

VSI: Interactive Video Courses, *Revised January 2, 1998*

Martin, D. C., & Arendale, D. (1998). VSI: Interactive video courses. Unpublished manuscript, The University of Missouri-Kansas City

Overview of VSI

Mindful of the University of Missouri's state-wide commitment to communities as a part of its land-grant mission, the staff of the Center for Academic Development, with other UMKC colleagues, originated *Video courses with Supplemental Instruction* (VSI). This educational delivery system simultaneously accomplishes the following:

- enables affordable and flexible delivery in venues where courses are otherwise not available;
- comprehension and application of difficult course concepts;
- high grades for 90 percent of students, including academically underprepared students at both secondary and postsecondary levels;
- maintains high academic standards for student and faculty performance; and
- provides an additional dual-credit option for high school students preparing for the University.

Based on the methodology of Supplemental Instruction (a U.S. Department of Education approved and funded UMKC program) the flexible VSI model delivers affordable, effective instruction on the University campus and at remote sites. Manuals for facilitators and students accompany the videotaped lecture/demonstration presentations. Together, these materials enable mastery learning of difficult content in mathematics, science, and other subjects of high interest to students and school officials nationally and internationally.

In the VSI mode as practiced at UMKC, a regular course instructor's lectures are video taped. Students enrolled in VSI sections of the course do not attend regular class lectures; instead, for a typical three semester-hour course requiring three hours of weekly attendance, VSI students enroll for a 7.5-hour block of time per week, spread over several days. These VSI sessions include a variety of activities in addition to viewing the video lectures with frequent stops to discuss of the material. Students engage in writing activities and other learning strategies that foster content mastery and the development of skills that underpin critical thought in the discipline. The expanded time allocation to the subject captures and manages the time which students normally spend alone studying the course material. Since VSI creates additional sections of the professor's course, students are evaluated by meeting the same standards and taking the same exams as students enrolled in the regular lecture sections.

The Origins of VSI: Prior Experience

In the early 1980s, the staff of the Center developed applications of Supplemental Instruction (SI) to answer the specific problem of medical students who failed the comprehensive examination in the basic sciences that comes at the end of their second year. Later in the decade, when the number of students from all parts of the U.S. seeking admission to the UMKC Board Review program outstripped the available resources, the staff made a video-based program, *FIRSTprep*, available for adoption in medical schools outside Kansas City. Although the video program was multi-faceted, the central instructional procedure was relatively

straightforward. The implementation steps that proved effective in *FIRSTprep* comprise the central core of VSI:

1. Preview both the vocabulary which will be used in the lecture and, in rather cursory fashion, the main topics to be covered in the lecture. ("Tell them what you are going to tell them.")
2. Process the videotaped lecture. In doing so, stop when necessary to permit students to clarify something the professor has said or simply to assure that the students are tracking the progress of the presentation. (This technique derived from that used by John Madden, commentator on football for CBS network television, who likes to present plays in slow motion for the edification of his audience.) This is the "Tell them" phase of the lesson.
3. Review the videotaped lecture, using any of a variety of well known techniques. ("Tell them what you told them.")

Departing only slightly from *FIRSTprep*, staff devised VSI according to the following plan:

- Get the most respected undergraduate professor who
- Teaches one of the historically difficult courses, and
- Invite the professor into the video studio to deliver an entire course for the video camera.
- Tidy the lectures with a modicum of editing.
- Assign three to four hours of regular course credit (i.e., History 201) to the VSI block and an option for the student to enroll in an additional three hours of study skills credit.
- Enroll students in a special section of the historically difficult course, and
- Give the students a videocassette recorder, a monitor, a blackboard, and a facilitator.
- Arrange the schedules of the students to accommodate extended class periods.
- Ask the professor to administer exams to the regular course and the video-based course on the same schedule and to apply the same grading standards to both sections of the course.
- Present the video-based course as rigorously as the regular course.
- Having done all the foregoing, then find a facilitator who has some familiarity with the material and train that person in techniques of collaborative learning.

The difference between this approach and those traditionally used in postsecondary education lay in the centrality of students to the process as opposed to the centrality of the material to be learned:

- Students conduct the preview;
- Students determine the pace of the lecture;
- Students assure their own mastery as the lecture progresses;
- Students select the key points for immediate review;
- Students identify misconceptions and modify and adapt their conceptions to achieve, eventually, more complete understanding.

In essence, students take responsibility for their own learning. The role of the facilitator is to drag his or her feet, assuring that students understand the material while firmly resisting the pressure from students to give them answers, thus hurrying the process. In the final analysis, facilitators become experts in finessing answers from their groups.

The result of using videotaped lectures in this way was quite remarkable. In four years, the VSI method has been used with salutary effect by two dozen different medical schools and health-care institutions, preparing people to perform well on medical boards. The combination of the three-stage presentation punctuated by student discussion has proved to be an extremely powerful learning mode.

Description of Methodology of Research Studies for Each Claim Statement

1. Design

The basic design of the various quasi-experimental research studies compares performance of the voluntary treatment group (VSI Participants) with the control group (Non-VSI Participants). Studies include one or more of the following independent variables: motivation to participate; college entrance standardized test scores, high school percentile rank, prior academic achievement; and ethnicity. Studies include one or more of the following dependent variables: final course grades; percent A & B final course grades; percent D & F final course grades and course withdrawals; reenrollment rates; and graduation rates. All final course grades were based on a 4.0 grade scale (4=A; 3=B; 2=C; 1=D; 0=F). The research does not meet the standards for true experimental design, but results have been replicated across many institutions. For the foregoing analyses, all students within the courses are included.

