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About *The Learning Assistance Review*

The Learning Assistance Review is an official publication of the National College Learning Center Association (NCLCA). NCLCA serves faculty, staff, and graduate students in the field of learning assistance at two- and four-year colleges, vocational and technical schools, and universities. All material published by *The Learning Assistance Review* is copyrighted by NCLCA and can be used only upon expressed written permission.

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Letter from the Editor

This issue echoes a metaphorical reality that exists within the discipline of learning assistance: we build scaffolding for support; we toss life-saving buoys to help keep students afloat; we create success plans; and we nurture self-regulated integrated learning experiences. No wonder we are exhausted by the end of the day!

Although learning assistance centers differ widely on the type of services provided, the physical structure of the centers, and whether the center wears an "academic" or "student services" hat, there is one common thread: our unrelenting goal is to help all students succeed (from those students in developmental programs all the way to those students in graduate level programs). We are all busy building, tossing, creating, and nurturing—yet, we still have time to build the discipline, so our successes can be replicated in other institutions. Along that line, please enjoy our submissions for this issue.

The first article, "Impacting Attitudes of ELL Students: Integrated Learning Communities in Introductory Science Courses," by Annia K. Fayon, Emily Groff, and Irene M. Duranczyk reinforces the importance of learning communities to student success. I am personally honored to submit this article because—as I am sure TLAR readers will recognize my predecessors in that author listing—I am humbled to present them again within the covers of this publication.

"A Plan for Academic Success: Helping Dismissed Students Achieve their Goals" brings forth an interesting program whereby some students are offered an opportunity to create a Plan for Academic Success that could reverse academic dismissal. A key component to the plan is that once approved, the plan is entirely student driven—the failure or success lies directly in the students' hands.

The featured article, "Scaffolding and Tutoring Mathematics," in the segment "Join the Conversation: Further Research" is an engaging discussion on how tutors who model the problems can benefit math students. The article sets the stage for future conversations on how scaffolding can work in other disciplines as well.

Finally, the book review of *The Calculus Lifesaver: All the Tools You Need to Excel at Calculus* determines that the text was, indeed, written with "lifesaving" in mind.

On another note, I wish to take a brief moment to thank those readers who responded to my request for submissions. I appreciate the response;

keep up the good work. It is rewarding to find such diverse submissions. I hope you enjoy this issue as much as I have: it "adds" up to quite a treat.

Christine Reichert
Editor

Impacting Attitudes of ELL Students: Integrated Learning Communities in Introductory Science Courses

Annia K. Fayon, Emily Goff, and Irene M. Duranczyk
University of Minnesota

Abstract

In large introductory science courses at the postsecondary level, there is significant anecdotal evidence of traditionally underrepresented students disengaging from the lectures, resulting in withdrawals or failures. Because these science courses often fulfill graduation requirements and provide the students with broad introductions to basic scientific principles, success in these courses is paramount to students' success at the postsecondary level. In this paper, we illustrate how integrated learning communities contribute to the development of positive attitudes and beliefs necessary for the success of ELL students, and suggest strategies for enhancing students' self-regulation.

English Language Learners (ELL) are the fastest growing group of high school graduates in the United States (Short, 2000; Spencer, 2005). Universities have had difficulty engaging all traditionally underrepresented students in the sciences, including ELL students. With the confluence of these trends, we need to continue to develop strategies that will increase the participation of traditionally underrepresented populations in science in order for these students to have equal opportunities to pursue Science, Technology, Engineering, and Math (STEM) degrees and professions. In so doing, these students can succeed and become role models for the next generation of students entering the university and the workforce. This article highlights the benefits of a credit-bearing academic English course paired with an introductory science course in order to support ELL students' affective and cognitive development.

Background

It is well documented that traditionally underrepresented students must overcome both academic and affective barriers to success at the postsecondary level. This is true for all underrepresented students, including recent immigrants and ELL students (Moore & Christensen, 2005; Zamel & Spack, 2004). In an effort to address the academic issues, many institutions require students to take non-credit bearing courses in mathematics, reading,

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and writing to build stronger foundations in these basic skills, particularly for ELL students. The zero-credit course, while sometimes effective in remediating students' academic difficulties, generally does not satisfy requirements for degree completion and can inhibit a student's progress towards successful and timely graduation (Boylan, 2002). With regards to affective barriers, students who are not participating in credit-bearing mainstream courses can face decreased opportunity for social networking and can suffer from decreased family and community support due to their inability to make timely progress toward a degree, which could result in students who do not persist (Boylan 1999, 2002). Providing structures within the context of mainstream, credit-bearing courses is a way for programs to support those students who might struggle with academic issues while also avoiding potential negative impacts on students' affective development and degree progress (Boylan, 2002; Ramirez, 1997).

In an acknowledgement of the effectiveness of this model and in an effort to address students' affective and academic barriers, many colleges and universities have adopted some form of credit-bearing course-based support for students who are struggling or predicted to struggle in science courses; many of these participants are ELL students. These courses can take many forms including Supplemental Instruction (SI), Learning Communities (LCs), and partnerships with learning centers that offer study skills development, among other models. In the University of Minnesota's Department of Postsecondary Teaching and Learning (PsTL), the Commanding English (CE) Program was one such program designed to support recent immigrants and ELL students.

In an effort to provide the contextualized content-based support that has been proven most effective for supporting ELL academic and linguistic abilities (Lantolf & Pavlenko, 1995; McCafferty, 1994), "CE builds language support and academic orientations into an entire credit-bearing first-year curriculum so that students can obtain a more contextualized use and understanding of academic English" (Moore & Christensen, 2005). Unlike some learning support programs for ELL students, CE students enroll in credit-bearing courses all of which meet graduation requirements at the University of Minnesota (Christensen, Fitzpatrick, Murie, & Zhang, 2005). Participants in the CE program are—for the most part—non-white students from South East Asia and Eastern Africa. During the first semester of their freshman year, CE participants enroll in PsTL 1041, "Developing College Reading," a 2-credit course paired in a learning community with a content area course. PsTL 1041 is offered as part of integrated learning communities with a variety of science, social science, and humanities courses. During the fall 2007 semester, a CE course was part of a learning community with PsTL's Introductory Earth Science course (PsTL1171). However, this option was not available to students during the spring 2008 semester so the participants from spring 2008 serve as a control group whose experiences can be compared with the treatment group of fall 2007. In this article, we present data from a self-reported attitudes survey administered during both fall 2007 and spring 2008 that illustrates the benefits of participation in an integrated learning community in the sciences for ELL students.

The STEM Achievement Gap and Learning Communities

The STEM achievement gap between white and non-white students is well documented and is usually first observed early in the elementary school years (Banks, 1997). In Minnesota, TIMSS test scores reveal an increasing gap in the 4th and 8th grades from 1995 to 2007 (Schmidt, 2010). There are many theories as to why the gap exists (Hunter & Bartee, 2003), and it is clear that the gap persists to the postsecondary level (Hill, Holzer & Chen, 2009), where enrollment gaps in STEM between white and non-white students still exists (National Science Foundation, 2009). Furthermore, ELL students are a growing segment of the non-white population in postsecondary education, particularly in Minnesota (Christensen, Fitzpatrick, Murie, & Zhang, 2005). Postsecondary science educators can contribute to closing the gap by employing techniques that encourage students to evaluate their attitudes and beliefs. A significant part of this change involves increasing the students' levels of self-awareness and metacognition, which can only serve to promote the academic success of these students.

There is a long-standing body of research that documents the benefits of learning community models on student success at the postsecondary level (Cargill & Kalikoff, 2007; Kuh, 2009; Lenning & Ebbers, 1999; Tinto, 1998; 2003). Tinto (2003), in his summary of learning communities, gives four overall positive student learning and development outcomes that resulted from the students' participation in learning communities. These students tended to (a) "form their own self-supporting groups which extended beyond the classroom" (p. 5), (b) be more actively engaged in their learning process, (c) enrich each other's learning experience and subsequently perceived themselves as having learned more, and (d) persist. Specifically in the math and sciences, Treisman (1985, 1992) observed significant benefits of collaborative learning for the success of underrepresented populations. His workshop model has been applied in a variety of settings with success (Swarat, Drane, Smith, Light, & Pinto, 2004). The small group cooperative learning model has also been shown to create an environment that promotes the exchange of ideas and allows students to "challenge their own knowledge" (p. 19).

These observed behaviors are similar in nature to those exhibited by students who are self-regulated learners. Self-regulated learners are defined by Zimmerman (1990) as those who "approach educational tasks with confidence, diligence, and resourcefulness" (p. 4). Self-regulated learning requires students to study themselves, thereby increasing their metacognitive level (Glenn, 2010; Zimmerman). Once students have these learning habits, they are more likely to succeed in other courses. In this paper, we present data that documents increasing positive attitudes and confidence towards studying science for ELL students as a result of participation in a learning community that also supports their language learning.

Methodology

A learning attitudes survey was administered to two introductory geoscience courses at the University of Minnesota (UMN) – Twin Cities campus during the academic year 2007-2008. Introductory geoscience courses at UMN fulfill the general liberal education physical science with lab and environmental theme requirements for graduation. GEO1001, "Earth and Its Environments," is a large-lecture course offered through the Department of Geology and Geophysics, with anywhere between 100 to 250 students enrolled per lecture section. Students attend 2.5 hours of lecture and 2 hours of laboratory per week. Generally, the laboratory content is independent of lecture content and students from a particular lecture are not in the same laboratory section. A course that contains the same content and fulfills the same graduation requirements is PsTL1171, "Earth Systems and Environments," offered through PsTL. Enrollments in this course are generally lower (40 to 80 students), and the lecture and laboratory content are more integrated. Overall, enrollments in GEO1001 and PsTL1171 were significantly different; however, the number of traditionally underrepresented students in both classes were similar in the fall 2007 semester ($n_{GEO1001}$ = 28; $n_{PsTL1171}$ = 21). The traditionally underrepresented student population in the control group from spring 2008 PsTL1171 (n = 16) mirrored that of the fall 2007 cohort.

