EDUCATION QUARTERLY, December 2008, *66* (1), 71-86
U.P. College of Education

Effects of Prior Knowledge and Lesson Outline on Note Taking and Test Scores

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Abstract

This study sought to find the effects of two teaching strategies—the use of lesson outline and the activation of prior knowledge—on note taking and test scores. The relationship between notes and test scores was also determined. Three intact classes of freshmen high school boys were assigned to three note taking environments prior to attending a videotaped lecture class. They were randomly assigned to prior knowledge environment, lesson outline environment, and the control environment. A posttest was administered immediately after the lecture and the students' notes were collected and rated. The same test was administered to the students a week later, after they have reviewed their notes. Results indicated that prior knowledge and lesson outline do not necessarily induce any specific note taking strategy. Note taking and review of notes are related to better test scores. Correlation tests showed that high test scores are associated with more notes.

Keywords: prior knowledge, lesson outline, note taking, test scores, information processing

Learning psychologists have consistently noted that students spend about 80% of class time listening to lectures (Armbruster, 2000 in Kiewra, 2002). To benefit from these lectures, students resort to note taking as their most frequently used learning strategy (Carrier, Williams & Dalagard, 1988; Kiewra, 2002).

Studies have shown that note taking is a worthwhile learning strategy (Di Vesta & Gray, 1972). Taking down notes while listening to a lecture facilitates encoding or the impression of information in the memory. Students are already engaged in some memorization work while taking down notes, especially when they are engrossed in deep comprehension of the source of their notes (Williams & Eggert, 2002). Note taking also provides notes or recorded data that are available for future review. Many studies have shown that students who review their notes obtain higher academic achievement than those who do not (Hartley, 1983; Kiewra, 1985a). This makes the production of notes or external storage—the second function of note taking—more important than encoding.

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Note taking, attention, and academic achievement

Note taking is believed to improve attention. Borich (2004) claims that students are more receptive to what they hear or see if they take down notes. It can be said that the amount of notes approximates the attention of students in lectures. "Taking lecture notes is widely accepted as a useful strategy for augmenting student attention and retention of academic discourse" (Dunkel, 1988, p. 259).

Evidence shows that recording lecture notes leads to higher achievement (Kiewra, 2002). Several studies that have evaluated students' notes have also shown that quantity matters as far as influencing test scores is concerned (Austin, Lee, & Carr, 2004; Hartley & Marshall, 1974; Howe, 1970; Kiewra & Benton, 1988; Kiewra & Fletcher, 1984; Locke, 1977; Norton, 1981; Nye, 1978). In addition, studies have documented the positive relationship between quality notes and achievement and between correct responses in tests and noted propositions (Baker & Lombardi, 1985; Dunkel, 1988; Einstein, Morris, & Smith, 1985; Palkovitz & Lore ,1980; Pauk & Fior, 2000).

Note taking in the Information Processing Theory

Among the different cognitive learning theories, note taking is perhaps more aptly appreciated in the Information Processing Theory. To the advocates of this theory, learning "is all about attending to information in the environment and using strategies to transfer it from short-term storage to long-term storage" (Byrnes, 2001, p. 31). In this theory, three operations on information are viewed to be essential. These are encoding, storage and retrieval of knowledge (Matlin, 1998; Woolfolk, 2004). These three are also at the core of note taking. In note taking, encoding takes place not only in the mind of the note taker, but also in his notes. In other words, a physical encoding takes place on paper when one is engaged in note taking. Thus, notes can increase the limited capacity of the working memory and relieve pressure from it by preventing the decay of received information. Consequently, this makes the working memory more efficient in encoding information (Kiewra, 1988, 1989).

Notes can also serve as physical stimuli that help retrieve in a short period of time those information stored deep in the long-term memory. The task of recall is less burdensome with good notes. Whenever necessary, the note taker can go over his notes and review or retrieve what he has stored there.

