The History of ChemExcel
at the University of Kentucky

1995-1997

For its first two years, 1995-96 and 1996-97, ChemExcel was operated on the MathExcel model, pioneered at the University of Kentucky by Professor Mike Freeman. It was supported during this period by NSF Epscor funds. In fall semesters it accompanied CHE 105, General Chemistry I, and in the spring, CHE 107, General Chemistry II. A graduate teaching assistant was in charge of the sessions. The T.A. provided the problem sets and supervised two undergraduate helpers. The students were divided into smaller groups of two or three. They worked on problems together (in two two-hour sessions each week), consulting one another and the leaders when they had problems. The leaders were instructed to answer questions with questions.
They were expected to engage the students in the problem-solving process, and not to solve the problems for them in the manner of traditional teaching assistants.

Success Rate (the percentage of A, B, and C grades) has been used to measure the results. The Success Rate for the ChemExcel group averaged 22.6 percentage points higher than the Success Rate for all of the students in the course during this period (see chart below).

1997-1998

In the summer of 1997, we learned about a group of colleges and universities that had originated what they then called Workshop Chemistry (now, Peer-Led Team-Learning) under a grant from the National Science Foundation. Their workshops involved students working problems in small groups led by undergraduate peer leaders. With the support of the Dean Donald Sands of the College of Arts and Sciences, we began a trial using the workshop format (8 students per group with one undergraduate leader; one two-hour session per week) during the 1997-98 academic year. The success rate differential was 20.8 for these two semesters, an indication that the change from graduate student to undergraduate leaders and from four meeting hours per week to two had no major deleterious effect.

1998-1999

With the encouragement of the original Workshop consortium, a coalition, which included the University of Montana, American University, Clark-Atlanta University and the University of Kentucky, prepared a proposal to NSF. The University of Kentucky, a part of the first Adapt and Adopt group, received $43,000 for two years beginning in the fall of 1998.

For the fall semester of 1998, 92 first-year students were recruited into ChemExcel during their summer advising sessions. They were informed about ChemExcel in an Interest Session during their two days on campus and were interviewed individually following the procedure used in the previous three years. Everyone who wanted to enroll in the program was admitted. Sixty-three of those students continued into the spring semester with CHE 107 and ChemExcel. The average success rate differential for these two semesters was 18.8.

1999-2000

Every student who was enrolled in CHE 105-003 (one of three large lecture sections) during the fall semester of 1999 was

required
to enroll in ChemExcel as well. That lecture section meets twice a week for 75 minutes beginning at 8 a.m. and is usually the last section to be filled; many students donât want an hour and a half lecture at 8 a.m. Students were aware in advance that if they chose that particular lecture section, they also incurred the obligation to enroll in ChemExcel. According to an exit evaluation sheet, many students chose it because they had no other choice, either because the other sections were full or because the rest of their schedule dictated the choice.
In most semesters the Tuesday-Thursday 8 a.m. lecture section earns the lowest grades of all the sections in the course.

The 278 students enrolled in A&S 101 with pass-fail grading were divided into 36 peer-led groups. The leaders had a pre-semester orientation meeting and occasional mid-semester meetings, and sent weekly journals describing their experiences. At the end of the fall semester the success rate for ChemExcel students was only 3.2 percentage points higher than the rest of the class, but 10.5 points above the typical 8 a.m. lecture sections from the past four years. End-of-semester student evaluations of ChemExcel were quite favorable.

Again in the spring semester of 2000, all the students in CHE 107-002 (which met at a more conventional time, MWF at 2 p.m.) were required to enroll in ChemExcel. These 257 students were divided into 35 peer-led groups. Several changes were instituted to improve workshop performance.
The lecturer in CHE 107-002, an effective lecturer and a strong supporter of ChemExcel, visited workshop meetings occasionally, kept the leaders informed about what was covered in lecture, and reviewed many of the problem sets before they were distributed.
The success rate differential at the end of the spring semester rebounded to 22.0, a value typical of previous semesters.

2000-2001

At the end of NSF funding, the College resumed its support, on a smaller scale. During the fall and spring semesters, there were 56 places for students in CHE 105 and 107, and 7 leaders.

