Learning Communities as a Strategy for Success

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Abstract

This paper reports on the success of students in General Chemistry who were in a Learning Community that focused instruction on both the development of learning process skills and mastery of course content. A quasi-experimental research design was used in this study with an experimental group and two control groups. Students in the Learning Community (the experimental group) did better than those in the control groups on weekly assignments and quizzes. They also achieved higher scores on the examinations than predicted or expected at the beginning of the semester. Factors responsible for this success are identified.

Introduction

The design of curriculum and academic programs usually focuses on the disciplinary content of what should be taught while other issues important for success in courses, college, and careers are overlooked. Such issues include how students learn most effectively, how essential learning process skills can be nurtured, and, for first-year students, how the difficult transition from high school to college can be facilitated. These concerns can be addressed by applying the philosophy of Process Education in the context of a learning community.

Process education is an educational philosophy that integrates several educational theories, methodologies, and tools to support continuous improvement of learning skills and learner self-development. One of the tenets of Process Education is that developing expertise in a discipline not only requires content knowledge but also general learning process skills relevant to all disciplines and to life-long learning (Beyerlein, S., et al 2007).

A *learning community* is a small group of students who take a cluster of courses with both the faculty and students learning and teaching together. The concept of a learning community uses common enrollment in courses to develop mutual interests, experiences, and challenges because students who have these commonalities will engage in learning together and help each other be successful (Gabelnick, F., et al 1990).

Alexander Astin, who is Professor of Higher Education Emeritus and Founding Director of the Higher Education Research Institute at UCLA, spent many years conducting extensive research to identify the factors that influence student growth and development in college. As reported by Astin, "The single most important environmental influence on student development is the peer group. By judicious and imaginative use of peer groups, any college or university can substantially strengthen its impact on student learning and personal development." (Astin, A., 1993) Next to the peer group, Astin found that frequent interaction with faculty is most significant. His findings also support the idea that another crucial factor for success and personal development is the degree to which a student is *actively engaged* in the learning experience.

Centering instruction around a learning community is one way peer groups can be utilized to enhance learning, the learning experience, and personal development. The courses in a learning community cluster usually are linked by a common theme to provide greater coherence, develop a deeper understanding and integration of the material, and encourage student-student, student-faculty, and faculty-faculty interactions in an interdisciplinary teaching/learning process.

The ideas about Process Education and learning communities are not new. They have their foundations in the thinking of Alexander Meiklejohn (Meiklejohn, A., 1932), who envisioned the undergraduate college as a community of students and faculty addressing issues together from interdisciplinary perspectives around a common theme, and John Dewey (Dewey, J., 1933; Dewey, J., 1938), who saw education as a student-centered active-learning process. The term *learning community* was coined by Patrick Hill when he established Stony Brook's Federated Learning Communities in the 1970s (Hill, P.J., 1982).

Instruction in a Learning Community

Stony Brook's new learning communities program, which operated for 10 years from 1998 – 2008 and now has been subsumed by a larger system of undergraduate colleges, consisted of cohorts of 25 students. These cohorts were organized into larger thematic communities, e.g. Communities in Science, Ideas, Technology & Society, Business, Health Science, and American Cultures, among others. A novel feature of Stony Brook's Learning Communities was a four credit Linking Seminar. The Linking Seminar used its own intellectual

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content to make connections among the other courses in the cluster and provide relevant historical, philosophical, or societal contexts. Collaborative research projects and other activities were part of the seminar to help students develop essential learning skills in key areas such as information processing, critical and analytical thinking, problem solving, oral and written communication, teamwork, and metacognition (self-assessment and self-management). The seminar instructor also served as the students' academic advisor, guiding them on their responsibilities, the resources of the university, and the requirements of discipline majors and professional careers. Seminar instructors generally employ a student-centered process-oriented pedagogy, which now is known as POGIL (Process-Oriented Guided-Inquiry Learning) (Hanson, D.M., 2006).