During the fall 2007 term, PsTL1171 was taught as part of a learning community called "The Face of the Earth." Students enrolled in this learning community participated in the partner CE course, PsTL1041, "Reading in the Content Area" that used the content from the earth science course to address the academic and affective needs of ELL students. Students who participated in this learning community were all enrolled in the same laboratory section of PsTL1171.

The CLASS instrument (Adams et al., 2006) was administered to students enrolled in both GEO1001 and PsTL1171 in the fall 2007 and spring 2008 terms to assess student attitudes towards learning in the sciences. This instrument was first designed to measure student attitudes towards learning in physics (Adams et al.), and has since been modified for the Earth sciences. For this study, the items on the original physics CLASS instrument were slightly modified to reflect attitudes towards geology, the Earth sciences, and the physical sciences in general (Figure 1). Some of the statements in this survey have been grouped to represent general areas of attitudes and beliefs (Adams et al. Table 1). The attitudes and beliefs measured also reflect the student's level of self-awareness and self-regulation, in other words the student's metacognitive level. In general, the survey is administered to students at the beginning (PRE) and end (POST) of a semester. Students respond on a 5-point Likert scale in agreement or disagreement with each statement, and responses are then compared to the opinions of science professionals; favorable responses are those that are in agreement with the expert opinions. Because we are primarily interested in the students' final attitudes and beliefs, we analyzed and present here only POST-responses.

Here are a number of statements that may or may not describe your beliefs about learning geology.

Choose one of the five choices that best expresses your feeling about the statement. If you don't understand a statement, leave it blank. If you have no strong opinion, choose C.

A. Strongly Disagree B. Disagree C. Neutral D. Agree E. Strongly Agree

1. A significant problem in learning physical geology, is being able to memorize all the information I need to know.
2. When I am solving a science problem, I try to decide what would be a reasonable answer.
3. I think about geology and the environment in everyday life.
4. It is useful for me to do lots and lots of problems or examples when learning a science.
5. After I study a topic in geology and feel that I understand it, I have difficulty understanding problems or applications on the same topic.
6. Knowledge in geology consists of many disconnected topics.
7. As geologists learn more, most geological principles we use today are likely to be proven wrong.
8. When I solve a geological problem, I locate an equation that uses the variables and plug in the values.
9. I find that reading the text in detail is a good way for me to learn geology.
10. There is usually only one correct approach to solving a geological problem.
11. I am not satisfied until I understand why something works the way it does.
12. I cannot learn geology if the teacher does not explain things well in class.
13. I do not expect equations to help my understanding of the ideas; they are just for doing calculations.
14. I study physical geology to learn knowledge that will be useful in my life outside of school.
15. If I get stuck on a problem on my first try, I usually try to figure out a different way that works.
16. Nearly everyone is capable of understanding science, in particular physical geology, if they work at it.
17. Understanding a scientific concept in physical geology basically means being able to recall something you've read or been shown.
18. There could be two different correct values to a geological problem if I use two different approaches.
19. To understand material from this course, I discuss it with friends and other students.
20. I do not spend more than five minutes stuck on a problem before giving up or seeking help from someone else.
21. If I don't remember a particular concept needed to solve a problem on an exam, there's nothing much I can do (legally!) to come up with it.
22. If I want to apply a method used for solving one geological problem to another, the problems must involve very similar situations.
23. In doing a problem, if my calculation gives a result very different from what I'd expect, I'd trust the calculation rather than going back through the problem.
24. In science, particularly physical geology, it is important for me to make sense out of formulas and concepts before I can use them correctly.
25. I enjoy solving geological problems.
26. In geology, mathematical formulas express meaningful relationships among measurable quantities.
27. It is important for the government to approve new scientific ideas before they can be widely accepted.
28. Learning physical geology changes my ideas about how the world works.
29. To learn geology, I only need to memorize answers to sample problems.
30. Reasoning skills used to understand geology can be helpful to me in my everyday life.
31. We use this statement to discard the survey of people who are not reading the questions. Please select agree (option D) for this question to preserve your answers.
32. Spending a lot of time understanding where geological concepts and formulas come from is a waste of time.
33. I find carefully analyzing only a few geological processes in detail is a good way for me to learn geology.
34. I can usually figure out a way to solve problems in geology and other sciences.
35. The subject of geology has little relation to what I experience in the real world.
36. There are times I solve science problems more than one way to help my understanding.
37. To understand geology, I sometimes think about my personal experiences and relate them to the topic being analyzed.
38. It is possible to explain geological concepts without mathematical formulas/symbols.
39. When I solve a problem in geology, I explicitly think about which geological principles apply to the problem.
40. If I get stuck on a geology problem, there is no chance I'll figure it out on my own.
41. It is possible for geologists to carefully perform the same analysis and get two very different results that are both correct.
42. When studying geology, I relate the important information to what I already know rather than just memorizing it the way it is presented.

Figure 1. CLASS Survey as Modified for Geology.

Table 1

The Original Grouping of CLASS Items

Categories for Grouping Questions	Question Numbers
Personal interest: Feeling a personal interest in / connection to geology	3, 11, 14, 25, 28, 30
Real world connection: Seeing the connection between geology and real life	28, 30, 35, 37
Problem solving general	13, 15, 16, 25, 26, 34, 40, 42
Problem solving confidence	15, 16, 34, 40
Sense making / effort: Exerting the effort needed toward sense-making is worthwhile	11, 23, 24, 32, 36, 39, 42
Applied conceptual understanding: Understanding and applying a conceptual approach and reasoning in problem solving, not memorizing or following problem solving recipes	1, 5, 6, 8, 21, 22, 40
Conceptual understanding: Understanding that geology is coherent and is about making sense, drawing connections, reasoning not memorizing, making sense of geology	1, 5, 6, 13, 21, 32

Results

The data were first analyzed by comparison of the mean post-survey responses for the traditional underrepresented student population as a function of course (GEO1001 and PsTL1171) and academic term (fall 2007 and spring 2008) using SPSS (2007). In this paper, we highlight the statistically significant results from our analyses, and these data are reported in Tables 2-5. Mean responses from the fall 2007 cohort—which was the group that included those students who were enrolled in the integrated learning community—revealed a statistically significant difference, $p<0.05$, in the category of Problem Solving Confidence, with students from PsTL1171 responding more favorably than students in GEO1001. The same analysis of responses for the two introductory geoscience courses in the spring 2008 term did not reveal any statistically significant differences among traditionally underrepresented students.

Based on these results and the categorical nature of the responses, individual student responses were analyzed using a Mann-Whitney test (Tables 2, 3). This test determines differences based on the ranking of individual student responses, not the mean of the group. Effect size (r) for each z-value was also calculated. The following size effect standard was used: r = 0.10, a small effect (accounting for 1% of the total variance), r = 0.30, a medium effect (accounting for 9% of the total variance), and r = 0.50, a large effect (accounting for 25% of the total variance). Results of this analysis again revealed statistically significant differences, $p<0.05$, in the same category, Problem Solving Confidence ($Mdn_{GEO1001}$ = 25, $Mdn_{PsTL1171}$ = 75) for the fall 2007 cohort (Table 3), with students from the learning community responding significantly more favorably, reporting higher problem solving confidence with a moderate effect size (Table 3). Statistically significant differences, $p<0.05$, are also noted for the Real World Connections ($Mdn_{GEO1001}$ = 50, $Mdn_{PsTL1171}$ = 75). The students who

participated in the integrated learning community more often reported seeing the connection between geology and real life than those students who did not participate in the integrated learning community. Differences in Problem Solving, General ($Mdn_{GEO1001}$ = 37.5, $Mdn_{PsTL1171}$ = 62.50) were also noted.

Table 2

Mann-Whitney Test Ranks (2 Independent Samples): Underrepresented Populations in an Introductory Geology With(1171) and Without(1001) Integrated Learning, fall 2007

Ranks				
	Introductory Geology	*n*	Mean Rank	Sum of Ranks
Personal Interest	With Integrated Learning	21	20.60	792.50
	Without Integrated Learning	28	28.30	432.50
	Total	49		
Real World Connections	With Integrated Learning	21	28.95	608.00
	Without Integrated Learning	27	21.04	568.00
	Total	48		
Problem Solving General	With Integrated Learning	21	29.19	613.00
	Without Integrated Learning	27	20.85	563.00
	Total	48		
Problem Solving	With Integrated Learning	21	30.17	633.50
Confidence	Without Integrated Learning	27	20.09	542.50
	Total	48		

Table 3

Mann-Whitney Test Statistics (2 Independent Samples): Underrepresented Populations in an Introductory Geology With(1171) and Without(1001) Integrated Learning, fall 2007

Test Statistics				
	Personal Interest	Real World Connections	Problem Solving General	Problem Solving Confidence
Mann-Whitney U	201.5	190	185	164.5
Wilcoxon W	432.5	568	563	542.5
Z	-2.018	-1.999	-2.063	-2.53
Asymptotic Sig. (2-Tailed)	0.044	0.046	0.039	0.011
r	-0.29	-0.29	-0.30	-0.34

Students from the learning community reported higher problem-solving strategies, as measured in questions 13, 15, 16, 25, 26, 34, 40 and 42 on the survey with a medium effect size (Table 3). With regard to the Personal Interest category, PsTL1171 students reported feeling a personal interest in and connection to geology with a small to moderate effect size (Table 3). The GEO1001 students responded more unfavorably for questions related to this category than those students from PsTL1171 ($Mdn_{GEO1001}$ = 16.67, $Mdn_{PsTL1171}$= 0.00). (Table 3). There were no differences in responses between the underrepresented student populations enrolled in geology coarses without the integrated learning componet (GEO1001 and PsTL1171, spring 2008).