Note taking environments

Studies attest to students being poor note takers. They miss out more than half of the critical points of a given lecture (Baker & Lombardi, 1985). Studies indicate that only about 20-40% of important lecture ideas are recorded in students' notes (Kiewra, 1985b; O'Donnell & Dansereau, 1993). Thus, the idea of providing instructor's notes to students was brought up as a substitute for the poor quality of students' notes (Kiewra, 1985b; 2002). However, Austin et al. (2004) believe that it is more important to create an environment that encourages the right behavior for note taking. This environment should be one that constantly prompts students to be attentive to the key points of a lecture.

Two teaching strategies can contribute to the creation of two different note taking environments. These are: (a) the activation of students' prior knowledge on the lesson topic, and (b) the use of a lesson outline during a class lecture.

According to the cognitive view of learning, prior knowledge is one of the most important elements in the learning process. Knowledge is not just the end product of a learning process; it is also "a scaffold that supports the construction of all future learning" (Alexander, 1996, p. 89).

Several theories have been forwarded as regards the manner by which prior knowledge facilitates the learning process (Dochy, 1988). However, if it is to influence learning, prior knowledge has to be activated. Christen and Murphy (1991) has this to say in this regard:

> Brain-based research confirms the fact that the learning environment needs to provide a setting that incorporates stability and familiarity. It should be able to satisfy the mind's enormous curiosity and hunger for discovery, challenge, and novelty. Creating an opportunity to challenge our students to call on their collective experiences (prior knowledge) is essential. Through this process we move students from memorizing information to meaningful learning and begin the journey of connecting learning events rather than remembering bits and pieces. Prior knowledge is an essential element in this quest for making meaning. (p. 3)

According to the study by Van Meter, Yokoi and Pressley, (1994), the only variable that students claimed to have influenced their note taking was background knowledge or prior knowledge. This factor affected the selection of information they wanted to keep as notes—the less familiar they were with the contents of a course, the more notes they tended to take. The same is implied in another investigation (Brobst, 1996) where students who read a related article before attending a lecture took less notes than those who read the same article after the lecture.

The outline, on the other hand, provides considerable assistance to students because it offers an overview of a lesson at a glance. Stored information is easily accessed when that information is organized (Ormrod, 1998). It also facilitates rapid identification of the main points of a lecture, something students can have difficulty in (Davies, 1976; Fahmy & Bilton, 1990a, 1990b). Hence, the outline helps sort out in advance the critical points of the lecture through the headings and subheadings used. Thus, the outline can serve as an advanced organizer. The lesson outline, when made available to students during a lecture, serves as a cue—a visual cue. It creates the right environment for note taking. It lessens the cognitive load on the note takers and allow them to focus more on understanding and encoding. Therefore, with the lesson outline, students can write down more notes than when they do not have it at hand.

Research problems

Three problems were answered in this study. First, what kind of note taking environment induces which kind of note taking strategy? Three note taking environments are considered to affect three note taking strategies (Figure 1). Second, in immediate and delayed posttests, how will test scores of students from three different note taking environments compare? And finally, considering students' notes objectively, what relationship do they have with test scores?

