STUDENT HIGHLIGHTING AND RELATION TO GRADE

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Abstract

This study examines student highlighting of text and its relationship to a grade in a beginning level academic course. The researchers examined actual textbook highlighting of students in two sections of Introductory Sociology to identify what type of material was highlighted and whether highlighting of text correlated with student grades. As part of the study, they also gave students a questionnaire on study habits and attitudes. Data from the survey were examined to see if any responses related to grades or to text highlighting. Results indicate that highlighting may have no relation to course success and that some assumptions of previous research on highlighting may be open to question.

Introduction

Helping students to read textbooks more effectively has long been a concern for college reading and study skills programs. Researchers have documented and catalogued patterns of student-text relationships. Formulas (SQ3R, SQ4R) have been invented, strategies (mapping, outlining) have been developed, and metacognitive processing has been emphasized. All of these have marked attempts to change student habits and make for better relationships between reader and text. The assumption has been made that students have inadequate strategies for dealing with text, and that these strategies can be changed to improve academic success.

But what if student strategies, however inadequate they appear to professionals, are working well enough for them during their initial college experience? Will students be likely to alter behavior that brings a measure of success? Do we know whether techniques beginning students practice work for them? The present study aims to document the relationship of textbook highlighting to success in a course typically taken by beginning college students.

Research has indicated that large numbers of students enter college ill prepared for dealing with their textbooks. Eanet and Campbell (1989) identify a major group of students who are satisfied with surface learning, who focus on a task to be accomplished, fail to recognize the relationship of task components to the whole, avoid seeking meaning, and rely on memory to reproduce surface aspects of their task. It is not surprising that such students exist. Schallert and Tierney (1982) assert that high school students have little awareness of content reading demands. Indeed, little reading has been demanded of these students (Smith & Feathers, 1983). Even this little becomes less than a requirement when teachers go over the important material from the text in class (Moore & Murphy, 1987).

Since people's conceptions of learning are largely formed from their early environment and from previous educational experiences (Van Rossum & Schenk, 1984), it is not surprising that many students approach college with little preparation for textbook reading tasks they will face. Indeed, Orlando, Caverly, Swetnam, and Flippo (1989) indicate many high school students feel course texts important only for introductions and reviews of concepts presented in class.

Caverly and Orlando (1991) cite the high popularity of underlining (highlighting) of text material which they claim is used by 63% to 97% of students. This finding is confirmed by Boyle and Peregoy (1991) who cite highlighting as the major strategy used by a sample of 300 students. This technique remains popular although, as Caverly and Orlando point out, it is usually poorly done.

Describing highlighting as a complex strategy involving material selection and encodation through subsequent rehearsal, Caverly and Orlando (1991) point out a reason for highlighting inadequacies. They cite research (Anderson & Armbruster, 1984; Tessmer & Jonassen, 1988) showing that highlighting works only when overall patterns are recognized and that it is a progressive skill used randomly by novices with no emphasis on main ideas, and that the more explicit the passage, the better the highlighting. Interestingly, they indicate that highlighting is more likely to occur if a student thinks a passage difficult than if the passage is perceived as easy.

Caverly and Orlando (1991) go on to suggest that effective highlighting should include only one idea per paragraph to focus on important material. They indicate that a successful process depends on the quality and extent of instruction on highlighting techniques and that success in highlighting is also dependent on reading skill. They feel that really good readers and really poor readers are not effective highlighters, one group because of interference with other strategies, the other because of low level reading abilities. Subject background affects highlighting success as does length of material with longer selections less likely to be highlighted effectively. Still, studies involving the teaching of highlighting have found it preferred by students over other methods of text interaction (Caverly & Orlando, 1991).

A pilot study (O'Hear & Ashton, 1987) reported on the highlighting behavior of 13 students in an introductory sociology class. While the sample size was too small to produce meaningful data, this study suggested there was little relationship between highlighting and grades. Most students highlighted less material as they went deeper into the course. As a group, they highlighted between 12% and 30% of text paragraphs containing no substantive material.

The present study of students in two sections of an introduction to sociology course attempts to answer the following questions: (1) Do beginning college students highlight their texts? (2) If so, what type of material do they highlight (substantive or non-substantive)? (3) Are there specific kinds of material that students highlight? (4) Is there a relationship between highlighting and course grade? Since a student survey provides additional study data, we also asked whether any survey items seemed related to highlighting or course grade.

Method

Subjects

The subjects in this study were 93 students enrolled in two weekday sections of Introduction to Sociology at a midwestern commuter campus. Both sections had the same instructor who had written the textbook's study guide and who emphasized the importance of the textbook for learning course material. Since we wanted to look at the text interaction of those completing the course, students were asked whether they would be willing to participate in the study one week before the end of the semester. They were assured that participation would in no way affect their grades. On this basis, 75 students volunteered for the study.

Table 1 illustrates the demographic comparison of the volunteers to the total class. The sample mirrors the gender pattern of the class as a whole. It also well reflects the grading pattern although volunteers had slightly higher grades than those of the whole group. These grade differences were not significant.

Table 1. Study Sample Compared to Course Population

	Sample n	**Population n**	**Sample as % of Population**	
	75	93	81%	
	Sample n	**Sample %**	**Population n**	**Population %**
Males	29	39%	36	39%
Females	46	61%	57	61%
Course Grade				
A	12	16%	12	13%
B	33	44%	34	37%
C	23	31%	31	33%
D	7	9%	11	12%
E	0	0%	5	5%

Participants filled out a brief questionnaire (Appendix A) on their perception of the course text and on their study techniques. At the conclusion of the course, students were asked if they would sell their textbooks, which were being supplanted by a new edition, to the researchers. Students were also told that the researchers would return the text books to those who wanted them at a later date.