To assess whether or not the differences in post-survey responses were a function of participation in the integrated learning community paired with PsTL1171 and not to the course structure (GEO1001 – large lecture, PsTL1171 – small lecture), post-survey responses from PsTL1171 fall 2007 (small lecture, integrated learning community) were compared to student responses from PsTL1171 spring 2008 (small lecture, however in this case *not* paired with a CE course in an integrated learning community) (Table 4, 5). Both PsTL1171 courses were similar in size and were taught by the same faculty member. This analysis revealed significant differences in more than half of the categories measured on the CLASS survey (Table 5). Students in PsTL1171 fall 2007, the integrated learning community, responded more favorably in all beliefs and attitudes toward learning geosciences when combining all the categories on the survey ($Mdn_{PsTL1171\ fall\ 2007}$ = 60.0, $Mdn_{PsTL1171\ spring\ 2008}$ = 42.31) with a medium to large effect.

Table 4

Mann-Whitney Test Ranks (2 Independent Samples): Underrepresented Populations in PsTL Introductory Geology With (fall 2007) and Without (spring 2008) Integrated Learning

Ranks				
	Introductory Geology	*n*	Mean Rank	Sum of Ranks
All Categories	With Integrated Learning	21	22.76	478.00
	Without Integrated Learning	15	12.53	188.00
	Total	36		
Personal Interest	With Integrated Learning	21	22.38	470.00
	Without Integrated Learning	16	14.56	233.00
	Total	37		
Real World Connections	With Integrated Learning	21	22.50	472.50
	Without Integrated Learning	16	14.41	230.50
	Total	37		
Problem Solving General	With Integrated Learning	21	22.62	475.00
	Without Integrated Learning	16	14.25	228.00
	Total	37		
Problem Solving Confidence	With Integrated Learning	21	22.24	467.00
	Without Integrated Learning	16	14.75	236.00
	Total	37		
Sense Making /Effort	With Integrated Learning	21	23.43	492.00
	Without Integrated Learning	16	13.19	211.00
	Total	37		

Table 5

Mann-Whitney Test Statistics (2 Independent Samples): Underrepresented Populations in PsTL Introductory Geology With (fall 2007) and Without (spring 2008) Integrated Learning

	Test Statistics					
	All Categories	Personal Interest	Real World Connections	Problem Solving General	Problem Solving Confidence	Sense Making / Effort
Mann-Whitney U	68	97	94.5	92	100	75
Wilcoxon W	188	233	230.5	228	236	211
Z	-2.876	-2.219	-2.332	-2.368	-2.155	-2.883
Asymptotic Sig. (2-Tailed)	0.004	0.026	0.02	0.018	0.031	0.004
Exact Sig. [2*1-tailed Sig.)]	0.003*	0.029*	0.023*	0.019*	0.037*	0.004*
r	-0.48	-0.36	-0.38	-0.39	-0.35	-0.47

**Note:* Not Corrected for Ties.

Using the CLASS categories, a significant difference, $p<0.05$, in Personal Interest was indicated, with the fall 2007 cohort having a more positive interest in and connection to geology ($Mdn_{PsTL1171\ fall\ 2007}$ = 66.67, $Mdn_{PsTL1171\ spring\ 2008}$ = 41.67) with a medium effect. This effect size is larger than the effect size for the difference between the large lecture course and the integrated learning course reported previously. The difference between the groups when looking at Real World Connections ($Mdn_{PsTL1171\ fall\ 2007}$ = 75, $Mdn_{PsTL1171\ spring\ 2008}$ = 50) is quite similar in effect size to the Personal Interest grouping. The integrated learning section espouses more connections between their lives and geology concepts and ideas. Problem Solving General ($Mdn_{PsTL1171\ fall\ 2007}$ = 62.50, $Mdn_{PsTL1171\ spring\ 2008}$ = 43.75) and Problem Solving Confidence ($Mdn_{PsTL1171\ fall\ 2007}$ = 75, $Mdn_{PsTL1171\ spring\ 2008}$ = 50) for the integrated learning community yield a medium effect and indicate that the integrated learning community has students identifying with confidence and useful strategies for problems solving. A new area of differences between the groups is Sense Making/Effort ($Mdn_{PsTL1171\ fall\ 2007}$ = 71.43, $Mdn_{PsTL1171\ spring\ 2008}$ = 42.86). In this category there is a medium to large effect with the integrated learning community participants identifying with more favorable responses. Integrated learning community participants exert the effort needed for and see the value of sense-making.

Discussion

These differences in attitudes and beliefs overwhelmingly illustrate the benefits of participation in an academically integrated learning community for a growing segment of the traditionally underrepresented student population—ELL students. The integrated learning approach is of particular importance for increasing the level of students' self-awareness and self-regulation in learning science, which can subsequently engage students in the sciences and contribute to the academic success of this population (Zimmerman, 1990). Engagement, retention, and success of this student population are particularly critical in the context of the STEM achievement gap.

The results presented here document the benefits of integrated learning for ELL students in the introductory geoscience course. PsTL1171, taught as an integrated learning community, created an environment in which students were supported in their reading of the textbook and encouraged to practice problem solving techniques. The statistically significant difference in Problem Solving Confidence supports this conclusion. Furthermore, students in the integrated learning community were able to identify and relate Earth science concepts to their own lives, supporting the increased level of engagement. However, there were no statistically significant differences in the responses to statements we have identified as relating to self-regulation (statements 2, 10, 12, 17, 18, 19, 20, 29, 38).

Self-regulated learners are defined by Zimmerman (1990) as those who "approach educational tasks with confidence, diligence, and resourcefulness" (p. 4). Self-regulated learning requires students to study themselves, thereby increasing their metacognitive level (Glenn, 2010; Zimmerman). Once students have these learning habits, they are more likely to succeed in other courses. We have evidence that the integrated learning community participants were more engaged and had more confidence in their problem solving, which are necessary but not sufficient components of self-regulation (Schraw & Brooks, 1998). Self-regulation requires confidence, cognition (skills and knowledge of a particular discipline), and metacognition (thinking about one's thinking). A more complete longitudinal survey would be required to assess the level of students' success in subsequent course work.

Implications for Integrated Learning Support

ELL students who participated in the integrated learning community exhibited greater gains in positive attitudes towards learning science, which can potentially increase retention and persistence of this population of students. The integrated learning model exposes students to multiple perspectives of one discipline and encourages them to demonstrate their knowledge in multiple formats. This model also increases students' self-efficacy. Ideally, students will develop the habits of self-regulated learning.

According to Zimmerman (1995), self-regulated learning "involves more than metacognitive knowledge and skill, it involves a sense of personal agency to regulate other sources of personal influence, such as emotional processes, as well as behavioral and social-environmental sources of influence" (p. 218). In this integrated learning community, as with all learning communities, the affective barriers are addressed by promoting a student community. In the CE program students share their experiences in the United States as recent immigrants and ELL students. Overcoming the affective barriers is a clear benefit of these integrated learning communities. However, in the case we present here, an increased level of self-regulation was not observed. Proposed strategies to improve on this aspect are to provide students with structured, guided self-reflection, model the self-monitoring process during problem solving, and set clear goals (Hofer, Yu, & Pintrich, 1998). These strategies can be employed through collaborative teaching among learning assistance professionals and faculty.

Conclusion

While we present the positive effects observed for a general geoscience course, the benefits of integrated learning and the adaptation of self-regulating behaviors go beyond this one discipline. In theory, self-regulation is a transferable skill that will allow students to succeed in any learning endeavor. With increased student success comes increased engagement, which can possibly contribute to reducing the achievement gap in all STEM areas.

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A Plan for Academic Success: Helping Academically Dismissed Students Achieve their Goals

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Abstract

This article describes a unique process which allows a select few students who have been dismissed for academic deficiency the opportunity to create a Plan for Academic Success (Plan), which, if accepted, reverses the academic dismissal for one semester. If the Plan is accepted, the individual student assumes responsibility for taking action to complete the required steps which will ultimately bring the Plan to fruition. The findings based on data from Fall 2002—Fall 2007 indicate that students whose Plans were accepted were academically successful and were retained at a rate consistent with the retention rate of the institution as a whole.

The College of Charleston (College) is a public liberal arts college with an undergraduate enrollment of 10,000 students. The College requires students to maintain minimum scholastic attainment standards in order to avoid being placed on academic probation; failure to meet these standards within 15 credit hours of being placed on academic probation may result in academic dismissal. Oversight of the academic probation process and decisions regarding continued probation or academic dismissal are centralized in the office of Undergraduate Academic Services. Students who have been dismissed for academic deficiency have the opportunity to meet with the director of Undergraduate Academic Services to discuss the circumstances that led to their dismissal. Most students Dismissed for Academic Deficiency (DAD) are required to leave the College for one or more semesters before they can re-apply and be readmitted. However, each semester a small number of students is given the opportunity to write a Plan for Academic Success (Plan), with the possibility of having their dismissal status changed to probation status. The Plan is unique to the College of Charleston, both in terms of its composition and the high level of self-advocacy and responsibility that is placed upon the student. The Plan has proven to be effective in terms of retention and graduation of students.