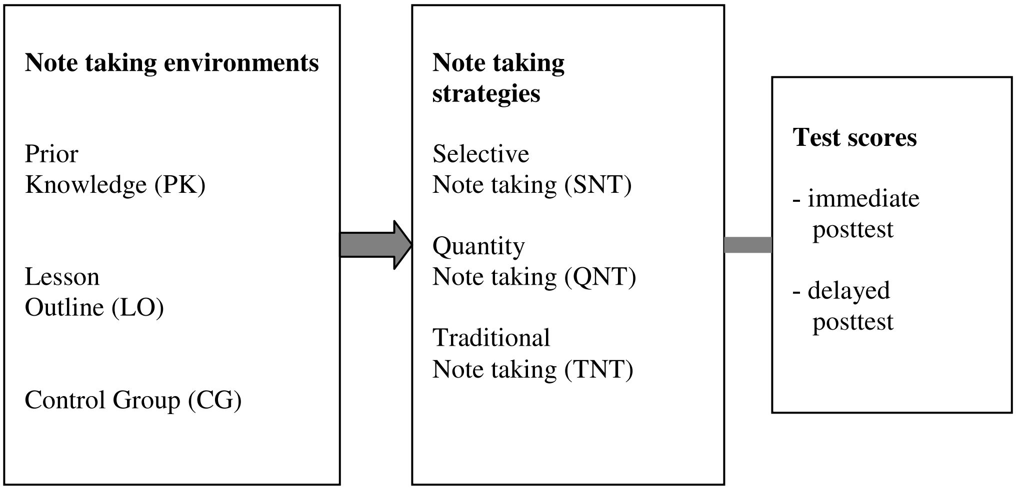

Figure 1. Conceptual framework

Research design

The study used the static-group comparison design (Fraenkel & Wallen, 2006). This design was considered most appropriate since the random assignment of individual subjects to groups was not administratively advisable. Also, possible reactive effects from an experiment were minimized since classes were used as they were. The students were not aware that they were involved in a study. Keeping the classes intact did not disturb the schedule of the students in their other classes.

Research participants

The subjects involved in the study were the three sections of first year high school students from a small private school for boys in Metro Manila. The 78 subjects of the study came from a bigger batch of 93 students. For various reasons, but especially due to absences, the consequent incomplete data on 15 boys, five boys from each class, were not included in the study.

Instruments

Prior-knowledge handout and test. The prior knowledge group received a handout to study overnight for a check-up test the following day. The handout was a two-page write-up on the Manhattan Project, the weapons research project of the United States that produced the atomic bomb in July 1945. The content of the handout was adapted from *The Manhattan Project: An interactive history* of the Office of History and Heritage Resources (n.d.), United States Department of Energy, retrieved on November 28, 2007 from h*ttp://www.cfo.doe.gov/me70/manhattan/index.htm*.

The check-up test was a 15-item Multiple Choice quiz. The senior Social Studies teacher of the school approved the test. The students had 15 minutes to finish it.

Seven items of the check-up test (items 4, 6, 10, 12, 13, 14, 15) were details that were also mentioned in the videotaped lecture. Thus, as far as the content of the videotaped lecture was concerned, good knowledge of the handout would mean having high prior knowledge in Section D, *Nuclear Holocaust*, of the videotaped lecture. The analysis of the test items showed that the scores could be used to identify those with *high* prior knowledge (those who got at least 4 correct items out of the 7 items) from those with *low* prior knowledge (those who got 3 or less correct items).

Videotaped lecture. The videotaped lecture, *The Japanese War*, was part of the Social Studies curriculum for first year high school. It ran for a little less than 24 minutes. The researcher himself delivered the lecture in the video. The pace of the lecture was at approximately 97 words per minute, slower than the moderate pace that, according to Peters (1972), would support the note taking by students. The Social Studies expert of the school assessed the videotaped lecture before it was shown to the students. Once approved, it was used in the pilot study to prepare the posttest.

Immediate posttest and delayed posttest. The posttest was a 20-item multiple choice test that checked on the students' knowledge and skill in comprehending the videotaped lecture. It was constructed by the researcher and served as the immediate and delayed posttest. The questions were constructed based on the videotaped lecture.

The posttest was previously pilot-tested and subjected to validity and reliability tests. The posttest was validated by the senior Social Studies teacher and the Social Studies expert of the school. A reliability coefficient of 0.74 was calculated using the Split-Half Method corrected according to the Spearman-Brown formula. Five items of the posttest were called critical items. Those with high prior knowledge were expected to answer these items correctly because they were cited in the handout.

Procedure

Pre-experimental phase

Prior to the beginning of the study, the initial equivalence in four skills of the three intact classes was investigated using the available results of the Otis-Lennon School Ability Test (OLSAT) and the Stanford Achievement Test (SAT) conducted to all students by the Guidance Office of the school in November 2007. The OLSAT measured the Verbal and Non-verbal skills of the students while the SAT measured Language and Listening skills. Utilizing one-way ANOVA on the scores and the Tukey's post hoc test disclosed essentially no significant differences among the three groups in the first three skills. However, the same cannot be said of the classes with regard to their listening skills. A significant difference was noted in the mean scores of CG and LO.