Procedure

The researchers, a reading specialist and a sociologist, chose three pivotal text chapters in the introductory sociology text (Tischler, 1993) for the study. Those chapters, focusing on

culture, social class, and social stratification, were covered in the early, middle, and latter parts of the class. The researchers read each chapter separately, highlighting substantive material. Then they compared highlighted material and attempted to resolve disagreements. In the few cases in which disagreement persisted after discussion, they followed the view of the sociologist who had a more direct knowledge of the type of material that would be required on tests. Extraneous highlighting and highlighting of material authors had placed in boxes was also noted. Next they tallied the number of sentences containing critical information for each chapter and for the three taken together. The substantive material was the subdivided into italicized and non-italicized items. The researchers also noted extraneous highlighting and highlighting of material text authors had placed in boxes.

The researchers tallied the highlighting in all participants' texts. They noted variants students used to identify important material (boxes, marginal notes, etc.). They also attempted to identify the type of extraneous material highlighted by students.

Analysis

Responses to all questionnaire items and percentage of various types of material highlighted were calculated. Course grades were then placed in the matrix. Pearson correlations were obtained on all items. Each item was then classified according to the principle component into which it loaded most heavily.

Results

Table 2 lists the percentage of respondents answering agree or strongly agree with questionnaire items 1-16 on perceptions of the text and on their study habits. Answers to most items were overwhelmingly positive. Large percentages of those surveyed claimed to enjoy the class (96.0%), found the text easy to read (90.5%), found text vocabulary easy (89.2%), usually understood what they read (85.2%), easily found important material (82.4%), thought examples helpful (82.4%), had no difficulty finding what they needed (78.3%), used highlighting or some other device (75.7%), and found the study guide helpful (72.9%). All items except the three negatively phrased items, had at least a 50% agree ratio.

Table 2. Percentages of Students Agreeing or Strongly Agreeing with Questionnaire Items

Item	Percentage
Easy to Read	90.5
Easy to Locate Information	82.4
Easy Vocabulary	89.2
Helpful Examples	82.4
Too Much Information in Chapters	46.3
Usually Understood Text	85.2

Item	Percentage
Person-to-Person Tone	58.1
Need to Re-Read Chapters	54.1
Enjoyed Course	96.0
Followed Guidelines in Text	53.5
Study Guide Helpful	72.9
Frequent Use of Study Guide	50.0
Summaries Read	62.2
Practice Tests Valuable	58.1
No Trouble Locating Material	78.3
Used Highlighting	75.7

Interestingly, 67.6% of students surveyed indicated they had had previous training in one or more study skills either in high school or in college. Since fewer than 25% of students at this university take a reading/study skills course, this percentage was higher than expected. Since we were mainly interested in establishing whether students had received study skill training in more generic study skill areas, we opted to ask about training in note taking, test taking, textbook reading, and other such areas rather than about specific applications of these areas (Cornell method, highlighting, etc.). We felt that being more specific would fragment responses so that we would have many categories with very few responses in any one grouping. Table 3 indicated the number of students receiving training in each study strategy. More students claimed training in note taking than in any other study skill, while memory improvement had the fewest number of positive responses. Twelve students reported they had received instruction in each of the study skills listed.

Table 3. Number of Students Receiving Training in Study Strategies

Strategy	Number
Reading Textbooks	29
Taking Notes	33
Taking Tests	28
Memory Improvement	19
Managing Time	28
Preparing for Tests	24
Number Receiving Training in All Listed Skills	12

The main questionnaire items focused on the relationship between student and textbook and on strategies for dealing with the text effectively. We were interested in seeing whether these perceptions and strategies related to our main study items of highlighting and grade. Table 4 indicates significant Pearson correlations of both questionnaire items and highlighting to grade, to use of author-provided study aids, and to types of material highlighted by students.

Table 4. Significant Pearson Correlations Between Questionnaire Items, Highlighting, and Course Grade

Variable	Significant Correlations
Grade	Usually understood material (.34); Need to reread (-.40)
Easy to read	Easy to identify important material (.56); Easy vocabulary (.47); Usually understood material (.43); Need to reread (-.36); No trouble location information (.50)
Easy to identify important material	Easy vocabulary (.40); Usually understood material (.42); Need to reread (-.31); No trouble locating information (.45)
Easy vocabulary	Usually understood material (.51); Need to reread (-.41)
Examples helpful	Usually understood material (.45); Personal tone (.32)
Too much new information	Need to reread (.31)
Usually understood material	Need to reread (-.48); No trouble locating information (.44)
Need to reread	No trouble locating information (-.32)
Followed textbook guidelines	Practice tests valuable (.41)
Study guide helpful	Frequent use of study guide exercises (.67); Read chapter summaries (.53); Practice tests valuable (.55)
Frequent study guide use of exercises	Read chapter summaries (.51); Practice tests valuable (.56)
Use of highlighting	Italic material highlighted (-.35)
Total italic highlighting	Total important material highlighted (.79); Total extraneous material highlighted (.48)
Total important material highlighted	Total extraneous material highlighted (.43); Total italic highlighting (.79)

Only two items relate to grade, neither of which is surprising. The perception of a need to reread might produce a negative attitude, which could affect grade. Conversely, the correlation of the perception that text material was usually understood reflects a positive attitude toward the text, which in turn makes it easier to read, which in turn relates to higher grades. The relation of use of in-text aids (introductory study guidelines, study guide helpfulness, frequency of study guide usage, reading of chapter summaries, and use of practice tests) to one another is strong in all cases.

Highlighting appears mainly self-related. People who highlight one type of text material are likely to highlight other types as well. What is surprising is the negative correlation between questionnaire response indicating use of highlighting and its actual practice. One possible explanation for this phenomenon is that the questionnaire item on highlighting included note taking or other techniques also ("I used highlighting, note taking, or other techniques to identify important information in the text."). Thus, some people who strongly agreed with this statement may have used note taking or some other technique for interacting with their text.