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Background

At institutions of higher education, there exists simultaneously the need to retain students and the desire to set and maintain high academic standards. For more than thirty years, educators have written about retention and characteristics which may influence student persistence (Attinasi 1989; Cabrera, Stampen, and Hansen 1990; De Los Santos, Montemayor, and Solis 1980; Bean and Metzner 1985; Nora 1987; Olivas 1986; Pascarella and Terenzini 1977, 1991; Stage 1989; Terenzini and Pascarella 1980; Tinto 1975, 1987, 1988). Various models, typically developed to try to better predict indicators of student persistence, focused on factors that influence a student's decision to attend college and, subsequently, his or her choice of college (Carpenter and Fleishman 1987; Chapman 1981; Ekstrom 1985; Hossler, Braxton and Coopersmith 1989; Litten 1982; McDonough 1997; Ortiz 1986; Paulsen 1990; Solomon and Taubman 1973; Stage and Rushin 1993; St. John, Paulsen, and Starkey 1996; Trent and Medsker 1967). Other models, drawing heavily on psychological and sociological theories, have been developed to explain student decisions to continue at the college of their choice after their first year (Bean 1982; Bean and Eaton 2000; Brower 1992; Eaton and Bean 1995; Peterson 1993; Stage 1989). All of these models, however, operate from the assumption that persistence is the choice of the student; none of these theories address the issue of students who are dismissed from the college due to their inability to meet the minimum academic standards of the institution.

Current Method

All colleges and universities set probation standards and hold students accountable for meeting these standards in order to graduate. When students repeatedly fail to meet these standards, they are subject to dismissal from the institution. Some institutions may employ a system by which students whose grades have repeatedly fallen below the minimum probation standards—but who demonstrate that they do have the ability to succeed—are given the opportunity to create a plan for academic success. The student is then held to specific tasks and behaviors enumerated in the plan, which typically include some or all of the following: 1) changing declared major to a program in which the student is more likely to succeed; 2) limiting the number of class hours the student is allowed to take based on the institution's probation policy (if applicable); 3) limiting the number of work hours; 4) using available academic and other support services (Learning Assistance Center, tutors, writing and math labs, etc.); 5) meeting at specified points during the semester with an advisor, dean, or other designated individual; and 6) achieving and maintaining a grade point average specifically calculated for the student based on their current GPA. While plan content varies from one institution to another, one component seems to be consistent among most colleges: the student is closely monitored to ensure that s/he follows the steps of the plan, and is made aware that s/he will be at risk for dismissal if s/he does not attend scheduled meetings, utilize resources, and maintain the specified work and class hours. Often, use of these services is tabulated by computerized tracking software, so reports of attendance can be generated on a regular basis for the supervising individual.

Proposed Method

Herein lies a significant difference between the Plan for Academic Success (Plan) created by the office of Undergraduate Academic Services at the College of Charleston and plans offered by other colleges and universities. Drawing from the work by Bandura (1986, 1997), in which he argues the relationship between self-efficacy (a person's own perception of his or her ability to carry out actions necessary to achieve a certain outcome) and student motivation for success, the College created a plan that requires self–efficacy. Although the College of Charleston's plan does contain similar components to the current method, the distinction is that the student is totally responsible for making the decision whether to follow through and seek the help that is available. Of course, faculty and staff members who are involved in the process may—and certainly do—encourage and support the student and may from time to time suggest s/he utilize services and schedule appointments, but the student's academic fate is not based on participation in these supplemental academic support services; it is solely determined by the final grades, which are posted at the end of the semester. Throughout the process of creating the Plan, the student must learn to take responsibility for his or her actions and must have the drive and the initiative to want to succeed. By the end of the process, the student understands that only s/he can initiate the changes that need to occur to be successful. The College of Charleston has been using a version of this Plan for approximately 15 years, but the current model has only been in place since 2002. This article is the first systematic review to determine the effectiveness of the process.

This paper will review the process by which a few carefully selected students are given the opportunity to write a Plan for Academic Success with the hope of having their dismissal reversed for one semester, thus allowing them the opportunity to show significant improvement in their academic progress. This paper will explain the purpose of the Plan, describe what students are both required to do and encouraged to do when given the opportunity to write a Plan and, finally, show the success of this process on retention and graduation rates for this subset of students.

The Probation/Dismissal Process at the College

At the College of Charleston, individual schools and the deans of the schools are not involved in reviewing students on academic probation to determine whether students will be allowed to continue or be dismissed due to Academic Deficiency (DAD). There is no appeal process for DAD; instead, students who are dismissed are encouraged to schedule an appointment to meet with the Director of Undergraduate Academic Services to discuss their dismissal and to explain why they have had such difficulty.

Students on academic probation are notified of their academic status by an email from the registrar's office at the end of every fall and spring semester and are provided with a number of links to campus resources that may be of help to them. These resources include the Academic Advising and Planning Center, the Center for Student Learning, the Career Center, and the Undergraduate Academic Services Office. It is the responsibility of each student to seek help from these resources and/or other appropriate resources such as the major advisor, the Counseling and Substance Abuse Services Office, or the College's Disability

Services Office to assist as needed. (Information regarding probation standards and guidelines for the College of Charleston is outlined in Figure 1). Once a student is placed on academic probation, s/he is reviewed at the end of every fall and spring semester by the Director of Undergraduate Academic Services; the number dismissed at the end of every fall and spring semester ranged from 79 to 178 from fall 2002 through fall 2007 with an average of 113 students dismissed at the end of the fall and 121 dismissed at the end of the spring semesters. The numbers include students who have been academically dismissed for the first time, the second time, and who were readmitted with a GPA under 2.00 and were under a contract to achieve a specific GPA each semester in order to raise their cumulative GPA to 2.00. On average, approximately two-thirds of the students dismissed at the end of the fall or spring semester schedule appointments with the director of Undergraduate Academic Services to discuss their circumstances.

College of Charleston Probation Procedure

When students receive electronic notification they are on academic warning, academic probation, or that they have been academically dismissed, they are directed to the Undergraduate Academic Services web page which has links to pages regarding Academic Standards and Academic Resources. The Academic Standards provides the information regarding:

- the minimum scholastic standard required to avoid being placed on academic warning or probation;
- general information and requirements for students who have been placed on academic probation;
- academic probation FAQs for students (or parents, advisors, faculty, etc.);
- information about academic dismissal; and
- information about applying for readmission once the dismissal period is over.

The page also provides links so students can get academic help from campus offices, use the GPA calculators to determine the GPA needed to achieve academic good standing, and links to Useful Information regarding the College's Learning Strategies course and general information regarding learning styles.

Figure 1. College of Charleston Probation Details listed as "Academic Standards" on the web page (http://undergrad.cofc.edu/academic-standards/index.php).

The vast majority of the DAD students at the College of Charleston identify their reason(s) for lack of academic success as one or more of the following: not taking school seriously, poor attendance in some/all courses, working too many hours, not taking advantage of available resources, substance use/abuse, immaturity, poor time management, difficulty making the transition from high school to college or from their previous college or university, and personal issues or concerns that distracted them. The Director of Undergraduate Academic Services will not extend the opportunity for those DAD students to use the Plan; however, the director will offer

the opportunity to write a Plan for Academic Success (see Figure 2) for the following category of students. A relatively few students each semester (perhaps 5-15) are on the borderline of possible academic success. Typically the student is capable of academic success but is in the wrong major (and poor grades in the major courses are pulling down the grade point average), or s/he had (and can document) unusual mitigating circumstances that typically affected one or two semesters but resulted in such low grades that s/he may have not been able to recover without assistance. Examples of these include a previously undiagnosed learning disability, serious physical illness, serious victimization and possible subsequent trauma, or significant personal or family problems which have now been resolved but dramatically affected the student's ability to focus on school. As both Astin (1998) and Upcraft (1996) have noted, significant percentages of today's college students have serious personal issues or experience emotional distress which affect their ability to succeed academically.

Plan for Academic Success

1. Your written plan for academic success (word processed in good form with perfect spelling and grammar) is due by _____. You need to do a very good job ("A" work) on this – your academic future depends on this plan being well written, thorough, and reasonable. Failure to meet any of the expectations outlined in this contract will result in a rejection of your plan and your dismissal will stand.
2. See an advisor in the appropriate major and determine appropriate courses for the _____ to meet graduation requirements.
3. Contact CSL (Addlestone Library, 953-5635) immediately. Ask for the "Managing Time and Tasks Packet." Follow the instructions in the packet exactly.
4. After meeting with an advisor in the appropriate major and after meeting with a CSL study skills instructor, you will be required to write a detailed explanation about why you had difficulty and what you are going to do in the future to avoid these problems. List specific things you will do to achieve academic success both overall and in problematic classes. Project how you will spend your time, 24 hours per day, 7 days per week during the semester.
5. Project your transcript for all the classes you propose to take, semester by semester. The GPAs must be accurately computed, as C of C computes them.
6. If a decision for reversal is made, you will be obligated to perform at the agreed upon level or you will be subject to dismissal again.
7. You must include contact information within your plan. You are responsible for picking up the plan once it has been evaluated.
8. Other conditions:

I have read, understand, and agree to the above requirements.