In spite of the manifested weaker listening skills of one group, the study proceeded as planned for the following reasons: (1) the OLSAT results showed the equivalence of the three groups in the skills it tested; (2) there could have been factors that affected the test results on the skill that had to do with the audibility of what was read to the students for the test; (3) the significant difference in this skill was true only between CG and LO; differences in mean scores between PK and LO, and between CG and PK were not significant.

Experimental phase

Three intact first year high school classes of 26 students each were randomly assigned, by drawing lots, to three note taking environments. Section A was assigned to the lesson outline environment (LO); Section B was assigned to the no-prior knowledge, no-lesson outline environment which served as the control group (CG), and Section C was assigned to the prior knowledge environment (PK).

PK was initially given a 2-page handout related to the topic of the videotaped lecture. This served as the basis of prior knowledge of the group in relation to the contents of the videotaped lecture. The students were later tested on the contents of the handout to determine their prior knowledge level.

As soon as the prior knowledge level of PK was determined, the three groups took turns in watching the videotaped lecture in the same conference room. As instructed, the students came to the room with only a pen each. Three clean sheets of bond paper for note taking were provided for each one. Instructions were given by the Social Studies teacher of the class following the indications given in the *Teacher's Guide to Conduct the Videotaped Lecture* constructed by the researcher.

For the lesson outline group, aside from the three sheets of paper for notes, a copy of the skeletal two-level topic outline of the contents of the videotaped lecture was provided. A very brief introduction on the five parts of the outline was given orally to the members of the group before the start of the videotaped lecture.

In each class, as soon as the videotaped lecture was over, the notes of the students were collected and the immediate posttest was conducted. Everyone took the 20-item Multiple Choice test and finished within the allotted time of 15 minutes.

Exactly a week later, the notes, which were collected after the immediate posttest, were returned to the students at the beginning of their respective Social Studies period. After 20 minutes of reviewing their own notes, the delayed posttest was administered to the students.

As regards scores on notes, these were provided by three raters (A, B, and C) who had been trained by the researcher using the *Notes Rating Guide* which he prepared. The raters counted the number of information units and independent data in the students' notes.

Information units are units of knowledge that can stand as a separate assertion and can be judged true or false (Anderson, 1980; Dunkel, 1988). Recorded notes such as *"General Douglas MacArthur came from Australia, fought the Battle of Leyte Gulf"* in the context of a lecture can be judged as either correct or wrong data.

Independent data are units of knowledge in the form of significant names, dates, or terms that were mentioned in the videotaped lecture but which could not be classified as *information units* because they cannot be judged true or false propositions since they appear as isolated data. Examples of independent data are: "1937", "self-defense", "Tokyo", "Guam", "Saipan", and "125,000 casualties".