2. Population

The population studied for this report includes all students enrolled in courses in which VSI was offered, those who enrolled in the VSI section of the course as well as the section that was taught live by the same instructor. The population for these studies represent students from UMKC and from high schools in rural Missouri where the VSI courses were offered. Within this population are two subgroups: those enrolled at the University of Missouri-Kansas City and students enrolled at high schools in rural Missouri.

Since a definition of VSI participant is required, for the purpose of these studies a VSI participant is defined as someone who enrolled in a VSI course and received an official grade on their transcript of A, B, C, D, F, I, or W (withdrew after the initial two-week drop/add period of the semester).

3. Instruments and Procedures

Course rosters and background data (e.g., ethnicity, standardized entrance test scores, self-reported use of study strategies, high school rank) for students enrolled in VSI targeted courses were obtained. Final course grades, reenrollment and graduation data for students were also obtained after the semester for students enrolled in the targeted classes.

4. Data Collection

The UMKC national VSI director was in charge of all data collection and analysis. This person was responsible for the collection, analysis, writing, and distribution of periodic reports on the VSI program's effectiveness. A variety of instruments and procedures were used to obtain the information needed for an analysis of the data related to student enrollment in the targeted courses. The VSI staff was carefully instructed in proper use of confidential student data. All university protocols were followed.

5. Data Analysis

Standard statistical methods were used in analysis of the data for comparing students. The level of

significance was set at $p < .01$ when independent t-tests were employed for comparing final course grades. A significance level of $p < .05$ was set when using the chi square tests for comparing: the percentage of A and B final course grades; the percentage of D and F final course grades and withdrawals; and the percentage of reenrollment.

With the chi square, using nominal data, this research study used $p < .05$ to heighten the sensitivity of the measures. If an effect were present, the researchers did not want to overlook it. On the other hand, when using interval data, the researchers sought to enhance the specificity of the statistical test, not wishing to claim an effect that may not have been present. Additionally, the researchers used $p < .05$ in measures there were thought of as a preliminary, screening test. In more precise efforts to specify effects, the researchers used $p < .01$.

6. Limitations

This document contains a collection of studies. Some are focused on a single academic course at UMKC. When possible, all available independent variables were included for analysis. For some of these studies additional independent variables were unavailable. In those studies the researchers recognize the possible impact of the following variables on the research results: different institutions; different types of institutions; different academic courses; students with different abilities in the groups; and different VSI facilitators. While some studies do contain the aforementioned limitations, it should be noted that the replication of similar results (higher academic achievement) across the groups (i.e., different institutions, different courses) can be considered as another means to validate the educational efficacy of VSI.

Use of VSI with UMKC College Students.

Study #1: Academic Achievement, Persistence and Affective Domain Changes for UMKC Students in History 201.

Table 1. This data study is a composed of combined data from Winter 1992 through Winter 1997 in eleven academic terms. A comparison is made between students who were enrolled in two sections of a course (VSI and live classroom lectures). Variables that are studied include: standardized entrance examination scores, high school graduation rank percentile, college academic status, designated college major, and gender. The type of data in this table suggested use of t-test and chi square.

Table 1: Comparison of Selected Characteristics Between VSI and Non-VSI Groups
UMKC College Students Enrolled in History 201: Winter 1992 through Winter 1997

Student	VSI Group	Non-VSI Group	p-value
Characteristic	n = 160	n = 1,515	
Mean ACT Composite Score	20.1	25.1	$p < .01$ t-test
Mean Percentile High School Graduation Rank	34.7% n = 160	50.8% n = 1,511	$p < .01$ t-test

Percent of Students On Academic Probation	35.6%	13.5%	p < .01
	n = 57	n = 204	chi square
Percent of Students in Good Academic Standing	64.4%	85.6%	p < 0.1
	n = 103	n = 1,311	chi square
Distribution of College Majors:	31.3%	41.0%	p < .01
Percent Arts and Sciences	22.56%	40.9%	chi square
Percent Professional School	46.3%	18.1%	
Percent Undeclared Major			
Gender:	50.6%	45.0%	not significant
Percent Male	49.4%	55.0%	chi square
Percent Female			

Discussion of Table 1. An analysis of data on student demographics and previous levels of academic achievement found that the VSI participants: had significantly lower standardized college entrance examination scores; significantly lower high school graduation percentile ranks; significantly higher proportion of students on academic probation; and a higher proportion of students with undeclared college majors (a common characteristic of college dropouts).

Table 2. This data study is a composed of combined data from Winter 1992 through Winter 1997 in eleven academic terms. A comparison is made between students who were enrolled in two sections of a course (VSI and live classroom lectures). Variables that are studied include: final course grades for all students, final course grades of students who were at risk academically based on traditional identification criteria, and reenrollment rates of academic risk students the following academic term (excluding summer term). "At risk" is based on low standardized test scores, low high school rank, placed on academic probation by UMKC, and/or previously dismissed from UMKC due to low academic performance. The type of data in this table suggested use of t-test and chi square.

Table 2: Comparison of Academic Performance Between VSI and Non-VSI Groups
UMKC College Students Enrolled in History 201: Winter 1992 through Winter 1997

Performance Variable	VSI Group	Non-VSI Group	p-value
Studied	n = 160	n = 1,515	
Mean Final Course Grade	2.95	2.52	p < .01 t-test
Reenrollment the Following Academic Semester for All Students	76.3%	82.6%	p < 0.099
	n = 122	n = 1,230	chi-square
Percent A & B Final Course Grades	70.6%	49.9%	p < 0.01 chi-square
Percent C Final Course Grades	18.8%	26.7%	p < 0.01 chi-square
Percent D & F Final Course Grades	7.6%	17.1%	p < 0.01 chi-square

Percent Course Withdrawals	3.1%	6.1%	p< 0.01 chi-square
Percent Unsuccessful (D, F & W)	10.7%	23.2%	p< 0.01 chi-square
Mean Final Course Grade of "At Risk" Students	2.58 n = 57	1.02 n = 204	p< 0.01 t-test
Reenrollment the Following Academic Semester for "At Risk" Students	63.2% n = 36	56.4% n = 115	p< 0.39 chi-square

Discussion of Table 2. An analysis of data on grades and withdrawal rates suggests that the VSI participants: earned significantly higher percentage of A & B final course grades; significantly lower percentage of D & F final course grades and withdrawals; and significantly higher mean final course grades than the students enrolled in the same large live course taught by the same professor. These results were higher than predicted since various predictors (Table 1) had suggested that the VSI students were less prepared academically and would perform at lower levels than the students enrolled in the large lecture class.