Table 5 indicates loading items in a principal component analysis. While the Pearson correlation analysis showed the relationship of individual items to one another, this type of analysis focuses on creating groups of items that seem more closely related to one another. In this case, we rotated the data to form six components composed of correlated items with loading values (i.e., correlations) of ± .5 or greater. In short, each item appears with those other items most closely related to it. We named the groups descriptively according to the correlated items in a particular component.

Table 5. Varimax Orthogonally Rotated Factor Pattern Matrix of Student Text Highlighting Variables
(Only loadings exceeding ±.50 are shown)

Variable	Accessibility of Text	Use of Study Helps	Use of Highlighting	Personal Connection	Satisfaction with Course	Trained in Techniques
Reading Ease	.75					
Easy to Locate Material	.75					
Easy Vocabulary	.68					
Usually Understandable	.67					
Need to Reread	-.68					
No Trouble Locating Important Information	.55					
Follow Study Guide		.58				
Study Guide Helpful		.81				
Frequent Study Guide Usage		.81				
Read Chapter Summaries		.59				
Practice Tests Valuable		.80				
Highlight Italicized Material			.89			
Highlight Important Material			.84			
Highlight Extraneous Material			.71			
Helpful Examples				.70		
Personal Style				.65		
Enjoy Course					.59	
Grade					.68	
Received Study Skill Training						.84
Eigenvalue	3.30	2.90	2.40	1.73	1.61	1.44
% of Explained Variance	15.7	13.8	11.4	8.2	7.7	6.9

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	Satisfaction with Course	Trained in Techniques
	.59	
	.68	
		.84
	1.61	1.44
	7.7	6.9

The factors produce no surprises. Accessability items, use of text aids, and highlighting all load together to reinforce relationships seen in the correlation table. What is interesting is the loading of course enjoyment and grade to form the fifth factor. This suggests the relationship between attitude toward course and success.

A final catalogued item is the type of extraneous material highlighted by students. Categories most represented here are as follows: Extensions—students highlighted needed information but continued to highlight additional sentences containing less important discussion of the cardinal points; examples—students highlighted extensive examples taken from other fields or brief mentions of sociology research; headings—students highlighted headings, but not the important material in the text that followed; and questions—the author asked a question, and the students highlighted it. All other highlighting problems were isolated instances that defy categorizing.

As to other text marking, it was infrequently used. Rarely did students use boxes, squiggly lines, or parentheses to identify important material. Only two people occasionally used margin notes on text material. What the text author placed in special boxes was highlighted on only four occasions, never more than once by the same student.

Discussion

Consistency of student questionnaire responses indicates that they are probably accurate representations of student feelings. The items related to grade (usually understood material, no need to re-read material) show those who felt the text to be easy were more likely to do well in the course.

While highlighting was the preferred strategy for student-text interaction, large numbers of students made no marks in their texts. Only 40 of 75 students (53.3%) used this device. This is a smaller number than predicted by Caverly & Orlando (1991). It is hard to tell whether this was due to the presence of in-text aids, which large numbers claimed to have used, or whether students substituted note taking or other devices for text marking strategies.

Important material tended to bunch in certain places so that students needed to highlight almost all sentences in certain paragraphs while doing no highlighting at all in large sections of the text. This situation did not support Caverly and Orlando's (1991) research, which indicated students should only highlight a single item per paragraph. If the situation documented here is typical, then students are better advised to cluster highlighting in especially informative paragraphs.

As expected in light of the earlier pilot study (O'Hear & Ashton, 1987), highlighting does not relate to course grade. However, it raises the question of the importance of text-marking for course success. Whether the reason for this phenomenon is ineffective highlighting, use of other devices or high school habits is not certain. If students have adapted other devices which seem to have worked, research suggests that there may be little reinforcement for getting students to change habits of text relationship. (Van Rossum & Schenk, 1984)

Most highlighters mark as much extraneous material as significant material. As research suggests, those who highlight do not do a good job of it. It might be a useful study to see if students trained in effective highlighting techniques succeed better than those who use it without special training.

There also appears to be little carry over of study skill training to actual content course practice. We did not check to find out what students meant by saying they had received study skill training. They may have remembered a few distant comments on the need to take effective notes, or they may have taken a study skills course. This item needs further research.

In-text aids seem to have been heavily used by students. If this self-report is accurate, it suggests that more textbook publishers need to look to supplying study information, study guides, summaries, and practice tests in their books to aid student learning.

This study has centered on overall course grades, highlighting, and study perceptions. It has left two questions for further examination. First, the present study has focused on relationships, not on causality. The fact that an item such as satisfaction with course relates to grade does not mean that because people are satisfied with a course, they will receive higher grades. A regression analysis is needed to see whether causal relationships exist. Second, since the researchers have collected tests from all students in the study, the specific question of the relation of highlighting in selected chapters to test items related to those chapters is still to be addressed. Perhaps grade is too gross a measure to be sensitive to the results of specific highlighting. These questions await a future study.

Appendix A
Sociology Text Questionnaire

Please rate the following statements/questions on a scale of 1-4.