_____@edisto.cofc.edu

Name Date Email

CWID:_____

I agree to consider this student's plan for academic success if all the conditions of the above contract are met by the deadline. If the plan is acceptable, the student's dismissal will be reversed and s/he will be continued on a semester-by-semester basis so long as the student continues to meet the contract.

_____

UAS Director Date

Figure 2. Plan for Academic Success Sample Form

The Plan is designed to accomplish several things, including introducing students to appropriate individuals and offices on campus which can provide needed support and assistance, requiring students to reflect on and explain the reason(s) they have not been academically successful and what they did (or did not do) when they realized they were having academic problems, requiring students to review how they must plan to manage their time, and requiring students to project the courses they hope to take for a specified number of semesters and the grades they believe they will earn so they can see exactly how long it will take to reach academic good standing and the quality of work required to raise their cumulative GPA to the minimum 2.00 required for graduation. After meeting with the director of Undergraduate Academic Services and being given the opportunity to write a Plan, students must then meet with the Study Skills Coordinator in the Center for Student Learning, the academic support center on campus.

When the student makes the appointment to meet with the Study Skills Coordinator, s/he is given a "Managing Time and Tasks" packet. This packet contains a list of available resources on campus, handouts on prioritizing tasks, and a worksheet on time management. The student is instructed to read and complete the packet prior to the initial meeting with the Study Skills Coordinator. Typically, the student has 3-4 weeks to complete the Plan. It is critical that the student understand at the onset the high level of commitment and the significant amount of time that will be required in order to give ample time and attention to each part of the Plan.

As the student writes the Plan, there are several elements that s/he must address, including a self-reflective analysis explaining the recent lack of academic success and what will have to be done differently in order to be successful, a list of specific changes the student plans to make, a semester by semester listing of the courses the student plans to take as well as the grades the student believes s/he will earn, and, with the grades the students projects, an accurate calculation of the GPA so the student can see how long it will take and what grades must be earned to achieve academic good standing. The grades the student projects must be realistic, and the student is required to provide a short but honest rationale for why s/he believes s/he will be able to earn the grades indicated. Finally, the student is required to complete a time management plan indicating exactly how s/he will spend his/her time for an average week. This time management plan must indicate all work and class time, study time, travel time to and from home, school and work, as well as leisure time. The purpose of these tasks is to help the student gain a better understanding of what s/he must do and of the many resources available on campus to assist him/her. The Plan is designed to be a learning experience for the student, and students usually meet two or three times with the Study Skills Coordinator as they work through all that is required. In some instances, additional time may be needed for the student to meet with staff in the Career Center, Counseling Services, or a faculty advisor to discuss an appropriate major, as well as scheduling testing for learning disabilities and to apply for appropriate accommodations.

After meeting with the Study Skills Coordinator (and representatives from other offices, if required), the student completes the Plan and submits it to the Director of Undergraduate Academic Services for consideration. The Plan is evaluated based on how well written it is, whether the student

has complied with the instructions and requirements, whether the Plan the student has submitted appears reasonable, and whether the grades the student projects are realistic given past performance and personal circumstances, such as work and/or family responsibilities. If the Plan is accepted, the Director of Undergraduate Academic Services reverses the academic dismissal, and the student is allowed to enroll in courses for the next semester. Students whose dismissals are reversed are not required to meet with the UAS director nor are they required to meet with the Study Skills Coordinator; students choose whether they will take full advantage of the resources of offices and the assistance provided in various offices. At midterm, the UAS director reviews student midterm grades and contacts students via email to either congratulate them on midterm grades that indicate they will make the grades they projected in the Plan or to remind them of the grades they projected and that, based on their midterm grades, they are at risk of not making the necessary grades. Students are again encouraged to meet with appropriate people and to take advantage of campus resources, but no requirement is placed on them; it is the student's responsibility to meet with the Study Skills Coordinator as needed during the semester as well as take advantage of the academic resources available. At the end of the semester, final grades are reviewed and compared to the grades the student projected s/he would earn. Students who earn their projected grades are retained and are allowed to continue, even if they remain on academic probation. Students who do not earn the grades they projected are subject to academic dismissal.

Data

For this paper data was collected from fall 2002 – fall 2007 and analyzed to see how many students who were given the opportunity to write an Academic Plan for Success did, in fact, succeed. A total of 75 students who were given the opportunity to write a Plan between fall 2002 and fall 2007 wrote Plans which were accepted; as a result, their dismissals were reversed and they were allowed to continue. Of these 75 students, 62 (82.65%) were retained, 12 (16%) were not retained, and one (1.35%) student withdrew from all courses and left the College.

For students whose Plans were approved, retention is defined as meeting their projected GPA for the semester and thus being allowed to continue another semester. Current retention figures at the College for first-time, full-time freshman entering in fall 2008 was 82.9%, thus the retention of students whose Plans were accepted is consistent with the overall retention rate of the institution. Of the 62 students who were retained, 37 (59.67%) subsequently graduated, 10 (16.13%) are making progress toward graduation, and 15 (24.12%) have left the College by their own choice or were dismissed for failure to sustain academic progress.

Discussion

The retention rate for first-time, full time freshmen at the College ranged between 81.2% and 83.5% from fall 2002-2007 (Barclay, Smith & Reichert, 2009). Students who were dismissed and were allowed to write their Plan were retained at a rate comparable with the institution as a whole. These results are testament to the effectiveness of the Plan and to the changes that students chose to make as a result of writing their Plans.

The number of students who are given the opportunity to write an Academic Plan for Success each year is relatively small and represents students whose lack of academic success is based on extenuating circumstances and not just lack of effort. Students who have been dismissed because, by their own admission, they have not applied themselves or may not be mature enough for the freedom and responsibilities of college are not given the opportunity to write a Plan.

The students at the College of Charleston whose Plans are accepted and whose academic dismissals are reversed are generally highly motivated to live up to their promises. The unique element of this is that the responsibility for follow-through is entirely the students; at the end of the semester the decision of whether the student will be retained or not is based on the grades earned, not whether or not the student met with an academic advisor, the Study Skills Coordinator or the UAS director a specified number of times. As Bean and Eaton (2000, p. 52) argue, "Students who are academically at risk and who, despite past difficulties, begin to believe that they can succeed in academic tasks are more likely to invest the emotional energy necessary to achieve academic goals."

The students whose Plans are accepted succeed for a number of reasons. First, while writing the Plan they are given the opportunity to meet with people in appropriate offices and learn of services available to them; many times students report they were not aware of offices and/or services available to help them achieve academic success. Second, students are required to reflect on the reasons why they were not academically successful and identify specific changes they will make to increase the likelihood of academic success. Third, the students are required to assume the responsibility for their choices and their academic success. The students who are committed to being successful are the students who are motivated to take advantage of the resources available to assist them. This is consistent with Bandura's claim that "based on their understanding of what is within the power of human beings to do and based on their own capabilities, people try to generate courses of action to suit given purposes" (1997, p. 3). Bandura's previous research on self-efficacy has shown that when a person believes to have the capability to perform a given task and that the performance will then lead to a positive outcome, the person will be motivated to perform (1986). Finally, the faculty and staff who work with students as they write their indivdual Academic Plan for Success work collaboratively and often share information about individual students who follow through and work with the various offices. This collaboration allows offices to reinforce the importance and value of the many resources available to the students on the campus and is important to student success (Braxton, Sullivan & Johnson, 1997; Pascarella & Terenzini, 1977; Moxley, Najor-Durack & Dumbrigue, 2001).

Implications

At the College of Charleston, those faculty and staff who are involved with students who write Plans are aware of and committed to the amount of time and attention that is often needed by these students, both while they are writing Plans and after their dismissal has been reversed. For example, the Study Skills Coordinator may meet twice a week with a student who is writing a Plan and once a week after the dismissal has been reversed. This would not be possible if the number of students who write Plans was significantly increased. If an institution decides to try adopting a model for a Plan on a larger scale, it may be best to do so as a part of a Learning Strategies or Study Skills course if the institution has such a course that students on academic probation are required to complete.

Further Study

While expanding the program for a larger population of at-risk students (such as students on their first semester of academic probation) is not feasible at this institution, it may be a place for further study. A research question could consider if these students followed the steps of the Plan, accessing academic and other support services and resources, creating a support system of faculty and staff, making an honest assessment regarding their lack of academic progress, would fewer students be dismissed for lack of academic progress in subsequent semesters? Some factors to consider for that option would be that students who are in the first semester of academic probation are not necessarily headed down the path to dismissal. Their lack of success may be linked to emotional, physical, and intellectual maturity, lack of preparedness, overindulgence in the freedom of college life, or any number of other factors. Students may correct these problems after being placed on academic probation or they may choose to leave the institution if they find requirements of the institution do not match their interests or abilities. An additional study could determine if creating an expanded Plan would be beneficial or inefficient.

If an institution considers replicating this Plan on a larger scale, the level of commitment of faculty and staff must be taken into consideration. An institution that wishes to use a version of the Plan for more than a small, carefully selected number of students may need to consider the following:

- What would be the criteria for requiring a student to write a Plan? Will all students on academic probation be given this opportunity or only students who have been on probation for two or more semesters?
- Which on-campus services would be required for a student to use while writing the plan?
- Which, if any, services/resources, and with what degree of frequency, would be either recommended or required for the student to access after the Plan has been accepted?
- Do the offices that would provide these services currently possess the resources (tutoring hours, professional staff hours, etc.) to serve students at the level of frequency recommended/indicated in each student's Plan?

