, the SQE group did maintain their frequency of thinking questions and higher level responses (see the Student Interactions section). Therefore, decreased effectiveness of the peer-tutoring strategy is not a likely explanation.

The current findings parallel those of King et al. (1998) for the SQE group. In King and colleagues' work, however, the QE group's performance was indistinguishable from the SQE group's performance on most measures. That finding may illustrate an interesting cultural difference. American students, who are more used to cooperative learning-based activities, may already understand (from previous experience) that peer interaction provides opportunities to advance to higher level questions and answers. Malaysian students may have no such relevant schema. As a consequence, Malaysian students may need the more direct prompting of the script to ensure the best use of their peer-collaborative experiences. It would be interesting if researchers would investigate that possibility.

#### *Student Interactions*

The analyses of student interactions during Session 1 support the claim that Malaysian students in general possess minimal interpersonal and other skills necessary for effective peer-collaborative interaction in their repertoires. Results shown in Table 4 and Figure 2 indicate that during Session 1, students asked mostly factual questions, with minimal thinking questions. Low-level responses were common between the partners during the early tutoring session, regardless of the prompt card that they received.

Once the strategies were taught to them, students in each group quickly learned the interaction skills needed. The analyses of students' questions during Sessions 5, 6, and 7 clearly indicate that their skills improved over time. There were marked differences, however, during Sessions 5

and 6 concerning types of questions asked. Students in the QE group were far more likely to use knowledge-review questions than were all other groups. Students in the SQE group were more likely to use thinking questions than were all other groups. Given the differences in gender composition of the experimental groups, one might wonder whether gender was responsible for students in the Q group asking fewer higher level questions. Because our results parallel those of King et al. (1998) and because their groups were relatively equally split between genders, we believe that gender played an insignificant role.

Although students did not receive the prompt cards at Session 6, analyses of students' interaction during this session revealed that they continued to display appropriate peer-tutoring interaction skills, consistent with the condition to which they had been assigned. That result suggests that the students had internalized the peer-tutoring strategies. Analyses of peer interactions in Session 7 suggest that, although thinking questions were more likely asked by the SQE group, all groups increased their frequency of high-level responses. That outcome likely contributed to the increase in comprehension scores.

#### *Future Directions and Policy Implications*

The introduction of student-centered instructional strategies, such as peer tutoring, into the Malaysian education system will be a challenge. Unless research such as the present study can convince Malaysian educators that peer tutoring has the potential to succeed across grade levels, or at least across high school grade levels, the possibility that this strategy will be used in a Malaysian classroom will be exceedingly remote in the current teacher-focused education system.

An additional question for future research deals with the role of the teacher during a peer-tutoring experience. At what point should a teacher interfere with the work of a student pair to correct a misunderstanding or to dispel a misconception? Guidelines may be particularly important in a Malaysian context in which students expect the teacher to provide the majority of information in the classroom.

We were not able to address whether students learned more using a peer-tutoring strategy than they could have learned on their own. Given the move to a more learner-centered environment in the Malaysian schools, that question seems moot. However, we did reveal that students learned the reciprocal-questioning peer-tutoring strategy very easily. Within only 3 weeks, students internalized the cognitive procedures and processes that were taught. The analyses of the students' interactions illustrate that students also quickly learned the interpersonal skills needed to effectively collaborate.

In addition, given the cost effectiveness, ease of learning, and success of peer tutoring, it seems to be a good candidate for inclusion in the development of the pedagogical approach, or model, for Malaysia's future smart schools.

Although researchers might have difficulty convincing teachers to use peer tutoring in the present education system, as Malaysia's reforms move forward, teachers will be searching for student-centered strategies that work. Reciprocal peer tutoring with scripts and question stems may be an excellent candidate for use in Malaysia's education system.

The implementation of this peer-mediated learning strategy leads to two policy-making decisions. First, instruction on how to implement, monitor, and encourage the strategy should be included in teacher-education programs. Although peer tutoring is easy to implement, there are several interpersonal, facilitation, and reflection skills that teachers need to learn. Second, the use of this strategy in the classroom will require an approach to assessment and evaluation that is different from the present system. Higher level, more open-ended assessment practices seem appropriate to accompany the implementation of this strategy in the classroom. In addition, with encouragement from the teacher, peer tutoring might support authentic and performance-based assessment criteria in the classroom.

Despite the endeavor to transform Malaysia's schools into institutions that promote a learner-centered approach to learning and instruction, classroom lectures still are and will continue to be practiced. The ability to comprehend material presented in lectures is critical to success in the academic setting, although changes in Malaysia's standardized exit examination will have to be examined before the balance between lower level and higher level thinking will be understood. We show that the scripted reciprocal-questioning peer-tutoring strategy, if structured and implemented correctly in Malaysian classrooms, can help students understand materials more effectively than can simply instructing them to work together without the benefits of questions stems or instructions to order their questions in specific ways.

## NOTES

1. The disproportionate number of boys likely is due to the advanced nature of this course and the relatively common gender-based conceptions about the appropriateness of the content for girls. All female pairs in the classes were included in the audiotaped pairs.

2. The data from supportive comments and all question types were not included in these analyses because they were not relevant to the present hypotheses. Supportive communication, hinting, and probing questions, however, did increase over time for all groups (consistent with the peer interaction handout provided).

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