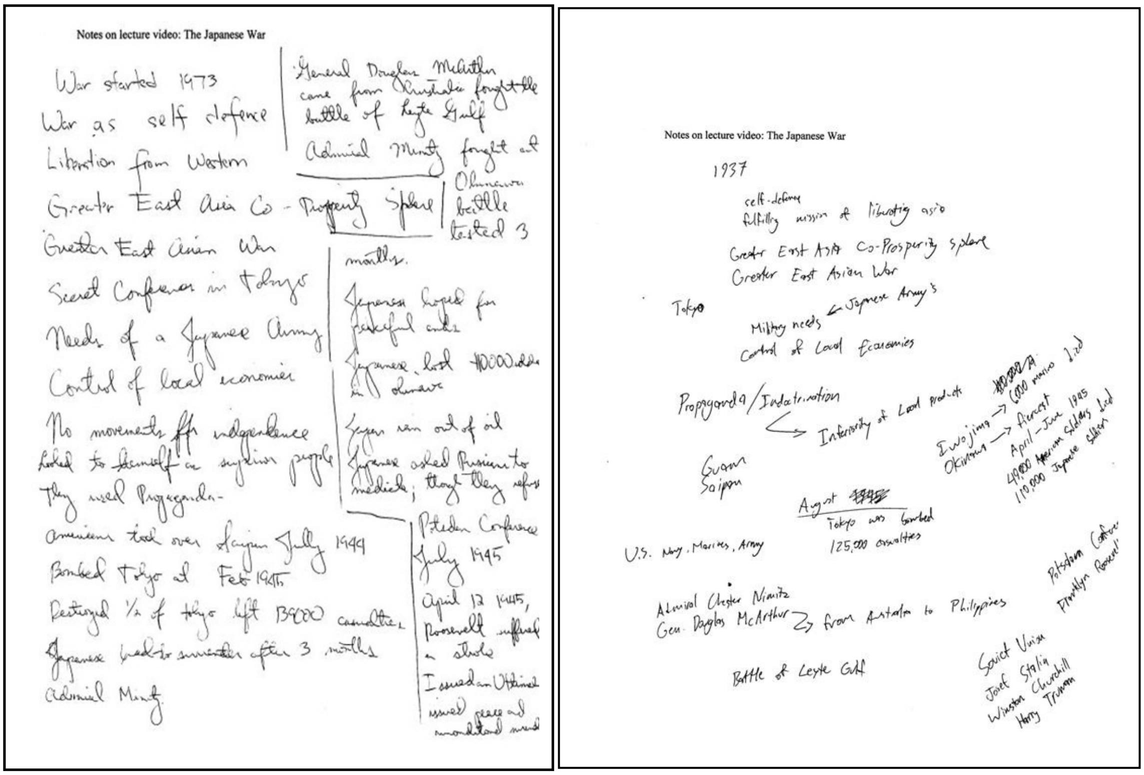

Figure 2. Samples of students' notes containing many information units (left) and notes containing more independent data (right).

Inter-rater coefficients of correlation ranged from 0.735 to 0.861 significant at $p < .01$ for both information units and independent data.

The Excel MegaStat Version 8.9 was used in all the statistical analyses of data. The mean scores on notes and posttests of the three groups were compared utilizing one-way ANOVA and t-test for independent means. To compute for coefficients of correlation, Pearson's Product-Moment Correlation Coefficient was used.

For ethical purposes, the researcher informed the participating subjects after the experiment period that they had been part of a study. The findings of the study were also explained briefly to them.

Results

On students' notes

On the average, 35% of students' notes were in the form of independent data. The results of the one-way ANOVA on information units and independent data (Table 1) showed no significant differences in the mean scores of the three groups. However, as regards the total notes scores, at least a pair of means of the three groups is significantly different. The Tukey's post hoc test showed that there is a significant difference in the mean scores of CG and PK [Tukey (3,75) = 2.80, $p < .05$].

Table 1

Means and standard deviations of notes scores

	LO (N = 26)		CG (N = 26)		PK (N = 26)			
	M	SD	M	SD	M	SD	F	*p*-value
info	22.5	9.81	26.1	9.34	20.8	11.7	1.76	0.179
data	8.7	6.18	9.3	4.89	6.3	3.61	2.51	0.877
tns	31.2	8.73	35.4	10.17	27.2	12.5	3.93	0.024

Note. LO = lesson outline group; CG = control group; PK = prior knowledge group; info = information units; data = independent data; tns = total notes score.

Further investigations on PK were made to see if the members of the group did selective note taking, i.e., they took down fewer notes compared to CG because of prior knowledge. Three variables were considered: the prior knowledge level, the test scores in the critical items of the immediate posttest, and the notes scores in the critical items. Table 2 shows the correlation among the three variables.