Conclusion

The Plan is well received at the College of Charleston; it not only supports the college's general philosophy that students should not receive an academic "get out of jail free" card but should also be given an opportunity to succeed while keeping the cost containment relevant. Students at the College of Charleston who are given the opportunity to write an Academic Plan for Success and whose Plans are accepted are retained at a rate consistent with the overall retention at the College of Charleston. This model has worked well at the College of Charleston for many years, and we believe it will continue to assist students who were not successful become successful, thus helping them achieve their academic goals.

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JOINING THE CONVERSATION: Scaffolding and Tutoring Mathematics

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Abstract

Tutoring is one of those skills which require the ability to communicate an in-depth understanding of the subject. This article is about scaffolding while tutoring, and the tutoring talents described can be applied across the curriculum. Lev Vygotsky's ideas about communication and education play a key role in the development of scaffolding strategies in tutorial or small group study sessions. These ideas can be used by a tutor/facilitator to help a student learn specific content at the most basic and immediate level of that student's academic need so it can be applied in a much broader context. The point of scaffolding strategy is to help tutors and facilitators engage students in the learning process.

At conferences, one often hears that "conventional wisdom" informs us that tutors should not put a pen or a pencil on a student's work—should not do the work for the student in any way, shape, or form. This wisdom assumes the position that doing the work for a student is not conducive to the development of good learning strategies. In many ways, this is correct. Doing the work for a student will not enhance learning if the work that is done by the tutor is the only work being done. However, if the work completed by the tutor is part of a scaffolding strategy that will engage the student, bring a better understanding of the materials, and lead to the student's ability to independently do the work, then the assistance serves a good purpose, and conventional wisdom is, if not incorrect, then in need of some revision. The key strategy for any assistance a tutor may offer is to keep the student engaged throughout the exercise while gently prodding for possible solutions through dialogue and by provoking problem-solving behaviors.

Background

Scaffolding, a term coined by Jerome Bruner (1960) and described in detail below, is the technique that a tutor/facilitator might use to help a student to learn specific content. Scaffolding is a support strategy—a way to work closely with a student at the level s/he requires for the best possible

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learning outcome. Tutorial scaffolding acts just like the support structures one would see along the side of a building that construction workers use while completing various tasks. Once those tasks are completed, the scaffolding is removed. A tutor may use scaffolding to work with a student on difficult aspects of content materials and then remove that additional support once the student can independently complete the task.

Of course, since there may be the occasional student who attempts to "play" the system and have the tutor do all of his or her work, it is especially important for the tutor to make certain the student does the majority of the work as independently as possible. The decision about who is and who is not trying to play the system rests with the tutor, so it is important that the tutor try to determine what each student understands about the content, what the student can contribute to the process, and how much s/he can accomplish independently. From the tutor's knowledge of the student's current understanding and ability and willingness to actively engage in the learning process, the proper scaffolding can be applied.

The approach to tutoring may vary widely from student to student depending on the level of preparedness, learning style, personality, and any number of other factors. First meetings with students present an opportunity to find out about students' academic support needs by determining their current understanding of the content of the course. Students who need quite a bit of tutorial support are often weak (or entirely lacking) in prerequisite background material and may have problems keeping up with the course material. Other students may require much less from a tutor and will show this by being able to converse freely about major course topics. The amount of scaffolding used during sessions will be determined by what the tutor decides about the student's abilities and current levels of understanding.

Vygotsky

Scaffolding is an outgrowth of Vygotsky's ideas that are of particular interest and value to academic support personnel searching for positive ways to help students learn. While Vygotsky's research focused on the learning and language development of children, certain aspects of his thought can be illuminating and useful in a tutorial setting in order to help adult students learn, as well. Scaffolding is a support strategy that may be employed in collaboration between a tutor and a student at whatever age or grade level that student might be.

Lev Vygotsky, a Russian psychologist and educator, viewed learning as an event where communication is both individual and social. Vygotsky (1929) says that educational development uses "the primary function of speech… communication, [and] social contact" (p. 8-9). The self-centered language children use to learn and share information is social in nature and necessary for transmitting information that raises the individual's ability to actively participate in his or her social environment. It is this ability to move from the egocentric speech where s/he "transfers social, collaborative forms of behavior to the sphere of inner-personal psychic functions" (p. 9) to a more social context that marks the educational development of the individual.

Language and Theory

Communication has an impact on the ability of a student to learn. The terminology or words that are used in all social and educational interactions play an important role in what the individual will accept as real and valid. Language allows humans to construct reality and to describe and define their experience. Language becomes a purposeful series of signs, symbols, numbers, letters, words, art, music, or graphic designs that can transform the merely personal into a social context. With language, people share experiences and go beyond the confines of immediate experience to include reflection about things and events that cannot be seen or felt at a specific moment in time. Without language to define and describe our environment, reality is limited to personal and immediate local experience. Social and cultural consciousness would be limited as would emotional and affective feelings such as empathy.

Vygotsky (1929) looks at a mnemotechnical method of memorizing, explained as "the method of memorizing by means of signs" (p. 1). This technique is used, Vygotsky tells us, by children as they learn language and, later, other social and educational tasks. That is, the signs indicate what has to be learned, and the student discovers how to memorize the connection between the sign and what s/he is expected to learn. As the child matures and begins to understand the social uses of language, s/he "with the help of the indicative function of words [. . .] begins to master his [her] attention, creating new structural centers in the perceived situation" (Vygotsky, 1978, p. 35). This technique may be considered in terms of two facets: natural and cultural mnemonics. The distinction may be described as an applied pedagogical usage of Ivan Pavlov's (Nobel 1904) ideas about association and conditioned reflex:

> The relation between the two forms can be graphically expressed by means of a triangle: in case of natural memorization a direct associative or conditional reflexive connection is set up between two points, A and B. In case of mnemotechnical memorization, utilizing some sign, instead of one associative connection AB, the others are set up AX and BX, which bring us to the same result, but in a roundabout way. Each of these connections AX and BX is the same kind of conditional-reflexive process of connection as AB. (Vygotsky, 1929, p. 5)

The "cultural" aspects of mnemonics in learning are inherent in teaching/learning situations in which the student participates at the direction of others; the "natural" aspects are those learning behaviors which are inherent with each individual. The social and individual are seen in a dynamic and symbiotic relationship during the learning process as the learner uses associations between and among signs to memorize information. The language of mathematics can be seen to fall under this rubric.

The agent that facilitates this memorization and learning may be, for our purposes, the teacher or the tutor. When scaffolding is used, the direct application of information to a given task will begin the associative process by using exactly those collaborative behaviors that seem to have a positive

impact on the child's ability to learn. Valkenburg & Dzubak (2009) point out that linking something new and/or difficult to something already known is intentional or purposeful learning. The collaborative model of scaffolding may offer a comfortable environment for establishing those links.

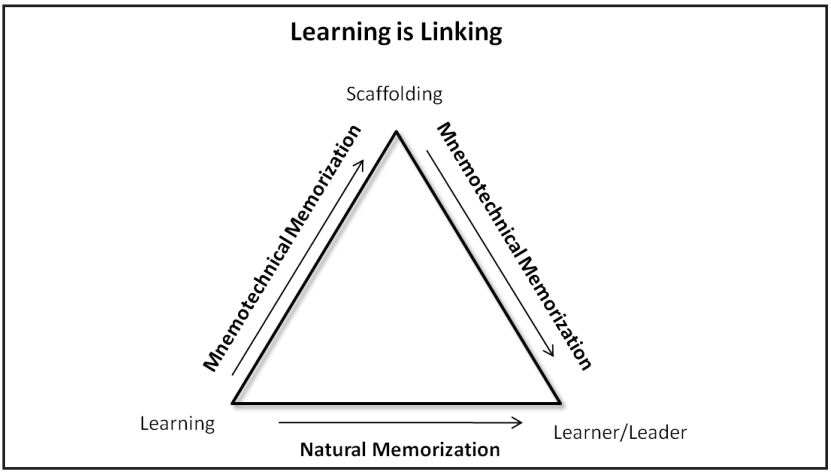

Figure 1. Schematic of Vygotsky's natural and mnemotechnical method of memorizing.

Often, students have difficulty learning the technical jargon for a class. It is very important that they learn such terminology, but it is just as important to remember that many do not arrive in class predisposed to learning that terminology. An association has to be intentionally made. During a tutoring session, whether using scaffolding or not, tutors should translate material into language that students can understand, followed by a restatement of the same material in more technical terms. This technique is relevant to Vygotsky's concept of mnemotechnical learning because understanding the proper terminology will follow the association and connection from the less complex to the more complex. That is one role of the tutor—helping the student move from one level of understanding to the next.

According to Vygotsky (1934a), a child goes through levels of learning or cultural development, starting with internalizing signs from the environment to the application of those signs in given situations. The process is one of change from naive psychology to cultural or mature understanding. In language development, children learn the meanings of words through the continued interaction with the people around them. They go from vague understanding to mastery. Progress from dependent to independent cognitive thought can be seen in this process of language development and in the way children solve problems.

Language, therefore, allows the shift between subjective and objective interaction and thought. It, language, allows one to create new contexts (formats) for a wide variety of things and ideas. This change of format is

important because it implies a change in the cognitive perspective of the individual and is a subtle movement from inner to social or social to inner understanding. Vygotsky described this change in the shift from oral to written narratives:

> Inner speech is condensed, abbreviated speech. Written speech [is] deployed to its fullest extent, more complete than oral speech. Inner speech is almost entirely predicative because the situation, the subject of thought, is always known to the thinker. Written speech, on the contrary, must explain the situation fully in order to be intelligible. The change from maximally compact inner speech to maximally detailed written speech requires what might be called deliberate semantics - deliberate structuring of the web of meaning. (Vygotsky, 1934b, p. 2)

It is the responsibility of the culture and, therefore, the teacher, to find suitable ways to teach. The construction of cultural perspective should be guided by using techniques that will enhance the student's ability to learn. The onus of responsibility for developing a learner-friendly style of pedagogical communication rests, Vygotsky says, squarely with those who would transmit information.

