

Understanding the Peer Assisted Learning Model: *Student Study Groups in Challenging College Courses*

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Abstract

The Peer Assisted Learning (PAL) program at the University of Minnesota is a primary academic support program for historically difficult, introductory college courses that serve as gatekeepers to academic degree programs. Based upon operating principles of other academic support programs and educational theories, PAL is integrated into the courses it serves. The PAL groups review essential course content, model cognitive learning strategies to deepen understanding, and promote metacognitive awareness so students are autonomous learners in courses without academic support services. The PAL approach operates at the confluence of collaborative learning, cooperative learning groups, and learning communities. This article provides a detailed overview of the PAL model, educational theories upon which it is based, and how variations of it are implemented at the institution. Quantitative and qualitative studies reveal academic and personal benefits for participating students and those serving as PAL facilitators. The studies validate the role of PAL with closing the achievement gap between students of different ethnicities and levels of academic preparedness for rigorous college courses in mathematics and science.

Keywords: Peer learning, Learning assistance, Group tutoring, Academic achievement

1. Introduction

The Peer Assisted Learning (PAL) program began during fall 2006 at the University of Minnesota (UMN) for students enrolled in historically difficult college courses due to challenging course material. PAL supports students to meet or exceed academic expectations set by instructors. PAL does not focus on high-risk students, but with difficult lower-division undergraduate courses. These courses share common characteristics: rigorous curriculum, extensive readings, high standards, and often serving as gatekeepers before entering limited-access academic degree programs (Arendale, 2010).

UMN, with 50,000 students, is one of the largest public research-intensive institutions in the U.S. It has a competitive admissions process with median ACT composite score of 28, median SAT composite score of 1,280, and median high school graduation rank percentile of 87th. This environment has influenced the choices made by the PAL program for its operation.

Three nationally implemented approaches to postsecondary peer cooperative learning programs contributed to development of the PAL program at UMN. *Supplemental Instruction* (SI, University of Missouri-Kansas City) operates at more than 2,500 institutions in 50 countries. It influenced the PAL approach through its procedures for conducting study review sessions (Arendale, 1994). The *Emerging Scholars Program* (ESP, University of California Berkeley) was implemented with introductory chemistry and mathematics courses at hundreds of colleges. It influenced PAL through intensive use of problem-solving sessions for courses in STEM majors and mandatory attendance at weekly sessions (Treisman, 1986). The *Peer-led Team Learning Program* (PLTL, City University of New York) is used at hundreds of institutions with introductory science courses (Tien, Roth, & Kampmeier, 2002). It influenced PAL with its practice of embedding study review sessions as part of a companion class. The professional literature of these three programs, along with several other models widely adopted in postsecondary education, includes more than 1,000 citations (Arendale, 2014). Each was studied for best practices that could be applied to our

PAL program. Peer learning program standards developed by a large team of researchers and practitioners were influential in PAL program design (Arendale, 2009).

Another influence on PAL was my personal experience. I served at the University of Missouri-Kansas City (UMKC) for 13 years in the student affairs unit that housed the Center for Supplemental Instruction. I conducted training workshops for faculty and staff from 400 colleges to adopt the SI model in the U.S., Mexico, Sweden, and United Kingdom. I collaborated with others to train educators from other colleges, write training materials, guide dissemination efforts domestically and abroad, and conduct research. Our team worked with colleges to address the inevitable challenges that arise when implementing new programs. We also listened to the voices of students who served as PAL leaders as well as the participating students.

Sometimes, so much effort is spent on building a program and helping others implement it, that planning, innovating, and learning from similar programs fall by the wayside. It was only after I changed positions and relocated to UMN that I deeply examined the wider field of learning assistance and the newer approaches to what I had done for so long. SI has a rich tradition, but so do ESP, PLTL, and others (Arendale, 2014). I learned much from my international colleagues who have implemented similar programs. Two prominent ones are called Peer Assisted Learning (PAL) and Peer Assisted Student Support (PASS). They have been implemented widely in Australia (Worthington, Hansen, Nightingale, & Vine, 1997) and the United Kingdom (Gibbon & Saunders, 1998). The UMN PAL model is built upon past traditions, emerging learning theories, and experimentation on our campus. We owe much to others for what we have developed here.

2. Need for the PAL Program and a New Approach

Academically challenging courses establish the foundation of a college degree, but also can serve as barriers. These courses can challenge first-generation college students who lack family role models to mentor them and share success strategies that helped them achieve a college degree (Pascarella, Pierson, Wolniak, & Terenzini, 2004). Low-income and historically underrepresented students often face similar challenges (Miller, Erisman, Bermeo, & Smith, 2011; Walpole, 2007). These courses often have high rates of final course grades of D, F, or withdrawal. The demoralizing impact of academic failure in a single course can lead students to question their confidence in completing a college degree and choose to drop out (Bailey, Jeng, & Cho, 2010; Blanc, DeBuhr, & Martin, 1983; Rech & Harrington, 2000).