Impact of a Learning Community Environment

This paper reports on the success in General Chemistry of students who were in the Communities in Science. Students in this community registered for General Chemistry, Mathematics, Writing, and the Linking Seminar. In General Chemistry the learning community cohorts were combined with other students in a large enrollment course, and in Mathematics three to five cohorts were combined to fill a larger course. Each cohort, however, had its own Writing section, Linking Seminar, and Chemistry and Mathematics recitation sessions.

While extensive assessments of academic achievement, personal development, and satisfaction were conducted, the most definitive results on student achievement were obtained for General Chemistry. These results, which are reported below, address a research question (*What is the impact of a learning community environment on success in General Chemistry?*) and a working hypothesis (*Students in a learning community environment are more persistent and successful in completing General Chemistry*.).

A quasi-experimental research design was used to answer this question and identify whether the hypothesis is supported or not. An experimental group and two control groups were identified. Students were not randomly assigned to these groups. Group I consisted of students taking Calculus and General Chemistry. Group II consisted of students taking pre-Calculus and General Chemistry, and Group III consisted of students in the science learning community taking Pre-calculus and General Chemistry. There were 581, 226, and 133 students in Groups I, II, and III, respectively. Achievement of each group in General Chemistry was monitored during and at the end of the semester using weekly quizzes and assignments, four course examinations, and the final grade.

The groups were characterized by gender, ethnicity, verbal SAT scores, Stony Brook writing placement scores, Math SAT scores, Stony Brook math placement examination scores, and an 86 item psychological, social, and experiential survey. By all these measures except one, there was no statistical difference between the groups that correlated with academic achievement. The one difference was in the Stony Brook math placement examination score (MPE). In Group I, students had an average MPE score of 3.9 and placed into a Calculus course. In Groups II and III, students had an average MPE score of 2.9 and placed into a pre-Calculus course. Historically, students placing into a Calculus course do much better in General Chemistry than students placing into a pre-Calculus course.

Based on experience documenting the strong correlation between math placement and achievement in General Chemistry, the baseline expectation for each group was established. Groups II and III, which have the same math placement and are not otherwise significantly different, were predicted to achieve at the same level in General Chemistry. Group I with the higher math placement was predicted to do significantly better.

Figure 1 shows the achievement of these three groups on work they did in weekly recitation sessions where students work in teams on process-oriented guided-inquiry activities (Hanson, D.M. and Wolfskill, T, 2000). Since these sessions are intended to provide learning experiences and do not serve to evaluate student performance, they are designed so it is relatively easy for students to attain high scores simply by completing the assignments and reporting on their work. Yet, only 40% of the students in Group I and 30% of the students in Group II managed to score in the range 90 – 100. In contrast, 78% of the students in Group III scored in this range.

Figure 2 shows the achievement of the three groups on weekly quizzes, each of which typically consisted of 10 questions directed at measuring conceptual understanding and the ability to apply this understanding in solving problems. These quizzes, like the recitation sessions, are considered to be learning experiences and do not serve to evaluate student performance. Consequently students have multiple opportunities to submit the correct answer, and most students generally score in the 90 – 100 range. Just as for the recitation sessions, more students in Group III (71%) score in this range than do students in Groups I (58%) and II (53%).

Figure 1 **Student achievement in weekly recitation sessions**
Groups I, II, and III in order from left to right in each cluster

