**Bridges Evaluation Report Spring 2015**

During the Spring 2015 semester, four Bridges exercises were included as homework assignments for the students enrolled in ITCS 2214 section 001. We also administered the knowledge tests to measure gains in course material mastered for students enrolled in ITCS 2214 sections 001, 002 and 003. The knowledge tests were administered to the sections during the first and last weeks of the semester. The students in all sections of ITCS 2214 were also asked to take an Attitude toward Computing survey and to self-report their confidence in retention in the major on a 1-5 scale during the first week of the semester. These scales were used again in the survey during the last week of the semester together with a course engagement survey and items that measured the level of experience, and the number of hours required for the course and the homework assignments.

**Comparison of Bridges class to two other sections of ITCS 2214 Pretest data**

The table below shows the mean scores of the students enrolled in section 001 (Bridges section) compared to the other two sections on all of the measures taken during the first week of the semester including their GPA. Although the students in the two groups did not differ on any of the computing attitude subscale scores, or in their confidence about graduating with a computer science major, their were some differences in GPA and knowledge pretest scores. The control group has a slightly higher average GPA but the Bridges group did a little better on average on the knowledge pretest.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | **Measures taken during the first week of Spring 2015 semester** | | | | | | | --- | --- | --- | --- | --- | --- | |  | GROUP | N | Mean | Std. Deviation | t test | | | GPA | BRIDGES | 49 | 2.55627 | .964311 | -2.70, p=.009 | | | CONTROL | 113 | 2.97094 | .722598 |  | | | Confidence in major | BRIDGES | 44 | 4.59 | .622 | <1 | | | CONTROL | 41 | 4.66 | .480 |  | | | Positive CA | BRIDGES | 44 | 39.4091 | 4.08809 | <1 | | | CONTROL | 41 | 39.1220 | 4.97592 |  | | | Negative CA | BRIDGES | 44 | 34.6136 | 4.27114 | <1 | | | CONTROL | 41 | 34.1951 | 4.46777 |  | | | Male/female CA | BRIDGES | 44 | 18.5909 | 2.03822 | <1 | | | CONTROL | 41 | 18.3659 | 3.25389 |  | | | Career CA | BRIDGES | 44 | 18.2955 | 1.92390 | <1 | | | CONTROL | 41 | 18.2195 | 2.20808 |  | | | knowScore | BRIDGES | 38 | 35.5526 | 10.66618 | 2.06, p=.044 | | | CONTROL | 90 | 31.6000 | 7.79340 |  | | |

Notes

Positive CA= Computing Attitude Scale- positive attitude toward computing

Negative CA=Computing Attitude Scale-negative attitude toward computing

Male/female CA=Computing Attitude Scale-attitude toward men and women

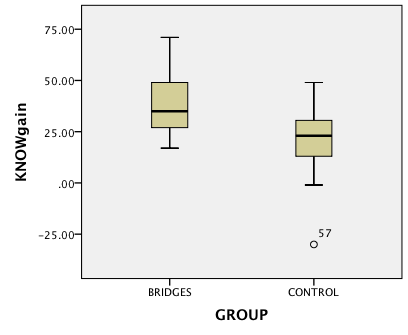
Career CA=Computing Attitude Scale- Career oriented factor.