Table 3. The data in this table studies the rate of reenrollment for an additional academic term after students were enrolled in History 201. Summer academic terms are excluded. Four comparison groups are created: All VSI students, all non-VSI students, VSI "at risk" students, and non-VSI "at risk" students. The data is presented for each academic term that the VSI program has been in operation since Winter 1992.

Table 3: Comparison of Student Persistence Between VSI and Non-VSI Groups
UMKC College Students Enrolled in History 201: Winter 1992 through Winter 1997

Academic Term that the Students Enrolled in History 201	Group Composition	Number of Students in Group	Percent of Students Who Reenrolled One Academic Term After VSI	Percent of Students Who Reenrolled Two Academic Terms After VSI
Winter 1997	All VSI	11	100%	n.a.
	All Non-VSI	150	100%	n.a.
	VSI "At Risk"	6	100%	n.a.
	Non-VSI "At Risk"	28	100%	n.a.
Fall 1996	All VSI	11	90.9% (10)	90.9% (10)
	All Non-VSI	115	78.1% (89)	85.0% (96)
	VSI "At Risk"	5	80.0% (4)	80.0% (4)
	Non-VSI "At Risk"	30	53.3% (16)	66.7% (20)
Winter 1996	All VSI	19	63.2% (12)	47.4% (9)
	All Non-VSI	157	71.9% (110)	71.4% (105)
	VSI "At Risk"	9	33.3% (3)	22.2% (2)
	Non-VSI "At Risk"	20	35.0% (7)	30.0% (6)
Fall 1995	All VSI	16	75.0% (12)	62.5% (10)

	All Non-VSI	140	88.5% (123)	71.3% (97)
	VSI "At Risk"	4	50.0% (2)	25.0% (1)
	Non-VSI "At Risk"	17	82.4% (14)	29.4% (5)
Winter 1995	All VSI	10	70.0% (7)	70.0% (7)
	All Non-VSI	155	74.2% (112)	70.2% (106)
	VSI "At Risk"	4	50.0% (2)	50.0% (2)
	Non-VSI "At Risk"	19	47.4% (9)	31.6% (6)
Fall 1994	All VSI	9	77.8% (7)	44.4% (4)
	All Non-VSI	162	84.5% (136)	74.2% (118)
	VSI "At Risk"	1	0% (0)	0% (0)
	Non-VSI "At Risk"	20	40.0% (8)	30.0% (6)
Winter 1994	All VSI	9	77.8% (7)	66.7% (7)
	All Non-VSI	159	76.3% (119)	73.0% (111)
	VSI "At Risk"	4	75.0% (3)	50.0% (2)
	Non-VSI "At Risk"	17	17.6% (3)	29.4% (5)
Fall 1993	All VSI	24	79.2% (19)	47.8% (11)
	All Non-VSI	155	91.4% (139)	83.8% (124)
	VSI "At Risk"	8	75.0% (6)	28.6% (2)
	Non-VSI "At Risk"	13	69.2% (9)	38.5% (5)
Winter 1993 Due to professor on sabbatical, non-VSI control group is unavailable for comparison	All VSI	19	57.9% (11)	36.8% (9)
	All Non-VSI	n.a.	n.a.	n.a.
	VSI "At Risk"	10	50% (5)	20% (2)
	Non-VSI "At Risk"	n.a.	n.a.	n.a.
Fall 1992	All VSI	18	94.4% (17)	61.% (11)
	All Non-VSI	157	84.6% (133)	78.3% (123)
	VSI "At Risk"	5	100% (5)	60% (3)
	Non-VSI "At Risk"	20	45% (9)	40% (8)
Winter 1992	All VSI	16	62.5% (10)	43.8% (7)
	All Non-VSI	162	77.2% (122)	70.6% (108)
	VSI "At Risk"	4	75.0% (3)	50.0% (2)
	Non-VSI "At Risk"	23	60.9% (14)	47.8% (11)

Discussion of Table 3. This data table provides a breakdown of reenrollment data by individual academic terms for students enrolled in History 201. While the VSI group was generally less academically prepared than the non-VSI group (Table 1), the VSI group enjoyed equal or higher rates of reenrollment the majority of the time. This is especially revealed when comparing "at risk" students.

Table 4. The data in this table examines dependent variables for each individual academic term that the VSI program has operated since Winter 1992 in History 201. Variables include: high school percentile rank, final History 201 grade, and students on academic probation.