Table 2
Correlation matrix of 3 variables for selective note taking

Variable	PK-Level	CI-notes score	CI-test score
PK-Level	---		
CI-notes score	-0.111	---	
CI-test score	.414*	0.223	---

Note. PK-Level = prior knowledge level; CI-notes score = notes score in the critical items; CI-test score = test score in the critical items. $*p < .05$

On the immediate posttest

The one-way ANOVA and post hoc test results of the immediate posttest showed significant differences among the groups (Table 3). As regards the results of the whole test, both CG's and PK's mean scores were significantly different from that of LO [Tukey (3,75) = 2.74, p < .05 and Tukey (3,75) = 3.45, p < .01 respectively]. In the critical items, the mean scores of CG and PK were also significantly different from that of LO [Tukey (3,75) = 3.29, p < .01 and Tukey (3,75) = 3.77, p < .01 respectively]. The mean scores of CG and PK in the immediate posttest, as a whole, and in the critical items, were not significant.

Table 3
Means and standard deviations (immediate posttest)

	LO (N = 26)		CG (N = 26)		PK (N = 26)			
	M	SD	M	SD	M	SD	F	*p*-value
Immediate posttest	10.3	3.2	13.0	3.6	13.7	3.7	6.6	0.0022
critical items	2.0	2.1	3.6	1.6	3.8	1.4	8.4	0.0005

On the delayed posttest

Considering the results of the delayed posttest as a whole (Table 4), the one-way ANOVA and t-tests for independent means (used as post hoc test) showed a significant difference in the mean scores of CG and the LO [t(50) = 2.02 p < .05]. The difference between CG and PK was not significant. There was a significant difference in the mean scores of PK and LO [t(50) = 2.93, p < .01].

Table 4
Means and standard deviations (delayed posttest)

	LO (N = 26)		CG (N = 26)		PK (N = 25)			
	M	SD	M	SD	M	SD	F	*p*-value
delayed posttest	11.0	3.7	13.0	3.5	14.0	3.7	4.6	0.0126
critical items	2.1	1.37	3.2	1.27	4.0	1.27	12.9	1.5E-05

Focusing only on the critical items, a significant difference was noted in the results of the pair-wise t-tests: (a) for CG and LO, $t(50) = 3.04$, $p < .01$; (b) for PK and LO, $t(50) = 4.98$, $p < .01$; (c) for PK and CG, $t(50) = 2.04$, $p < .05$.

On the relationship between notes and test scores

The inquiry on the relationship between notes and test scores was done by looking at the notes of the students as they were — i.e., a combination of information units and independent data —regardless of their groupings or note taking environment and by considering these notes in relation to test scores.

Table 5 summarizes the means and standard deviations of the different scores on notes of all students.

Table 5
Means and standard deviations of notes scores

information unit		independent data		total notes score	
Mean	SD	Mean	SD	Mean	SD
23.13	10.44	8.10	5.10	31.23	10.98

Table 6 summarizes the means and standard deviations of notes of high and low test scorers in the two posttests.

Table 6
Means and standard deviations of notes of high and low test scorers in the two posttests

	information unit		independent data		total notes score	
Group	Mean	SD	Mean	SD	Mean	SD
im-pt						
high (N=43)	25.88	11.14	8.44	4.64	31.23	11.3
low (N=35)	19.74	8.5	7.69	5.66	27.43	9.4
dly-pt						
high (N=43)	26.95	9.8	7.63	4.39	34.58	10.11
low (N=34)	17.88	8.88	8.79	5.93	26.68	10.58

Note. im-pt = immediate posttest; dly-pt = delayed posttest; high = high posttest scorers; low = low posttest scorers.

The t-test of the mean scores on notes between high and low test scorers in the immediate posttest revealed that: (1) there was a significant difference in information units between the two groups, $t(76) = 2.69$, $p < .01$; (2) there was no significant difference as regards independent data between the two groups, $t(76) = 0.65$, $p > .05$; and (3) there was a significant difference in the total notes scores (the sum of independent data and information units) of high and low test scorers, $t(76) = 2.89$, $p < .01$.