Many older approaches to academic support rely on voluntary attendance. Often, the students who could benefit from the experience chose not to attend (Arendale, 1994). SI research identifies about one-third of students in a class attend SI sessions one or more times, regardless of their placement on standardized college entrance exams (Arendale, 2014; Martin & Arendale, 1997). Research by Blanc et al. (1994) identifies a common reason students avoid voluntary academic support program. It is their fear of stigma for self-selecting a service perceived useful only for academically at-risk students.

In addition to the academic challenges, cultural adjustment to college life are significant (London, 1992; Orbe, 2004). These students described earlier often lack the social capital than students that are more privileged bring to the culture-laden college environment. The transition from high school to college learning environment is startling for most students (Terenzini et al., 1994) and is more severe for students without family members who have experienced the same and navigated it successfully.

Newer models in postsecondary peer cooperative learning – ESP and PLTL – embed learning assistance inside the course content. Attendance is mandatory and seamless. ESP and PLTL sessions are structured to be intentional about skill development and knowledge acquisition. After several years of faculty focus groups and collaborations with various academic department chairs and UMN, I advised a hybrid model that borrowed from many of the programs described thus far to yield the current PAL model. The PAL name was selected since it is a common term used elsewhere in the U.S. and abroad to describe similar programs. It also communicates clearly its purpose to students and faculty members.

3. Theories and Research Guiding the PAL Program

Educational theories guide the organization of the program and the ways assistance is provided. The PAL program is composed of hundreds of activities and choices for the PAL program coordinator and the PAL facilitator. Selection of the educational activity is based on what best fits the needs of the students. Theory must always lead the practice.

3.1 Theories to Organize the PAL Program and Students Served

3.1.1 Universal Design for Learning. Traditional academic support programs identify students who might need help and provide services specifically for them. As previously described, this has not been an effective approach. The PAL program adapts the concept of Universal Design for Learning (UDL) to learning assistance.

In terms of learning, universal design means the design of instructional materials and activities that make the learning goals achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember. Universal design for learning is achieved by means of flexible curricular materials and activities that provide alternatives for students with differing abilities (Burgstahler, 2005, p. 1).

UDL enriches the learning ecosystem to encourage higher academic performance and learning by all students in the classroom. Common elements of UDL include (a) respectful learning environment for students of different abilities and demographics, (b) focus on essential course components and discard of nonessential ones to provide time for engaged learning, (c) clear expectations and feedback to students so they can make changes before formal graded class activities occur, (d) natural learning supports and technologies for all students in the class, (e) multiple teaching strategies to engage different learning preferences of students, (f) multiple ways to demonstrate knowledge, and (g) students and faculty have more interaction with each other during the learning process.

Consider an analogy to health care with treating illnesses related to contaminated water. The traditional *medical model* relieves symptoms and cures the illness individual by individual. The *public health model* instead promotes healthy living for everyone in the community by taking systemic actions, such as treating and making available clean water for everyone and avoiding the illness. Similarly, developers of the SI approach understood focus was needed on historically difficult courses and not predicting which students might be at risk (Blanc et al., 1983). The PAL program is a value-added experience for all students and represents a UDL approach to make the course accessible for all. The problem is not the students, but rather the mismatch between their level of academic preparation and the expectations of the course instructor. This mismatch creates the need for academic support.

3.1.2 Stereotype threat. Stereotypes of culture can have a tremendous negative impact. Claude Steele (1997) named these phenomena *stereotype threat*.

“... [T]hreat that others’ judgments or their own actions will negatively stereotype them in the domain [subpopulations of students at a school]. Research shows that this threat dramatically depresses the standardized test performance of women and African Americans who are in the academic vanguard of their groups...that it causes disidentification with school, and that practices that reduce this threat can reduce these negative effects. (pg. 613)

Steele’s research validated the “...overprediction or underperformance phenomenon...students from one group wind up achieving less--getting lower college grades, for example--than other students with the same beginning [ACT or SAT college admission] scores.” (Steele, 1997, pg. 615). This held true even for students of historically underrepresented college populations (ethnic, gender, etc.) who came from privileged backgrounds that had social capital (high socio-economic status, college educated family members, and a college-prep curriculum in high school).