Table 4: Comparison of Academic Performance Between VSI and Non-VSI Groups
UMKC College Students Enrolled in History 201: Winter 1992 through Winter 1997

Academic Term	Variable Studied	VSI Group	Non-VSI Group
Winter 1997 VSI=11 Non-VSI=153	Mean Percentile High School Rank	26.1%	44.1%
	Mean Final Course Grade	2.54	2.40
	Percent A & B Final Course Grades	63.7%	43.8%
	Percent C Final Course Grades	9.1%	30.7%
	Percent D, F & W Final Course Grades	27.3%	25.5%
	Percent on Academic Probation	54.5%	18.3%
	Mean Final Course Grade of "At Risk" Students	1.66	1.16
Fall 1996 VSI=11 Non-VSI=115	Mean Percentile High School Rank	28.1	48.7
	Mean Final Course Grade	2.72	2.29
	Percent A & B Final Course Grades	81.8%	37.4%
	Percent C Final Course Grades	9.1%	33.9%
	Percent D, F & W Final Course Grades	9.1%	27.0%
	Percent on Academic Probation	45.5%	26.1%
	Mean Final Course Grade of "At Risk" Students	2.40	1.12
Winter 1996 VSI=19 Non-VSI=157	Mean Percentile High School Rank	33.2	43.7
	Mean Final Course Grades	2.38	2.63
	Percent A & B Final Course Grades	47.4%	54.8%
	Percent C Final Course Grades	31.6%	23.6%
	Percent D, F & W Final Course Grades	21.1%	21.0%
	Percent on Academic Probation	47.4%	12.7%
	Mean Final Course Grade of "At Risk" Students	1.62	0.78
Fall 1995 VSI=16 Non-VSI=140	Mean Percentile High School Rank	40.8	45.4
	Mean Final Course Grades	2.62	2.35
	Percent A & B Final Course Grades	56.3%	64.3%
	Percent C Final Course Grades	37.5%	17.1%
	Percent D, F & W Final Course Grades	6.3%	18.6%
	Percent on Academic Probation	25.0%	12.1%
	Mean Final Course Grade of "At Risk" Students	2.50	1.30
Winter 1995	Mean Percentile High School Rank	42.0	46.5
	Mean Final Course Grade	3.80	2.51
	Percent A & B Final Course Grades	100%	56.4%
	Percent C Final Course Grades	0%	25.0%

VSI=10	Percent D, F & W Final Course Grades	0%	18.6%
	Percent on Academic Probation	40.0%	12.3%
Non-VSI=155	Mean Final Course Grade of "At Risk" Students	4.00	0.72
Fall 1994	Mean Percentile High School Rank	43.9	48.0
	Mean Final Course Grade	3.25	2.56
VSI=9	Percent A & B Final Course Grades	66.7%	50.0%
	Percent C Final Course Grades	22.2%	22.2%
Non-VSI=162	Percent D, F & W Final Course Grades	11.1%	27.8%
	Percent on Academic Probation	11.1%	12.3%
Winter 1994	Mean Final Course Grade of "At Risk" Students	2.00	1.06
	Mean Percentile High School Rank	26.5	50.9
VSI=9	Mean Final Course Grade	3.22	2.72
	Percent A & B Final Course Grades	77.8%	54.1%
Non-VSI=159	Percent C Final Course Grades	22.2%	23.9%
	Percent W, F & W Final Course Grades	22.0%	0%
Fall 1993	Percent on Academic Probation	44.4%	10.7%
	Mean Final Course Grade of Students with Negative Academic Action	2.75	0.63
VSI=24	Mean Percentile High School Rank	32.9	56.7
	Mean Final Course Grade	2.95	2.50
Non-VSI=155	Percent A & B Final Course Grades	58.3%	48.4%
	Percent C Final Course Grades	33.3%	34.2%
Winter 1993	Percent D, F & W Final Course Grades	8.3%	17.4%
	Percent on Academic Probation	33.3%	8.4%
VSI=17	Mean Final Course Grade of "At Risk" Students	3.28	1.16
	Mean Percentile High School Rank	38.1	n.a.
Non-VSI Group unavailable due to course professor sabbatical	Mean Final Course Grade	3.13	n.a.
	Percent A & B Final Course Grades	82.4%	n.a.
Fall 1992	Percent C Final Course Grades	7.1%	n.a.
	Percent D, F & W Final Course Grades	7.1%	n.a.
VSI=18	Percent on Academic Probation	58.5%	n.a.
	Mean Final Course Grade of "At Risk" Students	2.60	n.a.
Non-VSI=157	Mean Percentile High School Rank	31.6	56.8
	Mean Final Course Grade	3.65	2.43
VSI=18	Percent A & B Final Course Grades	94.4%	52.9%
	Percent C Final Course Grades	0%	21.7%
Non-VSI=157	Percent D, F & W Final Course Grades	5.6%	24.8%
	Percent on Academic Probation	27.8%	10.8%
	Mean Final Course Grade of "At Risk" Students	4.00	1.00

Winter 1992	Mean Percentile High School Rank	56.0	65.0
	Mean Final Course Grade	2.62	2.35
VSI=16	Percent A & B Final Course Grades	68.8%	40.7%
	Percent C Final Course Grades	18.8%	37.7%
	Percent D, F & W Final Course Grades	12.5%	21.6%
Non-VSI=162	Percent on Academic Probation	11.1%	10.8%
	Mean Final Course Grade of "At Risk" Students	2.75	1.00

Discussion of Table 4. The data from this table reflects the data from the trends revealed in the aggregate study (Table 2). VSI participants earned higher grades and had lower rates of withdrawal than their non-VSI counterparts. This trend is especially pronounced when comparing VSI and non-VSI "at risk" students.

Study of Student Self-Reported Learning Skills

Table 5. In addition to analyzing actual academic performance data, students' self-perceptions were also examined. This analysis examines the affective domain impact of the VSI program. All VSI students enrolled in the History 201 course took several pre- and post-tests to measure self-reported changes in study behavior.