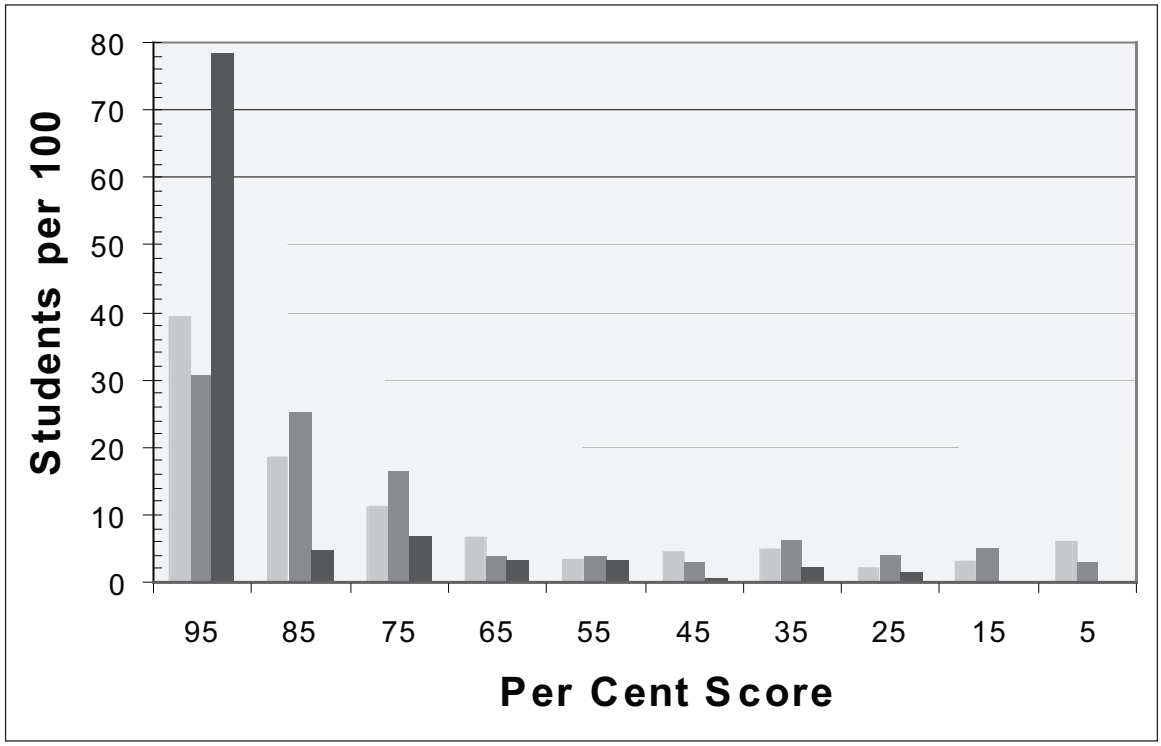


Figure 2 **Student achievement on weekly quizzes**
Groups I, II, and III in order from left to right in each cluster

