

## A WEBCT ENHANCED COURSE FOR HIGH SCHOOL STUDENTS

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### Abstract

WEBCT is used to enhance a remote site college algebra course offered by the Institute for Math Learning at West Virginia University. The course is offered to high school students for dual credit. In the fall 2001 semester, online quizzes and discussion groups were added as components to WvEB Algebra. Pre to post Accuplacer test scores show significant gain. The combined D/F/withdrawal rate for the two semesters that the course was offered during this study was less than 3%. On the final course evaluation, over half of the student participants indicated that the online quizzes helped them learn the course material and approximately 25% of the student participants completing the evaluation reported that component most helping them learn the material of the course was the online quiz.

### Introduction

In 1999, the West Virginia Higher Education Policy Commission (HEPC) invited mathematicians and mathematics educators from its higher education institutions to participate in the design of a mathematics course that would be offered to high school students for early college credit. A primary goal of the HEPC was to increase the college going-rate in West Virginia ( HEPC, 2002). The HEPC also works in collaboration with the West Virginia Department of Education (WVDOE) in efforts to increase the ACT scores for West Virginia students ( WVDOE, 2002). Steering Committee members developed the project by choosing an appropriate course, the objectives, and design for the project. The members of the *WvEB Algebra* Course Design Committee are state leaders in mathematics, mathematics education, and administrative governing bodies. The initial collaborative efforts, first year objectives and preliminary outcomes of the project are found in more detail in *WvEB ALGEBRA: A WEB ENHANCED COLLEGE COURSE for High School* ( Pyzdrowski & Pyzdrowski, 2001).

Although West Virginia students have shown improvement in both the composite ACT and math ACT scores from 2000 to 2001, the West Virginia average math ACT score of 19.1 is still significantly less the National average math ACT score of 20 (HEPC, 2002, and ACT, 2002). These statistics show that our students neither meet the state goal that mathematics performance will equal or exceed national averages nor the United States goal that our students will be first in the world in science and mathematics achievement.(WVDE, 2000). In addition to these findings, in the *Year 2000 High Schools That Work* report, the Southern Regional Education Board found that 52% of West Virginia students reported that they were not taking a mathematics course in their senior year and that 29% indicated that they were never encouraged to take more than the minimum high school mathematics requirement for graduation. Only 84% of the students completed the recommended

curriculum in mathematics, and only 75% completed College Preparatory Algebra I. Therefore, it became a goal of the project to encourage high school students to not only take the recommended mathematics curriculum, but to avoid a senior year void of mathematics.

*The WvEB Algebra project has the following objectives:*

- 1) Make available a college level algebra course for concurrent enrollment, thus helping students remain in a mathematics pathway while in high school, and allowing for a smooth transition into entry level college mathematics.
- 2) Systemically collaborate statewide to improve student mathematics achievement, and the number of high school students taking college courses while in high school.
- 3) Provide professional development in content and pedagogy for high school mathematics teachers.
- 4) Implement a statewide partnership between high school and higher education.
- 5) Engage the support of superintendents, principals, counselors and parents.

*The components of the WvEB Algebra project are:*

- 1) Reading Assignments ( Text Component)
- 2) Lectures ( CD Component)
- 3) Laboratories ( CD Component)
- 4) Homework ( Text Component)
- 5) Homework Quizzes ( Web Component)\*
- 6) Tests ( Given at High School Site)
- 7) Instructor/Facilitator/Student Communication ( Web Component)\*

\*The WEBCT components of the course were offered for the first time in Fall 2001 and Spring 2002 semesters.

#### Method

*WvEB Algebra* is designed to meet the needs of high school students who have completed their secondary mathematics requirements but wish to take further mathematics for college credit. It is designed for the “middle track” student, although those high school students in a higher mathematics track may also be interested in enrolling. It is not the intent for *WvEB Algebra* to replace any of the mathematics courses in the high school curriculum. Instead, it is developed as a mathematics course that a student would take in lieu of a “mathematics void” in a given semester or year. The course is web enhanced and has a university professor instructor of record and a high school mathematics teacher facilitator.

#### *Implementation:*

This research studies only the WvEB algebra course hosted by West Virginia University (WVU). This one semester course was offered through five schools in West Virginia in the academic year 2001-2002. The design is comprised of an electronic course based in part on the College Algebra courses currently offered at three participating state universities. High school teacher facilitators were provided professional development in content and pedagogy. An email list and electronic bulletin board called the teachers lounge were set up to enable facilitators the opportunity to communicate with each other and with the professors of record outside of the development sessions. The support of school administrators, principals, counselors and parents was encouraged by scheduled informational seminars at host sites. These visits were conducted by representatives from the higher education institutions.

### *Participants*

Seventy-four high school students participated in the WvEB Algebra project offered through WVU. All students enrolled in the *WvEB Algebra* course were required to have an overall GPA of 3.0 and a C or better in Algebra I, Algebra II and Geometry. In addition, students enrolled passed a WVU departmental mathematics placement test to determine course eligibility.