Table 5
Comparison of Improvement of Learning and Study Strategies of VSI Group
As Measured by the Learning and Study Strategies Inventory (LASSI)
UMKC College Students Enrolled in History 201: Winter 1992 through Winter 1997

Learning and Study Strategy n = 128	Mean Percentile Score		p-value
	Pretest	Posttest	t-tests
Attitude and Interest	41.4	40.4	n.s.
Motivation, Diligence, Self-Discipline	36.2	44.8	n.s.
Time Management	50.3	59.8	p < .05
Anxiety and Worry About School Performance	35.6	50.1	p < .01
Concentration and Attention to Academic Tasks	49.8	62.9	p < .01
Information Processing, Acquiring Knowledge & Reasoning	47.0	51.8	n.s.
Selecting Main Idea & Recognizing Important Information	50.3	71.2	p < .01
Use of Support Techniques and Materials	50.5	64.5	p < .01
Self Testing and Reviewing, and Preparing for Classes	47.2	67.8	p < .01
Test Strategies and Preparation for Tests	33.2	50.9	p < .01

Table 6
Comparison of Improvement of Learning and Study Strategies of VSI Group
As Measured by the ACT Study Skills Inventory
UMKC College Students Enrolled in History 201: Winter 1992 through Winter 1997

Learning and Study Strategy n = 114	Mean Percentile Scores		p-value
	Pretest	Posttest	t-tests

Managing Time and Environment	43.0	54.9	p < .01
Reading Textbooks	53.3	70.3	p < .01
Taking Class Notes	50.2	63.1	p < .01
Using Information Resources	54.0	60.6	n.s.
Preparing for and Taking Examinations	51.2	66.7	p < .01
Inventory Total	42.9	65.1	p < .01

Discussion of Tables 5 and 6. The two instruments (Learning and Study Strategies Inventory (LASSI) and the ACT Study Skills Inventory (SSI) reported similar findings. An analysis of data from the LASSI found significant positive changes in all ten areas measured by the assessment: attitude and interest; motivation, diligence, and self-discipline; time management; anxiety and worry about school performance; concentration and attention to academic tasks; information processing, acquiring knowledge and reasoning; selecting main idea and recognizing important information; use of support techniques and materials; self testing and reviewing, and preparing for classes; and test strategies and preparation for tests (Table 5). Data from the SSI suggests similar significant positive changes in all five areas measured by the assessment: managing time and environment; reading textbooks; taking class notes; using information resources; and preparing for and taking examinations (Table 6).

Study #2: Academic Achievement, Persistence and Affective Domain Changes for UMKC Students in Chemistry 211.

Table 7. This data study is a composed of combined data from Fall 1995 through Winter 1997 in four academic terms. A comparison is made between students who were enrolled in two sections of a course (VSI and live classroom lectures). Variables that are studied include: standardized entrance examination scores, high school graduation rank percentile, college academic status, designated college major, and gender. The type of data in this table suggested use of t-test and chi square.

Table 7
Comparison of Selected Characteristics Between VSI and Non-VSI Groups
UMKC College Students Enrolled in Chemistry 211: Fall 1995 through Winter 1997

Student	VSI Group	Non-VSI Group	p-value
Characteristic	n = 46	n = 718	
Mean ACT Composite Score	20.1	25.1	p < .01 test
Mean Percentile High School Graduation Rank	53.8%	59.8%	p < .01
	n = 46	n = 713	t-test
Percent of Students On Academic Probation	23.9%	12.5%	p < .01
	n = 11	n = 90	chi square
Percent of Students in Good Academic Standing	76.1%	87.5%	p < .01
	n = 35	n = 625	chi square

Distribution of College Majors:	15.2%	28.8%	p < .05
Percent Arts and Sciences	71.7%	63.1%	chi square
Percent Professional School	13.0%	8.6%	
Percent Undeclared Major			
Gender:	45.7%	49.6%	no difference
Percent Male	54.3%	50.4%	chi square
Percent Female			

Discussion of Table 7. An analysis of data on student demographics and previous levels of academic achievement suggest that the VSI participants: had significantly lower standardized college entrance examination scores; significantly lower high school graduation percentile ranks; significantly higher proportion of students on academic probation; and a higher proportion of students with undeclared college majors (a common characteristic of college dropouts).

Table 8. This data study is a composed of combined data from Fall 1995 through Winter 1997 in four academic terms. A comparison is made between students who were enrolled in two sections of a course (VSI and live classroom lectures). Variables that are studied include: final course grades for all students, final course grades of students who were at risk academically based on traditional identification criteria, and reenrollment rates of academic "at risk" students the following academic term (excluding summer term). "At risk" is based on low standardized test scores, low high school rank, placed on academic probation by UMKC, and/or previously dismissed from UMKC due to low academic performance. The type of data in this table suggested use of t-test and chi square.

Table 8
Comparison of Academic Performance Between VSI and Non-VSI Groups
UMKC College Students Enrolled in Chemistry 211: Fall 1995 through Winter 1997

Performance Variable	VSI Group	Non-VSI Group	p-value
Studied	n = 46	n = 718	
Mean Final Course Grade	2.88	2.38	p < 0.05 t-test
Reenrollment the Following Academic Semester for All Students	78.6%	84.5%	n.s. chi square
	n = 36	n = 607	
Percent A & B Final Course Grades	65.2%	41.4%	p < .01 chi-square
Percent C Final Course Grades	19.6%	21.7%	n.s. chi-square
Percent D & F Final Course Grades	6.5%	18.1%	p < .01 chi-square
Percent Course Withdrawals	4.3%	18.5%	p < .01 chi-square
Percent Unsuccessful (D, F & W)	10.8%	36.6%	p < .01 chi-square

Percent on Academic Probation	23.9% n = 11	12.5% n = 90	p < .01 chi-square
Mean Final Course Grade of "At Risk" Students	1.89 n = 11	0.51 n = 90	p < 0.01 t-test
Reenrollment the Following Academic Semester for "At Risk" Students	45.5% n = 5	61.1% n = 55	n.s. chi-square

Discussion of Table 8. An analysis of data on grades and withdrawal rates suggests that the VSI participants: earned significantly higher percentage of A & B final course grades; significantly lower percentage of D & F final course grades and withdrawals; and significantly higher mean final course grades than the students enrolled in the same large live course taught by the same professor. These results were higher than predicted since various predictors (Table 7) had suggested that the VSI students were less prepared academically and would perform at lower levels than the students enrolled in the large lecture class.