KnowScore= Score on the Knowledge pretest

| **Measures taken during the last week of the Spring 2015 semester** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  | GROUP | N | Mean | Std. Deviation | t test |
| KnowScore2 | BRIDGES | 29 | 74.4483 |  | 6.95, p <.001 |
| CONTROL | 81 | 53.6790 | 13.81921 |  |
| Confidence | BRIDGES | 28 | 4.46 | .637 | -1.75, p=.087 |
| CONTROL | 60 | 4.70 | .462 |  |
| Age | BRIDGES | 28 | 21.39 | 2.726 | -2.57, p=.012 |
| CONTROL | 61 | 23.46 | 4.829 |  |
| Positive CA | BRIDGES | 28 | 38.6429 | 4.49868 | -1.17, p=.248 |
| CONTROL | 61 | 39.8361 | 4.40523 |  |
| Negative CA | BRIDGES | 28 | 33.9286 | 4.53732 | <1 |
| CONTROL | 61 | 33.2459 | 6.63992 |  |
| Male/female CA | BRIDGES | 28 | 18.7500 | 1.97437 | <1 |
| CONTROL | 61 | 18.7705 | 1.99494 |  |
| Career CA | BRIDGES | 28 | 18.0357 | 1.85557 | <1 |
| CONTROL | 61 | 17.7705 | 2.16328 |  |
| Engage-skills | BRIDGES | 28 | 27.5000 | 5.80230 | -2.89,p=.005 |
| CONTROL | 61 | 31.3770 | 6.00601 |  |
| Engage-emotional | BRIDGES | 28 | 14.9643 | 3.88236 | -3.35, p=.001 |
| CONTROL | 61 | 18.1639 | 4.77905 |  |
| Engage-participation | BRIDGES | 28 | 13.8929 | 4.15745 | -3.13,p=.003 |
| CONTROL | 61 | 17.1148 | 5.19326 |  |
| Engage-performance | BRIDGES | 28 | 8.5000 | 2.76887 | -6.87,p<.001 |
| CONTROL | 61 | 12.5500 | 2.14106 |  |
| GPA2 | BRIDGES | 49 | 2.7188 | .53043 | -3.99,p<.001 |
| CONTROL | 113 | 3.0856 | .55216 |  |
| GradeN | BRIDGES | 49 | 1.1633 | 1.38965 | -9.66, p<.001 |
| CONTROL | 113 | 3.2566 | .92368 |  |
| Assignment | BRIDGES | 28 | 18.0357 | 3.46925 | -3.07,p=.004 |
| CONTROL | 61 | 20.3934 | 3.32304 |  |

The table above compares the two groups (Bridges vs control sections) on the measures taken during the last week of the semester. Although the Bridges group got higher scores on the knowledge test in comparison to the control group at the end of the semester, their average grade was significantly lower than the control group and their GPAs at the end of the semester were lower. By comparison, the control group scored higher than the bridges group on confidence in graduating in the major, opinions about the assignments and on all of the subscales of the course engagement scale. There were no differences in any of the factors associated with computing attitudes.

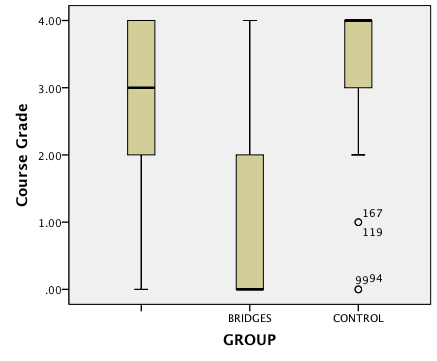
When the pre/post scores were compared across time, there were no significant shifts in the average ratings for confidence in retention in the major, and there were no significant shifts in the subscale scores of the Attitude toward the Computer Science Scale; however, performance on the knowledge test showed significant gains for both of the groups. The box plot below shows the knowledge gains (post knowledge score-pre knowledge score) for both groups. It is apparent that the Bridges group showed larger (*M* = 39.12, *SD* = 14.6) gains than the Control group (*M* = 22. 00, *SD* = 13.28), t (93) = 5.33, p <.001. The differences in knowledge gains for the groups could be explained at least partially by the differences in instructor emphasis on the knowledge tests. The bridges instructor used the knowledge test for the final exam while the other instructor used it as a classroom exercise that did not count toward the final grade.



**Course Grades in ITCS 2214**

Similar to the data reported in the Fall 2014 semester, in spite of showing greater gains in performance on the knowledge test, course grades in the Bridges section were significantly lower than in the other sections of the course. The box plot on the next page compares the Bridges section to the control and online section of the course.