Not all aspects of this particular argument ring true; socio/cultural norms can have a tremendous impact on the ability of a student to learn. The tutor or teacher should bear the responsibility of developing a clear style of presentation and communication. Yet, there should be some personal ownership of the learning process, some responsibility for learning that rests with the individual student. Solon, referred to as the law-giver of ancient Greece, proposed that one must know oneself. In Plato's *Apology*, Socrates offers the idea that "the unexamined life is not worth living" (West, 1979, p. 44). These views are important messages about the responsibilities that each individual has to him/herself and to his or her community.

Other thinkers believe that learning can proceed naturally and without much intervention from learned others—that an open environment where children can learn and grow as naturally as possible. A. S. Neill (1960), author of *Summerhill*, would argue that a student will learn what s/he wishes when it becomes important to her or him. Vygotsky (1929) would argue that anything that someone learns must be actively taught. Either way, it may be true that one can only offer strategies and tools for learning, but it is the student who will determine whether or when to use them.

Vygotsky's ideas about how children learn may be compared with the process of cognitive development advocated by Jean Piaget. According to Vygotsky, learning is a social event. Piaget focused on the individual learner as s/he advanced through the four stages of cognitive development. Learning is a natural aspect of what it means to be human, but there are social aspects of cognitive development as the student moves from egocentricity to cognitive independence: "The student becomes independent upon the successful completion of various learning tasks" (Valkenburg & Dzubak, 2009, p.20). One important aspect of Piaget's theories, however, is that a learner "reaches a plateau where s/he processes . . . new information

and begins to develop a new understanding of the world because of it" (Valkenburg & Dzubak, p.21). This concept of learning plateaus lends credence to Neill's idea that a child will learn when s/he is ready. The concept of learning plateaus also supports the idea of scaffolding for adults because as the student learns new information, s/he still has to incorporate that information into a world view or understanding of how ideas may be linked and synthesized.

Piaget's important work may be the middle ground between Vygotsky and Neill. Children and students do seem to move through stages of cognitive development and to process information at various plateaus of their individual learning that integrates (synthesizes) new material with information they already knew. But Neill's point, that the individual should be responsible for his or her own learning when the time is right for him or her, is also relevant and seems to imply that there should be a social or cultural value placed on learning for the sake of learning—not just to get a job or to get along, but to learn because knowledge has value, that learning is the culmination of knowing oneself and examining what is important and meaningful in one's life. At the same time, Vygotsky's concept of the shared responsibility for learning has merit in that teachers, tutors, and facilitators should be responsible for teaching in a manner that will actively engage the student in the learning process. It seems to be a two-way street. Seen as rigid absolutes, Vygotsky's ideas seem stultifying and limited, the cultural imperatives too narrow, but the synthesis that includes the flexibility of the ideas of Piaget and Neill seems to offer a more positive set of options.

The Zone and Scaffolding

According to Vygotsky, every student has the ability to be a learner and a leader in learning situations. He identified two areas of student learning: the Zone of Actual Development (ZAD) and the Zone of Proximal Development (ZPD). The ZAD is defined as the work a student is capable of doing independently—what materials and content the student can manipulate and use without assistance. The ZPD is defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Morris, 2008, p. 1). In other words, it is that area where the student needs assistance in order to understand and apply content materials.

Vygotsky's idea is that the potential for cognitive development can be attained when children engage in social learning behavior. Transition through the ZPD depends upon full social interaction. The range of skill that can be developed with adult guidance or peer collaboration exceeds what can be attained alone. In this case, the individual and the social aspects of learning may be achieved when scaffolding is appropriately applied.

Jeffery Wilhelm and his associates, Tanya Baker and Julie Dube (2002), offer an overview of techniques that may be used to effectively apply scaffolding techniques while tutoring or teaching. The process can be described "I do; you watch > I do; you help > You do; I help > You do; I watch."

In other words, the tutor solves a problem while explaining each of the steps in the process. Next, the tutor solves a problem while asking the student to explain certain parts that s/he has come to understand; the tutor supplies correct information when the student has difficulty. The third step has the student solving and explaining the process for solving the problem while the tutor offers suggestions if and when the student needs assistance. The finale is reached when the student can independently solve the problem while the tutor sits by and silently watches. The scaffolding is removed as soon as the student is able to proceed independently. The student goes from learner to possible leader. These same scaffolding techniques can reap tremendous benefits in a small group setting.

Practical Applications

Identifying Need and Demonstrating Practice

Some conventional wisdom about tutoring suggests that characterizing subject matter as hard is a negative approach to gaining student engagement in learning. However, anything that a person finds difficult is hard for him or her, by definition. Denying that is counterproductive. However, the difficulty of subject material does not preclude a successful outcome. As a student gains confidence and skill, it can sometimes be amusing to (intentionally) overstate the level of difficulty of the material. One can imagine a somewhat comical debate between the tutor who claims the material is extremely difficult and the student who argues that it is not so hard after all. One key seems to be the supportive dialogue with the student throughout the entire tutorial process.

One excellent teaching/learning strategy can be seen when one tutor asks another for help on a difficult problem. Here, the collaborative team effort will serve as a model that everyone sometimes needs help and that working with others is often productive. Usually, when tutors get together to solve a difficult problem, they will converse throughout the problem solving process. The exposure of students to this dialogue can be instructive and have a positive impact on their desire to learn because they can see the positive effects of collaboration and communication.

Assessing the Student's Work

One cannot assume that a student approaches his or her studies using appropriate or beneficial learning strategies. Examining the student's work will allow the tutor to suggest those learning strategies that may help the student to learn better, thereby reducing some of the stress the student feels and thus allowing an easier path to learning.

It is helpful to observe the quality of work already done by the student when deciding which approach to use in helping the student. It will help the tutor to determine just where to apply the necessary scaffolding.

While discussing this process of assessing a student's abilities, David Witbrodt, a math and science tutor with over fifteen years experience, commented that he automatically attempts to assess the level of

understanding of any new student he works with and attempts to "jump to the level of that [mathematical or scientific] formula that seems most appropriate" (personal communication, March 14, 2010). It is important to note, however, the revealing comment he made immediately thereafter. "I am often wrong in my first approximation, and have to jump backward or forward in response. Indeed, I sometimes find myself jumping backward and forward during a single tutoring session, as the student's skill level varies with varying material." The process is dynamic and changes according to what the student brings with him or her to the table. The tutor has to be astute and flexible enough to move along with the student.

Earlier, the Socratic Method, the technique of asking a string of directive questions during the dialogue with a student, was mentioned. The dialogue is a way to engage the student in the work and to assess the root of the student's immediate academic support needs. Scaffolding is a worthy technique that can complement or be complemented by Socratic dialogue, and together, they can have a positive impact on student success.

Conclusion

A few years ago, the idea of scaffolding was much more difficult to talk about among members of the tutoring profession. Any discussion of putting one's pencil on the paper or of doing problems for students was strictly forbidden. It is still difficult to get faculty members to understand the concept and see the value of using sample problems. The tutor solves the problem in order to demonstrate the proper method to the student. This serves as the foundational learning platform for students. Scaffolding, when used during tutorial sessions and in small groups, is a powerful tool for helping students to actively engage in their work and in promoting self-sufficiency.

Vygotsky suggested that "What the child can do in cooperation today [,] he can do alone tomorrow" (as cited in Wilhelm, 2002, p. 6). He also suggested that "instruction is good only when it proceeds ahead of development. It then awakens and rouses to life those functions which are in a state of maturing, which lie in the zone of proximal development. It is in this way that instruction plays an extremely important role in development" (as cited in Wilhelm, 2002, p. 6). This instruction can be supported by using scaffolding as an approach to support student learning because it reflects good classroom teaching/learning practice of instructors who show sample problems for new content. If instructors fail to show examples, show inadequate examples, or show perfectly adequate examples that the student is simply unable to comprehend during the class period, then using the scaffolding technique can be of great benefit by providing appropriate examples of problem solving techniques.

Scaffolding, then, is essentially a technique a tutor/facilitator might use to enhance his or her ability to determine the level of independence of the student with regard to a specific set of materials and then to move the student toward the ability to work alone. Not every student will go from failing to an A, but the object of our collective endeavors as tutors and facilitators is to help the student to see that s/he can succeed and to offer a number of suggestions about how the student can solve the problem independently—to become, perhaps, better critical and creative thinkers.

As educators, we, too, need to be critical and creative in our approaches to earning and gaining the trust of the students who come to us. We have to question why and how we do the things we do. We have to reassess the methodologies and technologies we use to teach and understand why we use them. Conventional wisdom, tradition, the way tutoring and teaching has always been done, is not an excuse for ignoring beneficial methods for improving the chances for student learning and success.

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Book Review: *The Calculus Lifesaver: All the Tools You Need to Excel at Calculus*

Banner, A. (2007). *The Calculus Lifesaver: All the tools you need to excel at calculus*. Princeton, NJ: Princeton University Press.