The t-test of the mean scores on notes between high and low test scorers in the delayed posttest was very similar to the results above: (1) there was a significant difference in information units between the two groups, $t(75) = 4.2$, $p < .01$; (2) there was no significant difference as regards independent data between the two groups, $t(75) = 0.99$, $p > .05$; and (3) there was a significant difference in the total notes scores of high and low test scorers, $t(75) = 3.34$, $p < .01$.

The correlation results between notes and test scores for both posttests were also similar to each other as can be seen in the two tables below (Tables 7 and 8).

Table 7
Correlation matrix of notes and the immediate posttest scores (N = 77)

	info	data	tns	im-pt
info	1.000			
data	-.135	1.000		
tns	.888**	.336**	1.000	
im-pt	.354**	.076	.372**	1.000

Note. info = information units; data = independent data; tns = total notes scores; im-pt = immediate posttest scores. **p < .01, *p < .05

Table 8
Correlation matrix of notes and the delayed posttest scores (N = 77)

	info	data	tns	dl-pt
info	1.000			
data	-.126	1.000		
tns	.887**	.347**	1.000	
dl-pt	.371**	-.133	.289*	1.000

Note. info = information units; data = independent data; tns = total notes scores; dl-pt = delayed posttest scores. **p < .01, *p < .08

Discussion

These results suggest that the learning environments introduced in the classes—prior knowledge, lesson outline and the no-prior knowledge, no-lesson outline—do not determine significantly any particular note taking strategy. In terms of information units and independent data, no significant differences were shown in the mean scores of the three groups (Table 1). Only when the notes were taken as a whole (as total notes score) was a significant difference shown and it was between CG and PK. The significantly fewer notes of PK in relation to CG tend to confirm the claim of Van Meter et al. (1994) and Brobst (1996) as regards the negative relationship between prior knowledge and the quantity of notes. In his study, Brobst observed that those students who read a related material prior to a lecture jotted down fewer notes during the lecture, presumably because they had more background information, than those who did not read the related text.

Furthermore, PK's having the least notes could imply that the group was engaged in selective note taking since they did not take down notes on those items they already knew. Consequently, the scores of the group in the critical items were the highest among the three groups. The scores also correlate positively and significantly to the prior knowledge level of the group (Table 2).

This means that the students knew the answers to those items in the immediate posttest where they had prior knowledge. However, when the prior knowledge level was correlated with the scores on notes on just the critical items, the result was not significant. Therefore, that PK did selective note taking during the video taped lecture is inconclusive. Van Meter et al. (1994) obtained the same findings in their study.

The immediate posttest was meant to look into the encoding function of note taking. The results suggest that having prior knowledge is a big advantage to student's vis-à-vis test scores. In this test where no chance for review of notes was given, PK outperformed CG and LO. The significant difference in mean scores between PK and LO—both as regards the whole test and especially in the critical items—highlights the value of prior knowledge. The inferior listening skills of LO could have affected their posttest scores.

CG also did significantly better than LO in this test. Considering the fact that CG had the most notes among the three groups, this result tends to support the study of Baker and Lombardi (1985) who investigated the relationship between students' notes and their test performance. They found out that students frequently answer post-lecture questions correctly if they have the information in their notes.

Finally, the absence of a significant difference between PK and CG suggests that good attention during lectures could make up for the absence of prior knowledge.

Analyzing these results within the framework of the information processing theory, the advantage of PK is easily compared to having units of information in the long-term memory. Having reached the long-term memory, these units of information can be considered already learned. The notes that students have are analogous to units of information in the working memory. CG had the most notes and so it could perform better than LO that had lesser notes. CG did not do better than PK because the latter had the advantage of having some units of information in its working memory (their written notes) and some others in the long-term memory (their prior knowledge).

The delayed posttest investigated the external storage function of note taking. This external storage function includes the availability of notes for review.