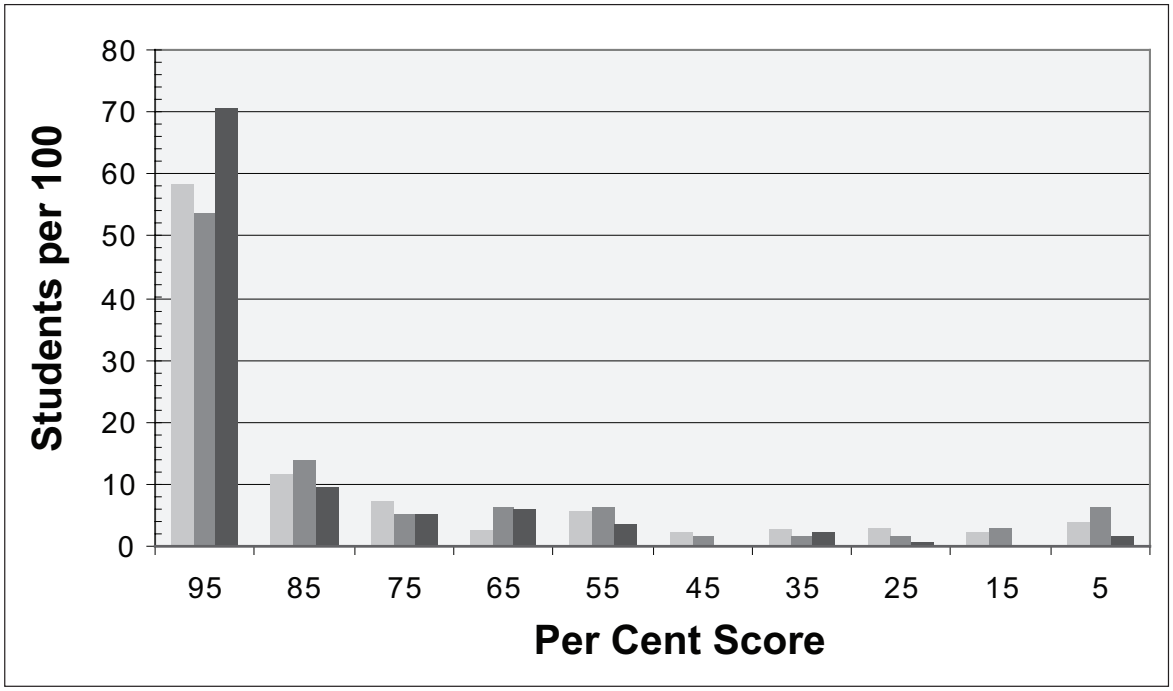


Figure 3 Average scores on weekly assignments (quizzes and recitations, aka workshops) ***Groups I, II, and III in order from left to right in each cluster***

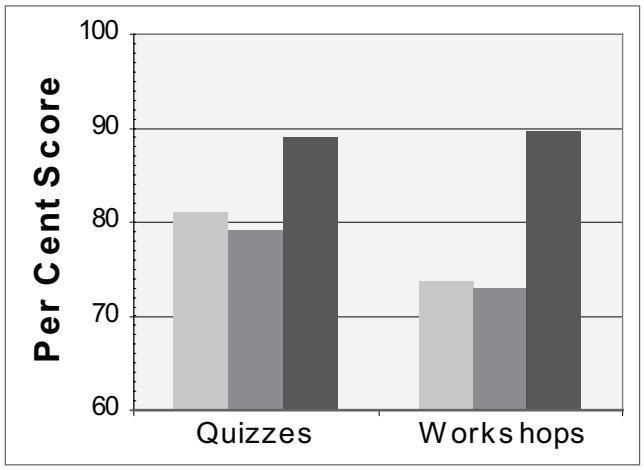


Figure 3 summarizes the performance on these weekly assignments. Students in the learning community (Group III) had an average score in both the quizzes and recitation sessions (aka workshops) of nearly 90%, while students in Groups I and II had average scores of 75 – 80%. Remember, the performance of students in Groups II and III was predicted to be comparable on the basis of Math placement, and students in Group I were predicted to perform at a higher level. Clearly the learning community students (Group III) were most successful in completing the weekly assignments.

Figure 4 tracks the achievement of these groups on the four examinations where the class mean for each exam is normalized to 50 to remove variations due to differences in the examinations. The standard deviation in the mean score for each group is 1 unit on the scale.

As predicted by MPE scores, students in Group I scored significantly higher than students in Group II on the examinations. The noteworthy observation, however, is how the exam performance of students in the learning community (Group III) differs from the performance of the other students both qualitatively and quantitatively.

Figure 4 shows that the gap between Group I and Group III narrows during the course of the semester, while the gap between Group II and Group III widens. Only Group III, the learning community group, ended up doing better at the end of the semester than at the beginning. This variation is attributed to the fact that students in a learning community are more persistent and successful in attaining their goals because they support each other, help each other, and exert peer pressure to do well. In contrast, it appears that students in Group II gave up in preparing for the final exam because they always were at the bottom of the score distribution with diminishing opportunities to recover.

The overall success in General Chemistry, as identified by a course grade of C or higher, is shown in Figure 5. Nearly as many students in Group III (67.6%) were successful as those in Group I (69.1%), while the success rate for students in Group II (49.4%) is significantly lower.

Figure 4 Achievement of Group I (top), Group II (bottom), and Group III (middle) on the four course examinations. The standard deviation in the mean score for each group is 1 unit.