2001-2002

Beginning in the fall semester of 2001, the UK Excel programs will be funded by a line item (recurring funding) in the College budget. Initially, at least, 120 students will be accommodated each semester.

Sources of ChemExcel's Success Rate

It is difficult to generate a good control group to use in comparing ChemExcel students with their non-ChemExcel peers. Perhaps the most valid control was set up in 1999-2000, when all the students in one lecture section were required to take ChemExcel, and they were compared with the rest of the class, which did not take ChemExcel. In the fall semester these students performed only a little better than the rest of the class and about 10 points better than a typical lecture section at that time. In the spring semester, a similar group was 22 points better than the rest of the class. Part of the improvement in the spring may be attributable to improved communication with the lecturer and more emphasis on student accountability in class.

Another control comparison occurred in the fall semester of 1996. In that semester the 75 students in one lecture section were required to enroll in a lecture section that had an accompanying traditional recitation attached. Those students met once a week for an hour with a teaching assistant to work problems in the course. Their success rate was 60.9%, compared with 48.1% for the rest of the class (which had no required time in addition to lectures). In the same semester, 24 students chose to enroll in ChemExcel, which at that time met with a teaching assistant and two undergraduate helpers for four hours per week in team problem solving sessions. The success rate for those students was 83.3%.

Over ten semesters the composite ACT scores for ChemExcel students averaged 0.4 points better than the rest of the class, with individual semester averages sometimes above the rest of the class and sometimes below. It would appear that in whatever

native ability the ACT composite score measures the ChemExcel students are about the same as the rest of the class.

The preponderance of evidence indicates that ChemExcel students are not having greater success:

(1) because they are smarter. The ACT comparison supports this conclusion.

(2) because they are initially more motivated to succeed. The two semesters (1999-2000) with large groups of required enrollees indicated otherwise.

(3) solely because they are spending a guaranteed extra two hours of time on task per week. The extra time on task must play a role but we believe that the peer-led team-learning method also plays a significant role in the improved success rate. We draw that conclusion in part from watching the teams in practice. It is clear to an observer that the students are actively engaged in the learning process. Most sessions involve a lively discussion of the problems. We also find that student evaluation of the method has been consistently enthusiastic for over five years.