Table 9. The data in this table studies the rate of reenrollment for an additional academic term after students were enrolled in Chemistry 211. Summer academic terms are excluded. Four comparison groups are created: All VSI students, all non-VSI students, VSI "at risk" students, and non-VSI "at risk" students. The data is presented for each academic term that the VSI program has been in operation since Fall 1995.

Table 9: Comparison of Student Persistence Between VSI and Non-VSI Groups
UMKC College Students Enrolled in Chemistry 211: Fall 1995 through Winter 1997

Academic Term that the Students Enrolled in Chemistry 211	Group Composition	Number of Students in Group	Percent of Students Who Reenrolled One Academic Term After VSI	Percent of Students Who Reenrolled Two Academic Terms After VSI
Winter 1997	All VSI	10	100.0% (10)	n.a.
	All Non-VSI	73	97.3% (71)	n.a.
	VSI "At Risk"	2	100.0% (2)	n.a.
	Non-VSI "At Risk"	12	100.0% (12)	n.a.
Fall 1996	All VSI	10	80.0% (8)	90.0% (9)
	All Non-VSI	257	85.2% (219)	87.2% (224)
	VSI "At Risk"	3	33.3% (1)	66.7% (2)
	Non-VSI "At Risk"	33	63.6% (21)	69.7% (23)
Winter 1996	All VSI	16	56.3% (9)	56.3% (9)
	All Non-VSI	103	63.1% (65)	59.2% (6)
	VSI "At Risk"	4	0% (0)	0% (0)
	Non-VSI "At Risk"	13	30.8% (4)	30.8% (4)
Fall 1995	All VSI	10	90.0% (9)	50.0% (5)
	All Non-VSI	292	86.0% (251)	73.3% (214)

VSI "At Risk"	2	100.0% (2)	0% (0)
Non-VSI "At Risk"	34	58.8% (20)	41.2% (14)

Discussion of Table 9. This data table provides a breakdown of reenrollment data by individual academic terms for students enrolled in Chemistry 211. While the VSI group was generally less academically prepared than the non-VSI group (Table 7), the VSI group enjoyed equal or higher rates of reenrollment the majority of the time. This is especially revealed when comparing "at risk" students.

Table 10. The data in this table examines dependent variables for each individual academic term that the VSI program has operated since Fall 1995 in Chemistry 211. Variables include: high school percentile rank, final Chemistry 211 grade, and students on academic probation.

**Table 10: Comparison of Academic Performance Between VSI and Non-VSI Groups
UMKC College Students Enrolled in Chemistry 211: Fall 1995 to Winter 1997**

Academic Term	Variable Studied	VSI Group	Non-VSI Group
Winter 1997 VSI=10 Non-VSI=73	Mean Percentile High School Rank	40.2	42.6
	Mean Final Course Grade	3.37	2.43
	Percent A & B Final Course Grades	80.0%	46.5%
	Percent C Final Course Grades	0.0%	30.1%
	Percent D, F & W Final Course Grades	10.0%	21.9%
	Percent On Academic Probation	20.0%	16.4%
	Mean Final Course Grade of "At Risk" Students	3.00	0.72
Fall 1996 VSI=10 Non-VSI=257	Mean Percentile High School Rank	77.8	63.53
	Mean Final Course Grade	2.70	2.54
	Percent A & B Final Course Grades	60.0%	52.5%
	Percent C Final Course Grades	30.0%	18.7%
	Percent D, F & W Final Course Grades	10.0%	28.4%
	Percent on Academic Probation	30.0%	12.8%
	Mean Final Course Grade of "At Risk" Students	2.00	0.34
Winter 1996 VSI=16 Non-VSI=103	Percentile High School Rank	54.3	52.7
	Mean Final Course Grades	2.64	2.28
	Percent A & B Final Course Grades	62.5%	37.9%
	Percent C Final Course Grades	18.8%	26.2%
	Percent D, F & W Final Course Grades	12.5%	35.0%
	Percent on Academic Probation	25.0%	12.6%
	Mean Final Course Grade of "At Risk" Students	1.33	0.80

Fall 1995	High School Percentile Rank	42.9	63.0
	Mean Final Course Grades	3.00	2.23
VSI=10	Percent A & B Final Course Grades	60.0%	32.5%
	Percent C Final Course Grades	30.0%	20.2%
	Percent D, F & W Final Course Grades	47.3%	10.0%
Non-VSI=292	Percent on Academic Probation	20.0%	11.6%
	Mean Final Course Grade of "At Risk" Students	2.00	0.50

Discussion of Table 10. The data from this table reflects the data from the trends revealed in the aggregate study (Table 8). VSI participants earned higher grades and had lower rates of withdrawal than their non-VSI counterparts. This trend is especially pronounced when comparing VSI and non-VSI "at risk" students.

Use of VSI with Rural Missouri High School Students

Problems Facing High School Students

More than 40 percent of graduating high school seniors are seeking higher education at Missouri community colleges. Due to changes in state educational requirements for higher education, many Missouri high school students may now be ineligible to enter state universities. These higher requirements will be especially difficult for rural high schools to meet. Rural superintendents and principals report that they are often unable to offer the following courses: foreign languages, calculus, advanced chemistry, anatomy, and physics. Missouri has 451 high schools that enroll 242,575 students. More than 80 percent of these students attend schools outside the metropolitan areas. Many of these students can only enter UM through the transfer process, primarily community colleges.