1 = Agree; 2 = Partly Agree; 3 = Partly Disagree; 4 = Disagree; 0 = No Opinion

_____ 1. The textbook was easy to read.

_____ 2. It was easy for me to tell what was important in most chapters.

_____ 3. The vocabulary used by the writer was easy to understand.

_____ 4. The examples really helped me to understand key points.

_____ 5. Chapters frequently contained too much new information.

_____ 6. I could usually understand what the author was trying to say.

_____ 7. I thought that the author was trying to talk to me person-to-person.

_____ 8. I needed to reread most chapters to understand them.

_____ 9. I have enjoyed taking this Sociology course.

_____ 10. I followed guidelines presented in "A Word to the Student" in this class.

_____ 11. I found study guide material helpful.

_____ 12. I did study guide exercises frequently.

_____ 13. I read the chapter summaries in the study guide.

_____ 14. I found the practice tests valuable as study aids.

_____ 15. I had no trouble locating important material in the text.

_____ 16. I used highlighting, note taking, or other techniques to identify important information in the text.

If you used a technique other than highlighting or note taking, please indicate the technique used._____

_____

17. Have you received training in high school or in college in any of the following areas:

_____	reading textbooks	_____	taking notes
_____	taking tests	_____	taking tests
_____	improving memory	_____	time management
_____	preparing for exams		

Year of high school graduation/GED_____ College major_____

First semester at IPFW: _____ Fall 199___ _____ Spring 199___

_____ Summer 199___

Name:_____
(Please Print)

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JOIN THE CONVERSATION

A JOURNEY DOWN THE RABBIT-HOLE OF MATHEMATICS EDUCATION IN A WELFARE TO WORK PROGRAM

By Pat Mower and Donna E. LaLonde, Washburn University

> Alice started to her feet, for it flashed across her mind that she had never before seen a rabbit with either a waist-coat-pocket, or a watch to take out of it, and burning with curiosity, she ran across the field after it, and it was just in time to see it pop down a large rabbit-hole under the hedge.
>
> In another moment down went Alice after it, never once considering how in the world she was to get out again. (Carroll, 1968, p. 12)

Introduction

As members of a Mathematics and Statistics Department at a metropolitan university, we, like Alice, are often asked to participate in projects that take us down unfamiliar rabbit-holes. Usually, the projects are so interesting we commit ourselves, again like Alice, with little concern about the amount of effort that will be required to successfully complete the project. In this article we will describe a recent project in adult mathematics education, a trip down the rabbit-hole. This project developed out of a need to provide basic mathematics skills to a group of women who were participating in a welfare to work program.

Welfare to work programs have become an integral part of the extensive welfare reform in the United States. In our city of Topeka, Kansas, there are several agencies which are seeking state and federal funding to sponsor a variety of programs, all of which involve some form of job-appropriate practical training and the teaching of social skills and acceptable work habits. The experiences which we will discuss in this paper resulted from our participation in a pilot project sponsored by one such local agency, New Dimensions. The pilot project was conducted during spring of 1998 and involved the training of welfare recipients to become bank tellers. Our specific role was to provide the prerequisite mathematics knowledge to a group of women whose mathematics education ranged from studying for the GED to some post secondary course work.

Initially, the plan was to involve eight to ten welfare recipients in a six-week intensive training program that included the teaching of mathematics, computer and ten key operations, customer service, and general social skills. Speakers from the community banks and schools were brought in to explain the banking, customer service, and computer operations, and tutors were provided for the students. Also, for three weeks the students came to our university twice a week for two hours to learn and relearn basic math skills. Throughout the three weeks we had six female students at most sessions, but not always the same six. The women were engaging, witty, and street smart. At the onset of the experience most of the women were very vocal about their dislike and fear of the learning of mathematics.

In this paper, we will present a qualitative description of what happened, a description of the program curriculum, and a discussion of how this experience influenced our thinking about mathematics education.

What Happened?

We met with the women six times over three weeks, which clearly was not sufficient to fully prepare them for entry into the banking field. Angie (all the names have been changed to respect the privacy of the participants), one of the more vocal students, asked us why we liked math. She obviously was amazed and perplexed at our excitement and enthusiasm for this subject. We began the first day by asking the women to give us mathematical metaphors by completing sentences like "if math was an animal, what would it be?" The metaphors given to us were full of dark images, such as "stormy," "black," "lions," and travels to "far away places." This activity was one that Donna had used as an introductory activity in a number of her university classes, including one of the required mathematics courses for students pursuing elementary teacher certification. It is interesting that many of the metaphors were shared by both groups. It is not uncommon to have mathematics described as stormy weather or with dark colors.

The math lesson that day covered the basics of adding, subtracting, and estimation of whole numbers. On that first day, a portrait of each of the women began to unfold. Terry was the defiant one who stated "I can't do it!" repeatedly. Ila was middle-aged and willing to participate but also eager to leave. She would drop out before the end of the six weeks. Bea was one of the brighter of the group and had been a bank teller previously. We wondered why she was in the program at all. Of the six who arrived the first day, two left after the first half-hour to go to previously scheduled appointments. We wondered if that would become a recurring problem. Over the next few weeks similar events occurred where students arrived late and occasionally left early.

At the end of the first day, it was obvious that shared attitudes existed between these students and some of our preservice education students. The strongest feelings seemed to be that mathematics was something to be, at best, endured and, at worst, a barrier to further success.

The second session was wonderful. We went in with an enthusiastic attitude and the women responded in kind. Only five women attended and one, Eve, was a new entry into the

program. She was bright, funny, and very noisy, but always on task. She only came to two of our sessions for reasons unclear to us. That day we moved away from the algorithms for adding, subtracting, multiplying, and dividing into why the processes work and, as is often the case, the students expressed some resistance. Throughout this session, they shared tidbits of their lives which seemed to demand an incredible set of survival skills. So, it seemed key to us that we provide them with an educational experience that would support adaptability. We believe we sold them, at least for that one day, on the notion that learning is not just knowing how to do something but also understanding the underlying concepts behind the procedures.

At one point during the lesson, the students asked that the door to the hall be closed as they were embarrassed to have other university students see them learning such basic math skills. So much for the theory that women who are mathematically illiterate wear their math deficiencies as a badge of honor! This caused us to wonder if this attitude might also inhibit our university students from enrolling in the appropriate mathematics class. Perhaps they, too, are embarrassed at the need to take Basic Algebra.

This session and all of the following sessions ended with the final half-hour spent on some hands-on activity, such as ten key operations or the role playing of bank transactions using play money. A positive attribute of these hands-on activities was that we were able to acknowledge the students' strengths. We could reinforce what they knew.