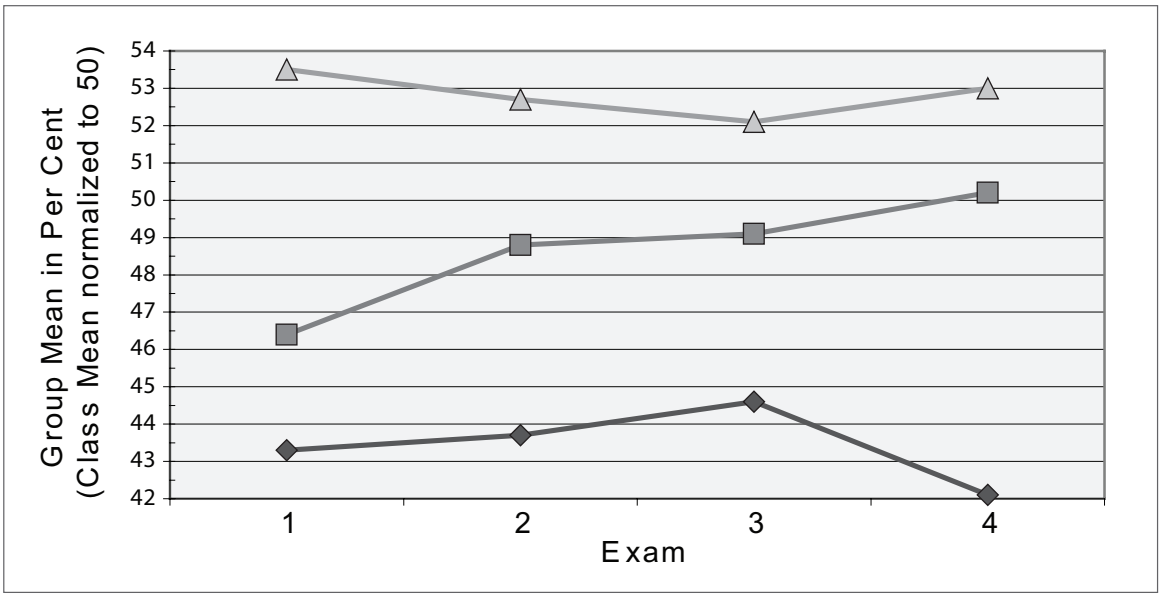
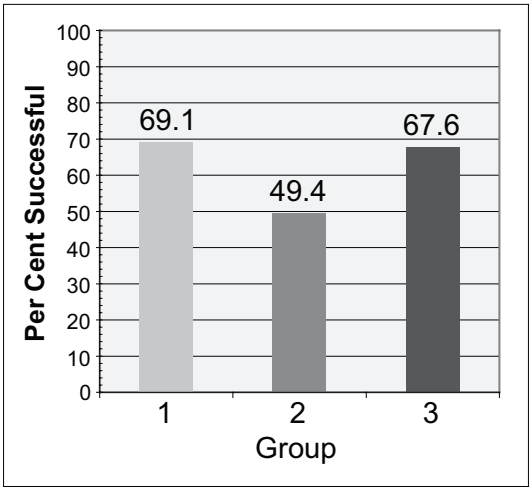


Figure 5 Percent of students in each group who were successful in General Chemistry as measured by attaining a grade of C or higher



The data presented in this paper show that students in the learning community group were more persistent and successful in completing the weekly assignments (recitation sessions and quizzes) than the students in the other two groups and more successful on examinations than expected.

Groups II and III were equivalent by all statistical measures except for the learning community intervention for Group III, and therefore these two groups were predicted to achieve at the same levels. Because of the consistent difference in performance, and the continual improvement of students in Group III over the course of the semester, the positive impact of a learning community environment on success in General Chemistry is demonstrated, and the working hypothesis (*Students in a learning community environment are more persistent and successful in completing General Chemistry*.) is consistent with the data. Learning community students scored higher on the weekly recitation activities and weekly quizzes compared to all other students (persistence), and higher on the four examinations relative to statistically equivalent students in Group II (success).

Conclusions

Four principal factors can be identified for the success of students in a learning community: peer support, peer assessment, group confidence, and the learning environment. Students in a learning community provide each other with encouragement, support, and help. They tend to study more because they study together. They set performance standards for each other and provide each other with constructive assessment and feedback. They quickly develop the confidence to take ownership of their education, identify issues for discussion, and place demands on instructors. The learning environment that they create for themselves is comfortable and secure, incorporates multiple perspectives, promotes extensive discussion outside of class, allows understandings to be shared and refined, and provides opportunities for misconceptions to be confronted.

As a result of these factors, students in a learning community are more persistent and successful in completing their weekly assignments, do better on examinations, and work continually to improve their performance.

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