VSI as a Solution to the Problem

Using the VSI educational delivery system, dual-credit core curriculum courses can be delivered off-campus through video. These courses, facilitated by high school faculty members, are highly interactive while retaining all of the rigor of the regular campus courses. The VSI methodology has withstood rigorous evaluation in pilot projects in several small rural high schools. Western Civilization to 1600 and more recently Introduction to General Chemistry (both historically difficult courses) can now be offered on video through the VSI methodology. Superintendents, principals, and teachers alike enthusiastically support the continuation and expansion of the VSI delivery system, preferring this medium to live satellite delivery of courses.

As a land-grant institution, UM has a unique role regarding the delivery of quality instruction throughout the state, including rural and under served urban areas. Using the VSI delivery system, dual-credit core curriculum courses can be delivered off-campus to meet a variety of high school, UM and student objectives. Rather than using expensive and inflexible satellite technology, VSI uses low cost, low technology, flexible systems to deliver courses to any location throughout the state and elsewhere as desired.

Benefits to UM include:

- Increase credit hour production for UM through the addition of off-campus sites.
- Increase student recruitment through enrollment in dual-credit courses through high schools in urban and rural areas not served by the present high school/college credit program.
- Augment UM revenues through sale and license of course materials that accompany core curriculum courses (e.g., video tapes, VSI facilitator manuals, student workbooks).
- Opportunity for UM to create intellectual property that can be disseminated
- The off-campus delivery of core curriculum courses allows UM to achieve two goals previously thought to be in conflict: increasing access to the University and maintaining high standards

Delivery of core curriculum courses through VSI to understaffed high schools addresses the following issues:

- Enable high schools to prepare students to meet the new core curriculum requirements.
- Allow schools that are not eligible to participate in the present high school/college credit program to enroll students for UM dual credit opportunities.
- Promote staff development among high school teachers who facilitate VSI.

Study #1: Academic Achievement for Rural Missouri High School Students in History 201.

Since 1993 the VSI program has been used with high school students. In response to requests from public school districts that are members of the Northwest Missouri Consortia for School Improvement, the VSI program started with the following high schools in Fall 1994: Hardin-Central, Northwestern, Stet, and Tina-Avalon. During Fall 1997 VSI classes were being conducted at 28 school districts in Missouri.

Table 11. For the purpose of comparison, data have been included in the following table concerning three student subpopulation groups since the inception of the Rural Missouri History 201 program:

- High school students who enrolled in the VSI History 201 class at their local high school. [High school VSI Students]
- UMKC college students who were enrolled in the VSI History 201 class during the Fall or Winter academic term on the UMKC campus. [UMKC VSI Students]
- UMKC student who were in the regular lecture course, History 201 during the Fall or Winter academic term on the UMKC campus. [UMKC Non-VSI Students]

**Table 11: Comparison of Academic Performance Between VSI and Non-VSI Groups
Rural Missouri High Schools Students Enrolled in History 201: 1994/95 to 1996/97
Cumulative GPA, Mean Final Course Grade & Mean ACT Composite Score**

Group Composition	Academic Year	Number of Students	Mean ACT Composite Score	Mean ACT Percentile Rank Compared to UMKC Profile of Enrolled Students	Mean Cumulative G.P.A. Prior to VSI Enrollment	Mean Final VSI Course Grade
High School VSI Students	1996-97	99	22.5	n.a.	3.5	3.30
	1995-96	30	20.9	n.a.	3.5	3.27

[VSI classes extends over two semesters]	1994-95	33	21.3	n.a.	3.6	3.30
UMKC VSI Students [Includes data from Fall & Winter Classes]	1996-97	22	20.1*	n.a.	n.a.	2.63
	1995-96	35	20.1*	n.a.	n.a.	2.55
	1994-95	19	20.1*	n.a.	n.a.	3.55
UMKC Non-VSI Students [Includes data from Fall & Winter Classes]	1996-97	268	25.1*	n.a.	n.a.	2.35
	1995-96	297	25.1*	n.a.	n.a.	2.47
	1994-95	317	25.1*	n.a.	n.a.	2.48

*Mean score over time period. These data change less than .1 per year according to UMKC Records Management

n.a. = not available

Discussion of Table 11. An analysis of data on grades suggests that the VSI students: earned significantly higher final course grades than UMKC Non-VSI Students who were enrolled in the same large lecture class with the same instructor and tests. The High School VSI Students earned significantly higher final course grades despite that they had significantly lower mean scores on the ACT college entrance examination than the Non-VSI College Students.

Table 12. In addition to analyzing actual academic performance data, students' self-perceptions were also examined. This analysis examines the affective domain impact of the VSI program. All VSI students enrolled in the History 201 course took several pre- and post-tests to measure self-reported changes in study behavior.

Table 12: Comparison of Improvement of Learning and Study Strategies of VSI Group
As Measured by the Learning and Study Strategies Inventory (LASSI)
Rural Missouri High School Students Enrolled in History 201: Fall 1995 through Winter 1997

Learning and Study Strategy n = 88	Mean Scores		p-value
	Pretest	Posttest	t-tests
Attitude and Interest	51.5	49.9	n.s.
Motivation, Diligence, Self-Discipline	65.4	59.5	n.s.
Time Management	56.3	55.9	n.s.
Anxiety and Worry About School Performance	69.5	69.7	n.s.
Concentration and Attention to Academic Tasks	63.0	61.6	n.s.
Information Processing, Acquiring Knowledge & Reasoning	57.2	56.7	n.s.
Selecting Main Idea & Recognizing Important Information	56.2	58.6	n.s.
Use of Support Techniques and Materials	63.9	66.7	n.s.
Self Testing and Reviewing, and Preparing for Classes	53.9	72.2	p < .05
Test Strategies and Preparation for Tests	64.7	62.7	n.s.