The second week we discussed fractions. As we anticipated, the women did not respond well to this instruction. It was as if we had surpassed their comfort level in mathematics. We also found that the students' abilities to abstract (even on the minimal level of one fourth as a fraction is similar to a quarter) was poor and needed to be developed. During this session we felt the pressure of time. We had given a pre-test during our introductory session and none of the participants had done very well. Since we had developed the pre-test based on the expectations of many of the local banks, we wanted the participants' scores to improve. More importantly, we wanted them to learn and to enjoy learning.

On the last day of that week we played a game called fraction bingo, where we drew pictures or wrote terms on the board and the students found equivalent expressions on their bingo cards to cross out. Although we are convinced that manipulative and hands on activities can enhance learning, we worried about the appropriateness of this tool for this group of adults. However, we all agreed the game was fun, the students appreciated the candy bingo prizes, and the learning objectives were accomplished.

Each seminar session we discovered more about our students. Bea, the bright one, was seven months pregnant and was just killing time as the state had said she must be enrolled in some welfare to work program until she found a job. She became very vocal about not wanting to be in the project and in the past had been enrolled in several other programs; she did not want to go to work. Viola, another late entry into our portion of this program, was also very bright and answered questions before anyone else had a chance. She plans to go to college, but is lacking in some basic social skills. Sandy was a very pretty and extremely quiet young woman with six children. She will succeed with the right kind and amount of support and

cheerleading. Everyday the group arrived late and someone came even later; on the other hand, Terry dropped her "I can't do it" line. She used a matrix for multiplication problems and seemed very uneasy about attempting problems without it. One of the rewarding aspects of the program was the connections we were able to develop in a short period of time. At least for the duration of the workshops, there was some shared sense that "we were all in this together."

During the last week, we talked about interest rates and loan payments. The students seemed to grasp the idea of simple interest and could follow the general idea of compound interest. The first day of this week was great. The women were in a playful mood and called us "groovy" and "cool." On the last day, all the women except Terry arrived a half-hour late. We told them we were hurt by their tardiness, and it seemed to affect them. They were quick to blame the tasking schedule of that day's program, saying they needed to go eat their lunch at 3 o'clock. By the end of that last day, we realized how much we wanted the women to succeed and that there was much they had yet to learn about social skills and responsibility. We gave our office phone numbers to the women, telling them to let us know how they are doing. We will miss them, and we found ourselves angry that the women were forced to choose between family, job training, and education. These demands were real, complicated, difficult to prioritize, and affected attendance and performance in class.

These women were not unlike the university women studied by Home (1998). Although the women in her study were pursuing university degrees, they were also forced to deal with the conflict between families and school. In her study, it was mothers with children under 13 who reported the most difficulty coping with the demands of school and family. To be successful, our program needed to find a means of easing this conflict.

What We Learned

The role of teacher often takes on many guises: purveyor of information, role model, cheerleader, counselor, advisor, parent, friend, and muse. Yet, as teachers we must remain teachable ourselves, lest we lose our ability to facilitate connections being made between student and content. This experience was one of those unique learning adventures where the teachers may have come away with more knowledge than the students. The six meetings we had with these few students revealed much to us about the nature of how students respond to learning mathematics, in particular, and to learning in general. This remarkable adventure served to accentuate and clarify much of what we both understood about the teaching and learning of mathematics. We both also felt that the seeds of understanding mathematics were planted in the minds of our students.

The fear-based attitude of "I can't do it" showed itself several times over those three weeks. As educators, we know that this negative statement can cause all learning to come to an immediate halt: the mind hears the words, believes them and tunes out. When two instructors are teaching six students, it is easy to see when this happens and to address it. Thus, we became coaches and encouraged the other students to join us, which they readily did. Questions like, "Bea, can you explain to Terry how you do this so she can see another way to do it?" assisted us in nurturing the atmosphere of a learning community. Exercises in

micro-peer teaching such as this occur frequently in traditional college mathematics courses. Students often "see" solutions or explanations of methods when expressed by their peers in their language. These are important to learning, but the teacher must be vigilant to prevent the spread of misconceptions. We usually tried to reinforce the peer explanation with a more formal description. Another danger of peer teaching was exemplified by the situation where a student felt her peers were ganging up on her as she tried to defend her faulty solution. Nunes, Schliemann, and Carraher (1993) have described mathematical knowledge as either "school" mathematics or "street" mathematics and discuss the importance of understanding the adult student's knowledge base for both. We came away from this experience with a greater awareness of the appropriate place for peer teaching both as an instructional method and as a tool for illuminating the existing "street" mathematics of the adult learner.

While the topic of peer pressure and modeling does not arise much when considering the pedagogy of college mathematics, this six week experience has caused us to rethink this subject. The social skills necessary to succeed in the academic setting are often honed in the college setting. Students learn swiftly from peers and through assessment that attendance and doing homework are essential for this success. They realize they are now adults and the responsibility for homework, studying, and participation is up to them. The more non-traditional student may come in to the college setting with some of these positive attributes but also sees what it takes to succeed by observing and mimicking their peers' actions. The women who attended our seminars really had no positive peer role models to emulate. In fact, the peer pressure seemed to go in the other direction. At times, the students seemed to encourage each other to give up or attempt to manipulate us or the agency employing us. Also, at times we could see the dependence the women felt on the agency or the "system" for their success. It was clear to us that more time and much more peer role modeling would greatly help these women to succeed. We were acutely aware that there were many years of unsuccessful habits that needed to be unlearned and we probably had not addressed or influenced many of these habits!