That PK's mean score was the highest among the three groups alludes in some way to the great advantage of having prior knowledge. It can be recalled that the group had the lowest mean scores on notes (Table 1), and therefore, they had the least notes to review. PK's mean score in the delayed posttest was significantly different from LO ($p < .01$) and CG ($p < .05$) in the critical items. The better performance of PK over CG underscores the importance of information settling well in the long-term memory as explained by the information processing theory (Matlin, 1998). Though PK had significantly less notes than CG, PK had prior knowledge (knowledge that can be considered already in the long-term memory) and this seems to have spelled the difference not only with LO, but more importantly, with CG, which had the most notes (or knowledge available in the working memory) among the three.

CG's mean score on the delayed posttest was significantly different from LO's. This supports the claim of previous studies (e.g., Austin et al., 2004; Locke, 1977; Norton, 1981; Nye, 1978) that more notes mean better test scores.

As regards notes scores and test scores (Tables 6, 7, and 8), the results of the study suggest that high-test scorers have notes with significantly more information units than independent data. Notes, it appears, are better taken down as propositions (Dunkel, 1988; Einstein et al., 1985) rather than independent data which can be more prone to suffer decay over time. High test scorers in the immediate posttest were likely encoding, through note taking, a lot more information units than low test scorers. Kiewra (1988, 1989) believes that the working memory has a lot to do with differences in quantity and quality of notes. This study tends to agree with this—the working memory of high test scorers is occupied more by information units (or propositions) than independent data. This behavior of high test scorers tends to demonstrate "terseness of note taking" exhibited by effective L1 and L2 students in Dunkel's (1988) study. Terseness of notations involved the recording of lecture propositions, and not merely quantity of notes. Furthermore, Pauk and Fior (2000) point out that note takers who concentrate on expressing the major ideas in relatively fewer words remember more than those who try to catch every detail of a lecture.

High test scorers in the delayed posttest are likely to have reviewed more information units than independent data (Table 8). This suggests that propositions facilitate more the recall of ideas than isolated data. If the review of notes is the more important function of note taking, then it follows that students should try to take down information units rather than independent data.

Although small, the significant correlation between the total notes score and the delayed posttest score concurs with earlier studies (Kiewra & Benton, 1988; Kiewra & Fletcher, 1984; Norton, 1981; Nye, 1978) that associate higher achievement with quantity of notes.

Conclusions and implications

Considering the performance of LO in the study, it can be said that teaching strategies, such as the use of a lesson outline, need time and training to be effective. What can appear to teachers as a simple adaptation for students to make may not be so. Perhaps the students in LO could have been trained more on the use of a lesson outline as a tool to improve note taking.

A more focused study on prior knowledge and note taking that can arrive at more conclusive results about the capacity of prior knowledge to induce selective note taking is recommended. Do students who practice selective note taking do so intentionally or because of existing circumstances? What are these circumstances? What is a more effective way of building prior knowledge among students? How is it better activated before note taking in a lecture? Is it worthwhile to train students in selective note taking? These are some questions that future research can look into.

While the effects of the activation of prior knowledge and the use of a lesson outline on students' note taking and test scores have been investigated in this study, the findings cannot be generalizable to other subject areas because the study was done in the Social Studies context. Further investigation involving these two note taking environments in different subject areas is needed to find out if different results can be achieved.

Similar studies should be conducted involving a larger and a more representative group of students to attain generalizability of findings. High school students coming from different schools (public and/or private), or from different year levels can be considered as subjects. Different schools might adhere to different note taking strategies and the effectiveness of one over the other could provide very useful inputs on improving students' note taking skills. The study can also be done with all-girls groups of students.

This study was limited to testing knowledge retention and comprehension skills. It would be good to extend the study to include transfer tests and involve higher order thinking.

Finally, the findings of this study have some important educational implications. First, if most teachers communicate information through lecture, the integration of a systematic teaching of different note taking strategies on the students' regular course work might have a positive effect on their academic performance. This should be verified by further research. Second, the two note taking environments explored in this study should be introduced as early as the elementary grades to find out whether these can help develop some level of basic automaticity with note taking skills among the students.

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Date received: June 2008

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