Differences among the 4 sections in the distribution of the final grades are shown in the Table, χ2(18, N=206)=86.95, p < .001. The table below shows that there were 20 withdrawals among the 206 students who were enrolled and 13 students with F grades.



| **SECTION \* Grade Crosstabulation** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | Grade | | | | | | | Total |
| A | B | C | D | F | I | W |
| 001 | Count | 3 | 8 | 9 | 3 | 9 | 0 | 17 | 49 |
| % within SEC | 6.1% | 16.3% | 18.4% | 6.1% | 18.4% | .0% | 34.7% | 100.0% |
| % within Grade | 3.8% | 14.8% | 26.5% | 50.0% | 69.2% | .0% | 85.0% | 23.8% |
| 002 | Count | 29 | 18 | 8 | 1 | 0 | 0 | 0 | 56 |
| % within SEC | 51.8% | 32.1% | 14.3% | 1.8% | .0% | .0% | .0% | 100.0% |
| % within Grade | 37.2% | 33.3% | 23.5% | 16.7% | .0% | .0% | .0% | 27.2% |
| 003 | Count | 29 | 14 | 11 | 1 | 1 | 0 | 1 | 57 |
| % within SEC | 50.9% | 24.6% | 19.3% | 1.8% | 1.8% | .0% | 1.8% | 100.0% |
| % within Grade | 37.2% | 25.9% | 32.4% | 16.7% | 7.7% | .0% | 5.0% | 27.7% |
| 080 | Count | 17 | 14 | 6 | 1 | 3 | 1 | 2 | 44 |
| % within SEC | 38.6% | 31.8% | 13.6% | 2.3% | 6.8% | 2.3% | 4.5% | 100.0% |
| % within Grade | 21.8% | 25.9% | 17.6% | 16.7% | 23.1% | 1.0E2% | 10.0% | 21.4% |
| Total | Count | 78 | 54 | 34 | 6 | 13 | 1 | 20 | 206 |
| % within SECTION | 37.9% | 26.2% | 16.5% | 2.9% | 6.3% | .5% | 9.7% | 100.0% |
|  |  |  |  |  |  |  |  |  |

**Regression analysis with course grade as the outcome measure**.

We tested a number of models to determine which combination of variables accounted for the most variance in course grade. Below is an example of a model that accounted for 54% of variance in two steps. In the first step, 30% of the variance was accounted for by the GPA, confidence in major, and pre knowledge score. When the engagement subscale scores were added, however, that increased significantly.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | **ANOVAc** | | | | | | | | --- | --- | --- | --- | --- | --- | --- | | Model | | Sum of Squares | df | Mean Square | F | Sig. | | 1 | Regression | 25.417 | 3 | 8.472 | 6.329 | .001a | | Residual | 58.896 | 44 | 1.339 |  |  | | Total | 84.313 | 47 |  |  |  | | 2 | Regression | 45.659 | 8 | 5.707 | 5.758 | .000b | | Residual | 38.654 | 39 | .991 |  |  | | Total | 84.313 | 47 |  |  |  | | a. Predictors: (Constant), knowScore, 15, CGPA  b. Predictors: (Constant), knowScore, 15, CGPA, Engage3, 5, Engage4, Engage1, Engage2  c. Dependent Variable: GradeN | | | | | | | |

| **Coefficientsa** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | -1.028 | 1.239 |  | -.830 | .411 |
| CGPA | .776 | .182 | .544 | 4.259 | .000 |
| 15 | .042 | .035 | .152 | 1.197 | .238 |
| knowScore | .013 | .016 | .100 | .777 | .441 |
| 2 | (Constant) | -2.565 | 1.806 |  | -1.421 | .163 |
| CGPA | .472 | .180 | .331 | 2.625 | .012 |
| 15 | .011 | .032 | .039 | .341 | .735 |
| knowScore | .016 | .015 | .127 | 1.077 | .288 |
| 5 | -.032 | .334 | -.012 | -.094 | .925 |
| Engage1 | .062 | .035 | .328 | 1.756 | .087 |
| Engage2 | -.012 | .054 | -.043 | -.219 | .828 |
| Engage3 | .006 | .046 | .022 | .129 | .898 |
| Engage4 | .135 | .057 | .338 | 2.388 | .022 |
| a. Dependent Variable: GradeN | | | | | | |