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The Calculus Lifesaver: All the Tools You Need to Excel at Calculus by Adrian Banner was, indeed, written with "lifesaving" in mind. As a lecturer at Princeton University, it is clear that Banner understands areas where undergraduate students tend to struggle in single variable calculus. As such, this book was written for those students who need occasional assistance throughout the semester and for those who may not have studied as diligently and need a refresher before an exam.

In his welcome to the reader, Banner specifically cites how a student should use this book to study for an exam. While learning professionals never wish to encourage cramming, we must also recognize that it does indeed happen, despite our best intentions. In addition to providing encouraging study tips, Banner presents two tables of contents: the standard table of contents and a second arranged topically, specifically for assistance in preparing for final exams.

One thing that sets this book apart from the majority of study guides available on the market is the way Banner interacts with students in his book; he writes using vernacular text. The vernacular writing style lends itself well to this newest generation of calculus learners. By writing in a style that is easily understood, he takes some of the mystery out of learning calculus and, instead, frames the subject matter in a way that students can understand, achieving an immediate connection with the reader. While it may not be the most professional of styles, students are more readily able to absorb information from a more informal approach, rather than the stuffy textbook they most likely currently endure in their classrooms.

Limits, for example, can be incredibly tedious to learn and are often a sticking point for beginning calculus students. In chapter three, Banner writes, "It turns out that it's pretty tricky to define a limit properly, but you can get an intuitive understanding of limits even without going into the gory details. This will be enough to tackle differentiation and integration" (p. 41). Banner immediately places students at ease by telling them up front that limits can be difficult, but doable. This is the exact tone needed for teaching calculus that more traditional textbooks are unable to achieve.

The book is arranged like most calculus textbooks, beginning with algebra and trigonometry reviews and transitioning into limits. From there,

Banner eases into differentiation (and all of the nasty examples therein) and finally to integration. One of the strongest points of this text is that it does not expect its readers to go further in engineering, mathematics, or the sciences. While it does contain examples in these fields, it very clearly states in each section the uses (or seeming lack thereof!) of each particular topic.

Mathematical proofs are unfortunately not very exciting to those merely taking calculus to pass a liberal arts requirement or to move on to other application courses. Because of this, the author does not take the time to delve into these within the text itself. For those interested, a forty-six page appendix is available, written in the same easy to understand format. By placing these in a different section of the book, they do not overwhelm students merely hoping to understand for an exam and move on in their educational careers.

Each chapter is arranged in a similar format. First, the overall subject is summarized and a glimpse of the chapter is provided. This allows the reader to know what the key points are and gives a basic look of how they fit together. Each subsection offers intuitive and specific examples, pictures, explanations in English, and explanations in math (with translation).

Banner models the same thinking processes we attempt to instill in the students visiting our math tutorial centers. First, we summarize the information, place it in our own words and draw a graph, picture, or diagram. As we solve the problem, we continue to ask ourselves questions as we go. Does this answer make sense? How else can I write this problem? Why do I care about knowing this? When will I use it again? By consistently modeling this process throughout the text, Banner introduces a problem solving method that will assist the student not only in calculus, but in any future math class.

Although I applaud the book's style and ability to break down complex topics, I do find myself desiring problems—or more exercises—for the reader. While the author explains that the book would become too large, expensive, and unwieldy with additional problems, all educators know that in order to truly learn, a student must practice. This book, instead, is used merely to supplement explanations given in a textbook and is not to be used as a replacement.

As the student gains more familiarity with the topics in question through *The Calculus Lifesaver*, it is imperative that he or she immediately practices those skills; I would recommend that it be kept next to *Schaum's Outlines* or a similar practice problem repository. While there are several examples worked out in detail throughout the book, there are no substitutes for exercises left to the reader. Without that crucial step, the information will not be cemented into memory, and that initial learning process will repeat ad infinitum—to the frustration of the student and the tutor.

I think the average student may also find the book daunting merely because of its size and weight. Realistically, most students who could best benefit from a book in this style are not going to actively search for the resource, but it is a "must have" for a math tutorial center. By making our math tutors familiar with the contents of this book, they will easily be able to point out useful sections to struggling students and then follow up with

more examples and self practice. Not only would this assist our tutors by giving them new tools and tricks, but it would also help students become more self-reliant by making them aware of additional resources within our centers.

Pertinent Publishing Parameters

The Learning Assistance Review (*TLAR*), the national peer reviewed official publication of the National College Learning Center Association (NCLCA), publishes scholarly articles and reviews that address issues of interest to learning center professionals (including administrators, teaching staff, faculty, and tutors) who are interested in improving the learning skills of postsecondary students. Primary consideration will be given to articles about program design and evaluation, classroom-based research, the application of theory and research to practice, innovative teaching and tutoring strategies, student assessment, and other topics that bridge gaps within our diverse profession.

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- Topics: *TLAR* will accept manuscripts that address our purpose: to publish scholarly articles and reviews that address issues on program design and evaluation, classroom-based research, the application of theory and research to practice, innovative teaching and tutoring strategies, student assessment, etc.
- Types: *TLAR* will accept manuscripts for the following four of the article types outlined in the American Psychological Association Manual: empirical study and articles on review, theory, and methodology. Follow 6th edition APA manual (sections 1.01-1.04) for specific requirements and structure for each type; regardless, all manuscripts need a clear focus that draws a correlation between the study, review, theory, or methodology and learning assistance practices.

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- Further Research: Article submissions that have a stated direct link to prior published *TLAR* articles. These articles will be considered following the manuscript submission guidelines.

Book Review
Book review requests should be accompanied with two copies of the book to facilitate the reviewing process. Potential book reviewers are urged to contact the editorial team for details.

Manuscript Guidelines

Manuscripts and reference style must be in accordance with the Publication Manual of the American Psychological Association (6th ed.). Submissions that do not comply with APA style will be returned to the author(s). Manuscripts must be original work and not duplicate previously published works or articles under consideration for publication elsewhere. The body of the manuscript may range in length from 10 to 20 pages, including all references, tables, and figures. Longer articles will be considered if the content warrants it. The authors are responsible for the accuracy of all citations and references and obtaining copyright permissions as needed. The only acknowledgments that will be published will be those required by external funding sources.

Submission Guidelines

Submission packets must include:

- A cover page
- The original manuscript
- A masked manuscript for review
- One hard copy of these materials must be mailed to the address listed below.
- An electronic copy must be submitted to the e-mail address listed below.
- The title page must include the title of the manuscript (not to exceed 12 words); the name(s) and institutional affiliation(s) of all authors.
- The lead author should also provide work and home addresses, telephone numbers, fax, and e-mail information.
- All correspondence will be with the lead author, who is responsible for all communication with any additional author(s).
- The second page should be an abstract of the manuscript, maximum 100 words.
- To start the reviewing process, the lead author will be required to sign certificate of authorship and transfer of copyright agreement. If the manuscript is accepted for publication, all author(s) must sign an authorization agreement.
- Figures and tables must be black and white and according to APA style.

Please send your comments and/or article submissions to: TheLearningAssistanceReview@utoledo.edu with a hard copy to Christine Reichert, M.A., Editor, The Learning Assistance Review (*TLAR*)

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Review Process

Author(s) will receive an e-mail notification of the manuscript receipt. The review process may include a peer-review component, in which up to three members of the *TLAR* editorial board will review the manuscript. Authors may expect the review process to take about three months. Authors may receive one of the following reviewing outcomes:

(a) accept with minor revisions,

(b) revise and resubmit with only editor(s) review,

(c) revise and resubmit for second full editorial board review, and

(d) reject.

As part of the reviewing correspondence, authors will be electronically sent the reviewers' rankings and general comments on one document and all the reviewers' contextual markings on one manuscript. Manuscript author(s) must agree to be responsible for making required revisions and resubmitting the revised manuscript electronically by set deadlines. Manuscript author(s) must abide by editorial revision decisions.

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NCLCA Membership Information

What is NCLCA?

The National College Learning Center Association (NCLCA) is an organization of professionals dedicated to promoting excellence among learning center personnel. The organization began in 1985 as the Midwest College Learning Center Association (MCLCA) and "went national" in 1999, changing the name to the National College Learning Center Association (NCLCA) to better represent its nationwide and Canadian membership. NCLCA welcomes any individual interested in assisting college and university students along the road to academic success.

NCLCA defines a learning center as a place where students can be taught to become more efficient and effective learners. Learning Center services may include tutoring, mentoring, Supplemental Instruction, academic and skill-building labs, computer-aided instruction, success seminars and programs, advising, and more.

Join NCLCA

NCLCA seeks to involve as many learning center professionals as possible in achieving its objectives and meeting our mutual needs. Therefore, the NCLCA Executive Board invites you to become a member of the Association.

The membership year extends from October 1 through September 30. The annual dues are $50.00. We look forward to having you as an active member of our growing organization.

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- A subscription to NCLCA's journal, *The Learning Assistance Review*
- Discounted registration for the Fall Conference and for the Summer Institute
- Regular issues of the NCLCA Newsletter
- Voting privileges
- Opportunities to serve on the Executive Board
- Special Publications such as the Resource Directory and the Learning Center Bibliography
- Opportunities to apply for professional development grants
- Access to Members Only portion of the website
- Announcements of other workshops, in-services, events, and NCLCA activities

Membership Application

On-line membership application or renewal available with PayPal payment option at: http://www.nclca.org/membership.htm. Contact Membership Secretary to request an invoice if needed.

OR

Complete the information below and send with your $50 dues payment to the NCLCA Membership Secretary. Be sure to check whether you are a new member or are renewing your membership. If you are renewing your membership, please provide updated information.

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National College Learning Center Association

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