There is a body of research that presents an analysis of teaching called the "frame factor" theory. Of particular relevance to this project is the organizational influences frame (Bernstein, 1975; Dahlöf, 1971; Lundgren, 1981, 1983). In this situation, the frames or structures are evident both inside the classroom, represented by conditions like class size and length, as well as outside the classroom, through the structures imposed by the society, as represented by prevailing fiscal and political conditions. For us, these conditions created a conundrum between training and education. As mathematicians and educators, we derive pleasure from the pursuit, acquisition, and teaching of new knowledge. However, the short time span of this program was not conducive for acquiring knowledge simply for intellectual satisfaction.

The women in this program were feeling the very real pressure to acquire the basic skills which would allow them to be successful in the work place. We ended this program unconvinced the adult education community has been sufficiently exact in the definition of basic mathematics skills. Specifically, a couple of the women were struggling to pass the mathematics portion of the GED. We question whether the acquisition of algebra skills is the appropriate first hurdle for the adult wanting to enter the job market. Our desire to

develop quantitative literacy with the concomitant understanding of why a particular algorithm works was constrained by the societal frame of what constitutes basic skills.

Other things we learned or remembered from this experience include the following facts. Mathematics is probably best taught and learned in the morning when the minds of the students are fresh and uncluttered by the burdens of the day. Students are easily distracted, but sometimes distractions such as food and related stories are good for the learning soul. The women in this program responded well to whimsical phrases such as "in the ballpark" referring to the use of estimation as a process for checking answers. Often, the women would repeat this phrase to each other when solving arithmetic problems involving large numbers. In fact, they seemed particularly receptive to acquiring estimation skills. In addition, it is important to remember that even though they may have had little work experience, they were not unaware of the impact of computers and calculators on the work place. They wanted to learn the skills that would help them get ahead in the work place.

These women were very much like our students sitting in college mathematics courses in that they started out only wanting to learn the algorithm. "Show me the method and I will repeat what you did!" We felt compelled to convince them that learning something well means not just knowing how to do it but also understanding and seeing why it works. Shortly into the first day's lesson, the women seemed to grasp this notion, but still liked to take short cuts. Perhaps, in the future when a former student is faced with some problem solving dilemma, she will appreciate this concept. Real life problems do not look like algebra problems and often require some creative and inventive thought. This thought only proceeds from an understanding of why some mathematical process can be applied to the situation in question. These problems might range from the balancing of a bank account to the setting up of a computer system. No matter what the project, creative problem solving only comes from a depth of understanding of the required method of solution. Still, it was no surprise to us to note that these students struggled with abstracting to general cases and worked much better with specific computations. Problem solving success does not come from mastering a finite set of problems but is developed intrinsically and comes from a lifelong commitment to learning and to practice. Our hopes are that we planted the seeds of this lifelong process, that our students will be nourished along the way, and that our students will blossom into hearty thinkers and problem solvers.

We also rediscovered there is a place for practice, the doing of repeated similar problems, and a place for using manipulatives to reinforce this learning. When the women mastered one process, they wanted to keep working on those types of problems. Staying in their comfort zone for a time was a confidence-building experience, and it took some enticing to get them to move on. Toward the end of each session, we had the women engage in a hands on activity using manipulatives such as the ten key machines and play money. These activities seemed to reinforce the lessons explored that day. Deciding when and where to use manipulatives is often a judgment call on the teacher's part. In this case, it proved to be invaluable since the women were able to see how they would be using the mathematical processes of arithmetic and estimation first hand.

Conclusion

> Alice soon came to the conclusion that it was a very difficult game indeed. (Carroll, 1968, p. 91)

Overall, this experience brought us a clearer understanding of what it takes for students to succeed in learning mathematics. Although, like Alice, we concluded it was a difficult "game," it informed our teaching of mathematics. Success in learning mathematics takes a combination of attitudes, actions, and skills on the part of the learner: the desire to learn, some social skills, the willingness to participate in the process, the ability to generalize, basic arithmetic skills, the time and motivation to practice, and, above all, the courage to change one's life and redefine one's self.

From our brief exposure to the welfare to work program, we have formed some opinions and remain troubled by some unsettling questions.

- By adulthood, the fear of learning mathematics might be so deeply engrained that the adult student is paralyzed and unable to function in a learning environment.
- The standard rules and consequences of breaking such rules are not appropriate when dealing with the reluctant adult student who is recently transitioning from little or no structure into the educational setting.
- Readiness to learn is not simply a function of age. Adults, like younger learners, may have problems with the lack of basic skills, the ability to think abstractly, and inappropriate social behaviors.

From this experience, we continue to struggle with the following issues:

- Hoe do we, as educators, distinguish training and teaching? How are they different? How ae they similar?
- We are willing to accept that anyone can be motivated to learn if placed in the right environment at precisely the right teachable moment: How is the suitable environment created?
- How do we, as educators, help parents who struggle with mathematics so that they can help their children be successful?

We continue to grapple with how to assess the success of our experience. The most concrete form of evaluation is performance on the post-test and successful entry into the job market. At this point, we cannot report on the employment prospects for the women who participated in the program. However, we feel that the program was successful because for six weeks a group of special women learned and enjoyed the learning of mathematics.

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Reviewed By Judith Sc

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BOOK REVIEW

FRAME BY FRAME: A VISUAL GUIDE TO COLLEGE SUCCESS

Reviewed By Judith Schein Cohn, University of Illinois at Chicago

Lowenstein, S., & Todd, P. (1999). Frame by frame: A visual guide to college success. Upper Saddle River, NJ: Prentice-Hall.

There are many books that attempt to teach students how to adjust to college and how to improve their study strategies so that they are successful. Some emphasize particular academic skills while others focus more on the experience of freshman year and the psychological elements of student life. I would like to consider generally what a study strategies book should offer, and then evaluate one new one with a slightly unusual approach.