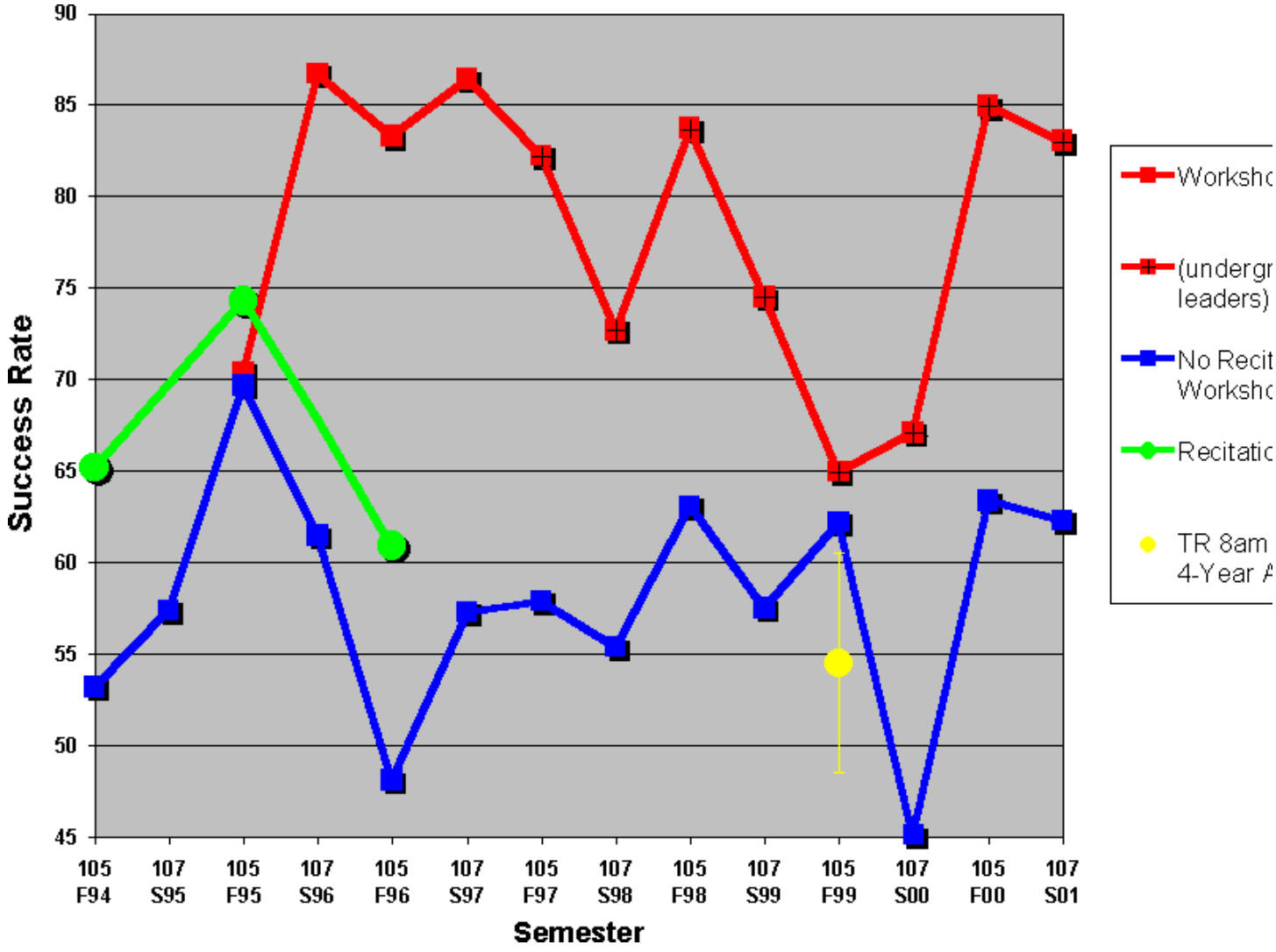
Data Summary

Semester	Course #	Sect. #'s	# Students	Support	Leaders	Enrollment	SR ChemExcel	SR all students	D SR
Fall 95	A&S 100	005	27	Epscor	1 Grad & 2 Undergrad	Optional	70.4	69.7	0.7
Spring 96	A&S 100	007	15	Epscor	1 Grad & 2 Undergrad	Optional	86.7	61.5	25.2
Fall 96	A&S 100	018	24	Epscor	1 Grad & 2 Undergrad	Optional	83.3	48.1	35.2
Spring 97	A&S 101	001	22	Epscor	1 Grad & 2 Undergrad	Optional	86.4	57.3	29.1
Fall 97	A&S 101	001-007	45	A&S	6 Undergrad	Optional	82.2	57.9	24.3
Spring 98	A&S 101	001-007	44	A&S	6 Undergrad	Optional	72.7	55.4	17.3
Fall 98	A&S 101	003-007	92	NSF	12 Undergrad	Optional	83.7	63.1	20.6
Spring 99	A&S 101	001-004	63	NSF	7 Undergrad	Optional	74.5	57.5	17.0
Fall 99	A&S 101	001	278	NSF	36 Undergrad	Required	65.0	62.2*	3.2*
Spring 00	A&S 101	001-012	257	NSF	35 Undergrad	Required	67.1	45.1	22.0
Fall 00	A&S 101	001-003	56	A&S	7 Undergrad	Optional	84.9	63.4	21.5
Spring 01	A&S 101	001-004	56	A&S	7 Undergrad	Optional	83.0	62.3	20.7
Fall 01	A&S 101	001-004	120	A&S	16 Undergrad	Optional			

Success Rate (SR) = 100(number of A+B+C grades)/(number of A+B+C+D+E+W grades)

Delta SR = (SR for ChemExcel students) ö (SR for all students in the class)

* Students in the 8 a.m. lecture section have had an average SR of 54.5 over the past 4 years. If the ChemExcel SR is compared with this value, the difference becomes 10.5.



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