### *Instruments*

The *Accuplacer* college level mathematics test was used. It is designed to provide placement, advisement, and guidance information for students entering two- or four-year institutions of higher education. Students were required to take a web version of a 20 item multiple choice test as both a pre test (common placement test) and post test (common final evaluation) in the course. In addition, high school facilitator and student course evaluation forms were given.

### *Treatment*

Each course was conducted over a typical university semester. Beginning and ending dates were adjusted slightly to accommodate school calendars. All students used the same text book, had the same content outline and laboratory activities, and were provided a CD containing video lectures of course material. Multiple choice homework quizzes were given via the internet. Each high school was set up with a discussion group in WEBCT. Each student was asked to take a common placement test during the first week of the course; however, the test was not used to eliminate anyone from the course. After completing the university-of-record final for the course, each student was asked to take a common final test. This test did not influence the final grade of a student. Students worked through the material using the outline provided on the CD to guide their progress. Each student was guided through lessons that included a reading assignment, a video lecture, a homework assignment, and at times a computer laboratory or online quiz. There were 13 laboratory assignments during the semester. Students could read, watch the lectures and do homework or homework quizzes at home or in school. However, the laboratory assignments were done in teams of two or three and in a facilitated school setting. Students were permitted to use notes and books when doing the homework quizzes. Each quiz had 10 questions and almost every question had five versions. Students were permitted to help each other with the individual quizzes; however, the facilitator could not help with quiz questions until the quiz was submitted. The high school facilitator helped with individual homework questions, supplemented the video lectures when necessary, and facilitated laboratory and quiz activities, thus taking on the role of a tutor which is a service offered by university learning centers. Four tests and a comprehensive final were developed by the professors of record. The tests were mostly free response and open ended. All course grading was done by the instructor of record with the exception of the pre *Accuplacer* placement test and the post *Accuplacer* common final. All tests at a site were given at a common time in a supervised setting.

### *Results*

A *t* test was computed to determine whether there was a significant difference between the pre *Accuplacer* placement test and the post *Accuplacer* common final. Of the 74 participants only 67 completed both the pre and posttest. The data concerning the results of the *t* test in Table 1 show that there is a mean difference of -9.37 between the pre and post test. The *t* was significant at the .0007 Level of confidence. The grade distribution for the 74 students enrolled for the *WvEB Algebra* course are found in Table 2. There were 42 A's, 26 B's, 4 C's, 1 D and 1 Withdraw. Table 3 shows the percent of the grade distribution for the course.

Seventy-two students completed the final course evaluation. In the final evaluation, students were asked to circle all of the course components that helped in their understanding of the course material. Fifty-five of the students circled the quizzes. Students were also asked to circle the one component that was most helpful in their understanding of the course material. Twenty six of the students circled the quizzes.

**Table 1 t Test For Pre and Post Accuplacer Scores For WvEB Fall 2001-Spring 2002**

Time of Test	M	SD	t
Pre	47.06	22.48	-3.53 *
Post	56.43	24.78	

\* p< .005

**Table 2 Course Grade Distribution For WvEB Fall 2001 - Spring 2002**

Grade	A	B	C	D	F	W
Number	42	26	4	1		1

**Table 3 Grade Percentages For WvEB Fall 2001 - Spring 2002**

Grade	A	B	C	D	F	W
Percent	57%	35%	5%	1%		1%

### Discussion

There is a significant mean difference between the pre and post test *Accuplacer* scores. This is especially interesting since the posttest common final had no affect on a student's grade and there was no motivation for a student to do well on the test. Because the test was given twice in a four month period, an *Accuplacer* representative was contacted to find the normal gain for that time period. There are no studies documenting expected gains in a four month turn around time, so caution should be used when interpreting the results. Also, the pretest mean of 47.06 and a post tests mean of 56.43 places the students on average between the 20<sup>th</sup> to 50<sup>th</sup> percentile for students taking this test. A score of 63 is needed to place students in the next 50<sup>th</sup> to 80<sup>th</sup> percentile. As a group, the students gained in content knowledge but, they did not change in category according to

Accuplacer (2001). It is hoped that with the implementation of a WvEB Trig course, a year long sequence of courses can influence an even greater gain in content knowledge. It is also believed that because the post Accuplacer test in no way affected students grades, posttest scores did not give a true indication of their exit level of skill.

Of the 74 students enrolled in the course, 42 earned A's, 26 earned B's, 4 earned C's, 1 earned a D and 1 withdrew. The student who withdrew from the course was failing at the time. Although the "middle track" high school student is targeted for the course, many students who enroll have close to a 4.0 overall grade point average as well as much better than a "C" average in mathematics classes. The University requires an overall grade point average of 3.0 for early admittance students. So it is expected that this group of students will perform well.

Students in the *WvEB Algebra* course had less than a 3% D/F/ Withdraw rate. Caution should be taken when looking at this percent. The class size of for WvEB algebra by site is no more than 25 and often much less. The students in the course must have an overall grade point average of 3.0 and a C or better in Algebra I, II and Geometry.

Seventy-two students completed the final course evaluation. Fifty-five of the students indicated that the homework quizzes helped them learn the course content with 26 of the students indicating that it was the component that helped them the most. A more detailed documentation of results with and analysis is underway.

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