Discussion of Table 12. In addition to analyzing actual academic performance data, students' self-perceptions were also examined. This analysis examines the affective domain impact of the VSI program. All VSI students enrolled in the History 201 course took a pre- and post-tests to measure self-reported changes in study behavior. The instruments was the Learning and Study Strategies Inventory (LASSI). An analysis of data from the LASSI found significant positive changes in "self testing and reviewing, and preparing for class." The other areas assessed by the LASSI did not show statistically significant

Study #2: Academic Achievement for Rural Missouri High School Students in Chemistry 211.

Table 13. Beginning in Fall 1994 the VSI class in Chemistry 211 has been offered to an increasing number of rural Missouri public school districts. For the purpose of comparison, data have been included in the following table concerning three student subpopulation groups:

- High school students who enrolled in the VSI Chemistry 211 class at their local high school. [High school VSI Students]
- UMKC college students who were enrolled in the VSI Chemistry 211 class during the Fall or Winter academic term on the UMKC campus. [UMKC VSI Students]
- UMKC student who were in the regular lecture course, Chemistry 211 during the Fall or Winter academic term on the UMKC campus. [UMKC Non-VSI Students]

Table 13
Comparison of Academic Performance Between VSI and Non-VSI Groups
Rural Missouri High Schools Students Enrolled in Chemistry 211: 1996/97
Cumulative GPA, Mean Final Course Grade & Mean ACT Composite Score

Group Composition	Academic Year	Number of Students	Mean ACT Composite Score	Mean ACT Percentile Rank Compared to UMKC Profile of Enrolled Students	Mean Cumulative G.P.A. Prior to VSI Enrollment	Mean Final VSI Course Grade
High School VSI Students [VSI classes extends over two semesters]	1996-97	79	22.5	n.a.	3.5	3.05
UMKC VSI Students [Includes data from Fall & Winter Classes]	1996-97	20	20.1*	n.a.	n.a.	3.00
UMKC Non-VSI Students [Includes data from Fall & Winter Classes]	1996-97	323	25.1*	n.a.	n.a.	2.51

*Mean score over time period. These data change less than .1 per year according to UMKC Records Management

n.a. = not available

Discussion of Table 13. An analysis of data on grades suggests that the VSI students: earned significantly higher final course grades than UMKC Non-VSI Students who were enrolled in the same large lecture class with the same instructor and tests. The High School VSI Students earned significantly higher final course grades despite that they had significantly lower mean scores on the ACT college entrance examination than the Non-VSI College Students.

Discussion and Conclusions

The single most encouraging trend that emerges from the implementation of VSI as an alternative rather than a supplement to instruction is evidence that under prepared, at-risk students can master difficult and rigorous content and develop requisite skills at the same time. The corollaries of that statement are the following:

- Students who cannot effectively read and understand the textbook or listen to and understand a professor's lecture or listen to a lecture and prepare a set of class notes can, nonetheless, learn history, and while doing so, can acquire or strengthen the skills necessary for academic success; and
- Students who cannot write an effective essay answer to an academic question can learn to do so within the context of an academic course of study.

These corollaries lead to the conclusion that students who are under prepared for postsecondary education can simultaneously engage in university study and develop the requisite skills. Of equal importance, perhaps, is the obvious fact that the facilitator manages students' study time. VSI staff conclude that managed study is an essential component of the program, as students who are at-risk need direct support, at least until they are sufficiently practiced in the techniques of study to manage on their own.

The magical ingredient in the process appears to be the technology that manifests in the form of the videocassette and the remote control device. This technology enables the student to alternate between the professor's lecture and the silence in which to consider the meaning. The moments of silence are precious. Silence offers the student a rare commodity in the context of a classroom: time to think. And the reflective time allows the student to form questions, observations, and opinions. Those, then, are shared with fellow students. Confusion is resolved; conflicting views are weighed; differences are explored. Students leave the session with clearly defined questions and a sense of what to do next.

National and International Dissemination of VSI

Through funds raised through hosting VSI training workshops, Center staff have continued to disseminate the VSI model to secondary and postsecondary institutions both in the United States and several countries abroad.

Future Directions for VSI

Based upon requests by high school and University administrators, plans call for the creation of a VSI algebra course in the next twelve months.

Video-Based Supplemental Instruction (VSI) Program
Faculty and Staff from the Following Institutions
Received Training to Implement VSI: January 1990 To November 1995
VSI Adoption Sites By Regions: January 1990 to November 1995

Regions	FY 1990-91	FY 1991-92	FY 1992-93	FY 1993-94	FY 1994-95	FY 1995-96	Grand Total
Eastern U.S.	0	4	3	5	5	1	18

Midwest U.S.	1	4	1	8	16	1	31
Pacific U.S.	0	0	0	3	0		3
South U.S.	3	3	0	1	0		7
West U.S.	0	0	1	1	2		4
Subtotal for U.S.	4	11	5	18	23	2	63
Subtotal Outside of U.S.	0	0	0	6	1	0	7
U.S.+ Outside U.S. Total	4	11	5	24	24	2	70

East=CN, DC, DE, MA, MD, ME, MI, NJ, NY, OH, PA, RI, VT, WV; Midwest=IA, IL, IN, KS, MI, MO, MN, NE, ND, OK, SD, WI;
Pacific=AK, CA, ID, NV, OR, WA; South=AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA; West=AZ, CO, MN, MT, TX, UT, WY

ALABAMA

* University of Alabama, Birmingham, 1991

ARKANSAS

* University of Arkansas College of Medicine, Little Rock, 1991

ARIZONA

Eastern Arizona College, Thatcher, March 1995

CALIFORNIA