The best study strategies texts are those that offer solid information on such areas as time management, building vocabulary, paper writing, and successful test taking. These books can also serve as a reference as students encounter new study or skill related problems throughout their college years. Most recent texts offer general encouragement to help students make a successful transition to college, and some books consider a number of transitional issues in some detail, from financial planning to dealing with drugs and alcohol. There are texts directed at a particular population, such as adults returning to school or students from urban backgrounds, and these texts try to deal specifically with issues faced by these populations. All of these books should be clearly written, with ideas for discussion, exercises for practice of skills, and directions for problem solving for the students who read and work with them. The most successful ones help students to assess their needs realistically and to take corrective actions without being discouraged.

One recently published text has a different twist, a set of cartoon characters who reflect the attitudes and issues of new college students. In Frame by Frame: A Visual Guide to College Success, authors Sharyn Lowenstein and Peaco Todd introduce a cast of characters and use their dilemmas in a series of cartoon panels to stimulate discussion and reinforce information. The introduction to the text makes clear that the cartoons are not just comic relief but central to the authors' attitude towards their material, and the instructor's manual provides details about each character as well as suggestions for how to use the characters to

further the ideas of Frame by Frame. The style is supposed to be whimsical and upbeat, and some of the cartoons are designed to elicit a chuckle as well as a discussion.

Aside from the drawings, Frame by Frame is a fairly traditional text. The topics in Frame by Frame are those found in most such texts, including assessing learning, time management, reading, note-taking, writing, and test taking. The authors also offer information on dealing with professors and academic problems and some personal concerns such as stress and budgeting, although the text does not deal with some of the difficult problems students face today, such as substance abuse or date rape. The topics are covered clearly and there is good, specific information in many areas, including some that are not always covered, such as the cycles of a project, study groups, and understanding professors.

The instructor's manual for Frame by Frame is quite detailed, with some material that I feel really belongs in the text itself. The manual introduces the cartoon characters and names and describes them, while the text only introduces them in the panels. There are ideas of how to use the cartoon characters and other activities which could be in the text. And at the end of the instructor's manual, there are outlines for a semester course and a week-long course. It seems that this book would be used most successfully within a classroom setting, where the instructor can direct discussion and activities rather than as a text which a student might purchase and use alone.

The strength of Frame by Frame lies in its successful rendering of the problems and issues faced by beginning students in an upbeat fashion without being condescending. Many students are likely to respond to such a book. For a teacher to use it successfully, he or she has to be comfortable with using cartoons to approach discussion and using such discussion to learn and practice skills and strategies for success. For very verbal learners (of which I am one), this book would be somewhat awkward to use at first, but it covers appropriate topics clearly and its fresh approach would be a good alternative to other established texts for both teachers and students.

Judith Schein Cohen, *Ph.D., is Acting Coordinator of Instruction in the Academic Center for Excellence at the University of Illinois at Chicago.*

THE DISCIPLINED MIND: WHAT ALL STUDENTS SHOULD UNDERSTAND

Reviewed By James McNamara, Alverno College

Gardner, H. (1999). The disciplined mind: What all students should understand. New York: Simon & Schuster.

What is the purpose of education? Howard Gardner offers the most recent, and most liberal, answer to this question in his latest book, The Disciplined Mind: What all Students Should Understand. "Two major goals of education across time and space could be called the modeling of adult roles and the transmission of cultural values" (p. 28). These goals were identified historically in an attempt to produce well-rounded individuals. To have effective citizens in a democracy requires participation; in turn, those people best able to participate are those who have been educated in a liberal arts fashion. According to Gardner, educational reform needs to concentrate on such content. "It is important that a culture identify the truths, beauties, and virtues that it values" (pp. 244-245). To that end, Gardner argues that K-12 education concentrate on teaching truth, beauty, and morality. To accomplish these tasks, students would examine three topics: the theory of evolution, as articulated by Darwin and others; Mozart's opera, The Marriage of Figaro; and the Holocaust. While Gardner acknowledges that other topics would serve as well, he provides significant reasons why this trio would accomplish his primary task, designing an education for understanding.

One major assumption of Gardner's is that education's purpose is not just to preserve the status quo; one should always be trying to better the world, to work towards an ideal realm. Unlike recent authors who have weighed in on the subject of education reform (e.g., Bloom, Hirsch, and D'Souza), Gardner seems less concerned with a strict canon than with how one might understand the knowledge acquired in school. He aligns himself with the progressive educational philosophy of John Dewey. At the same time, however, he is unwilling to dispense with the notion that some things need to be taught and learned. He is concerned with the relativism of cultural literacy; attempting to cover too much information too quickly may be as harmful as not covering areas at all.

To support his claim that education needs to concentrate on teaching students processes rather than merely products, Gardner traces both the ways that formal education has attempted to educate individuals and the shortcomings of each subsequent methodology. He then notes the forces at work that will require future educational changes; these forces include the following:

- technological and scientific breakthroughs;
- political trends;

- economic forces;
- social, cultural, and personal trends;
- the shifting cartography of knowledge;
- the postmodern perspective; and
- multiculturalism.

This discussion is followed by a further admission that knowledge of the mind and the brain (psychology and physiology) have also exerted influence on educational trends.

Gardner next provides evidence of effective educational reforms at work in the world. These include the preschools of Reggio Emilia, in Italy, which concentrate on focused study of limited topics. The entire school lends its attention to one point of interest, perhaps something as fleeting as a rainbow, with the intent of studying the phenomenon from a variety of perspectives. The success of this program is predicated on the extensive documentation that the instructors record of all student behaviors, as well as contributions made by the students' families; Gardner will return to this point later in The Disciplined Mind to argue that effective instruction requires committed teachers and communities. Other positive education examples include Spectrum classrooms, found throughout the United States, and the Key Learning Center of Indianapolis, both of which coincidentally make use of Gardner's own theories of multiple intelligences.

While Gardner finds the above programs laudable, he seems highly critical of the new wave of for-profit institutions, particularly those that practice their craft online. Of the University of Phoenix, he laments that there is "no intellectual life at the university, in any meaningful sense of the term" (p. 115). He argues that such an educational experience will hardly allow students to discern depth in their studies. Educational systems that stress the quick assimilation of factual information will not produce understanding minds, according to Gardner. And a "disciplined mind," the desired goal, will often find itself at odds with, or at least in contention with, the very nature of "facts."

It is this ability to examine "sharply contrasted terms," facts that may be observed by different disciplines to different ends, that Gardner feels is the heart of an understanding mind. Education should help students, particularly while they are young, learn that simple answers don't exist in the real world. To accomplish this goal, Gardner's method of instruction requires students to produce "performances of understanding" through ongoing assessment and self assessment. Further conditions, as touched on above, require that the teaching environment include well-trained, enthusiastic teachers; students prepared and motivated to learn; technology as a helper; and supportive communities. These ideals, when combined with Gardner's trio of topics, or others as appropriate, will provide a positive educational experience that will achieve his desired outcome.

But how would such an educational method be delivered to students, one might ask? Gardner offers practical advice on this question, as well. Making use of his own theory of multiple intelligences, he notes how students' strengths might be employed as points of entry to content areas. Numerical entry points, for example, for the mathematically inclined, might begin with a study of numbers and numerical relations in each of the topics.

Ultimately, Gardner acknowledges that barring the unlikely event that he becomes the "benevolent dictator" of education in the United States, a unified educational process with one set of national standards is dreaming, at best. In fact, in such a heterogeneous society, one method of instruction might not be advisable. Recognizing this inevitability, Gardner proposes several "pathways" of education that might appeal to a broad spectrum of the population. These pathways include:

- the canon pathway: inspired by Allan Bloom, William Bennett, and Lynne Cheney;
- the multicultural pathway: inspired by James Banks, Jesse Jackson, and Ronald Takaki;
- the progressive pathway: inspired by John Dewey, Francis Parker, and Deborah Meier;
- the technological pathway: inspired by Bill Gates, Louis Gerstner, and corporate America;
- the socially responsible pathway: inspired by civic organizations, environmental groups, and the Educators for Social Responsibility; and
- the understanding pathway: inspired by Socrates and The Disciplined Mind.

Whatever pathway society, or parts of society, decides to follow, success will be achieved, according to Gardner, only if leaders adequate to the task assume positions of responsibility. Effective education requires coordination and accountability, and Gardner calls on everyone to fulfill a role if they are at all concerned with the education of the children of the future.

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The Learning Assistance Review

The Learning Assistance Review is a publication of the Midwest College Learning Association (MCLCA). It is published twice a year, in the fall and spring.

The journal seeks to expand and disseminate knowledge about learning centers and to foster communication among learning center professionals. Its audience includes learning center administrators, teaching staff, and tutors as well as other faculty and administrators across the curriculum who are interested in improving the learning skills of postsecondary students.

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PUBLICATION GUIDELINES

As an official publication of the Midwest College Learning Center Association, The Learning Assistance Review seeks to expand and disseminate knowledge about learning centers and to foster communication among learning center professionals. Its audience includes learning center administrators, teaching staff and tutors, as well as other faculty and administrators across the curriculum who are interested in improving the learning skills of post-secondary students.

The journal aims to publish scholarly articles and reviews that address issues of interest to a broad range of learning center professionals. Primary consideration will be given to articles about program design and evaluation, classroom-based research, the application of theory and research to practice, innovative teaching strategies, student assessment, and other topics that bridge gaps within our diverse discipline.

1. Prepare a manuscript that is approximately 12 to 15 pages in length and includes an introduction, bibliography, and subheadings throughout the text.

2. Include an abstract of 100 words or less that clearly describes the focus of your paper and summarizes its contents.

3. Type the text with double spacing and number the pages. Follow APA style (Publication Manual of the American Psychological Association, 4th edition, 1994).

4. Include your name, title, address, institutional affiliation and telephone number along with the title of the article on a separate cover sheet; the manuscript pages should include a running title at the top of each page with no additional identifying information.

5. Submit all tables or charts camera ready on separate pages.

6. Do not send manuscripts that are under consideration or have been published elsewhere.

7. Send four copies of your manuscript to the following address: Nancy Bornstein, Co-Editor, The Learning Assistance Review, Alverno College, 3401 S. 39th Street, Milwaukee, WI 53215.

You will receive a letter of acknowledgment that your manuscript has been received. The review process will then take approximately three to six weeks at which time you will receive further notification related to your work. If your manuscript is accepted for publication, a computer disk will be requested.

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What is MCLCA?

The Midwest College Learning Center Association (MCLCA) is a regional organization dedicated to promoting excellence among learning center personnel in 12 midwestern states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. MCLCA defines a learning center as a place where all students, from entering freshmen to graduate and professional school students, can be taught to become more efficient and effective learners.

What Does MCLCA Do?

The MCLCA Constitution identifies the following objectives for the organization:

- To promote professional standards for learning centers through education, curriculum design, research, and evaluation.
- To promote support for learning centers by acting on issues affecting learning assistance programs.
- To assist in the development of new learning centers.
- To assist in the professional development of personnel in learning assistance programs by providing opportunities for sharing professional methods, techniques, and strategies.
- To provide an annual conference for the exchange of ideas, methods, and expertise in learning assistance programs.
- To publish educational information and research in the field.
- To develop and expand a communications network among learning assistance professionals.
- To coordinate efforts with similar professional groups.

How Can I Participate?

The MCLCA Executive Board is anxious to involve as many learning center professionals as possible in achieving its objectives and meeting our mutual needs. Therefore, we invite you to become a member of the Midwest College Learning Center Association. The membership year extends from October 1 through September 30, and annual dues are $40.00. Membership includes the MCLCA Newsletter and The Learning Assistance Review, discounted registration for the annual MCLCA Conference, workshops, in-service events, and announcements regarding upcoming MCLCA activities. We look forward to having you as an active member of our growing organization.

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