At the University of California-Berkeley, Uri Treisman developed the *Emerging Scholars Program* (ESP, Treisman, 1986). It was initially designed to support African-Americans pursuing advanced graduate degrees in mathematics. Through careful communications, the participating students perceived ESP as an honors program designed for their academic enhancement. A similar approach was taken by Steele and colleagues at the University of Michigan. They described their approach as a *transitions program* for enhancing the students’ experience in college. In both cases, stereotype threat was minimized, a positive learning environment was provided, and graduation rates for the participants soared. The PAL program employs a similar strategy of promoting itself as an extension of the course; through mandatory participation, all members of the class participate and no one demographic group is targeted.

3.1.3 Stigma and help-seeking. Some students choose not to pursue certain activities due to potential stigma they experience in their eyes and by others. Dovidio, Major, and Crocker (2000) stated that stigma has two parts, “recognition of difference based on some distinguishing characteristic or ‘mark’ and a consequent devaluation of the person” (p. 3). The same behavior in one situation is acceptable, but in another stigma is generated. Stigma “conveys a social identity that is devalued in a particular social context” (Crocker, Major, & Steele, 1998, p. 505). Students cope with their perception of stigma by accepting the validity of stigma or taking action regardless of the negative emotional state. Alternatively, they avoid stigma by not engaging in the behavior that affirms the public and private perception

(Miller & Major, 2000). While students may understand they need academic assistance programs, they reject involvement in voluntary programs regardless of the negative academic consequences.

Dochen, Hodges, and Joy (2001) analyzed research studies concerning help-seeking with application to learning assistance approaches. Stigma is experienced at both spectrums – high and low – of prior academic achievement (Karabenick & Knapp, 1988; Somers, 1988). Rosen (1983) and Freidlander (1980) replicated these findings by identifying that students behaved in a curvilinear manner: higher participation by middle-range students and lower participation by students at the two extremes – both high and low – of predicted academic preparation. Our own studies with SI at UMKC (n = 1,628 students) confirmed this finding (Martin & Arendale, 1997). One-third of students in a class would participate in SI sessions one or more times over the academic term. Analyzing the data further, we found if students were separated into four quartiles based on pre-entry ACT composite scores, the same one-third participation rate held for each of the quartile groups. The majority of SI sessions were dominated by the middle two quartile groups and only a third of the lowest quartile group participated even once.

Rather than treating this as a weakness of the SI model, it recognizes the limitations that any academic approach possesses. SI often is implemented to support large-enrollment, introductory college courses with high rates of D and F final course grades and withdrawals. SI is cost effective and has capacity to serve many students since they do not all have the same attendance patterns. If the goal is to serve as many as possible with limited funds, SI is an excellent choice. On the other hand, if the goal is increasing the likelihood all students are successful in a course, reliance upon voluntary attendance programs is problematic. Mandatory attendance and, better yet, deep integration into the course, so it appears seamless with the class sessions, will yield higher results for most students. Previous attempts to provide incentives of participation in SI sessions have mixed results at best (Hodges, 1997; Rettinger & Palmer, 1996). This research guides the PAL program as it implements different variations of course integration as described later in this article.

3.2 Theories and Research to Guide the PAL Session Activities

3.2.1 Academic and social integration. An influential college researcher and theorist is Vincent Tinto. He surmised the more a student was integrated academically and socially into many dimensions of the college, the less likely that student would depart prematurely. His theory states the decision to leave the institution is more a function of the school's culture and the interaction of the student within that culture than simply because the student was academically-underprepared (Tinto, 1994). Tinto identified six attrition themes: (a) difficulty adjusting to the college environment, (b) high academic rigor, (c) incongruence between what they know and what is presented in the classroom, (d) social isolation from others, (e) unable to meet financial cost of college, and (f) negative peer pressure from family and social groups inside or outside of college (Tinto, 1994). PAL sessions address many of these themes. Students talk informally about college adjustment issues along with review of the content material. Candid conversation is fostered by employing upper-division undergraduates to lead these sessions for lower-division students. Because PAL targets courses with high rates of academic failure, careful attention is made to link students' prior knowledge with the new academic content material. PAL sessions provide a stable group of fellow students to interact with and, for some, allow new personal friendships and collegial relationships to develop. Finally, PAL sessions provide a structured environment for students who are committed to academic success to encourage and support one another.

3.2.2 Metacognition. Metacognition literally means to think about one's thinking. Sometimes researchers describe this as executive control of the learning process. Some students have difficulty selecting appropriate study strategy to fit requirements of a particular learning situation. The sophistication of the learning environment at the college level requires a wider set of learning strategies than may have been employed with previous success in high school. This difference requires students to think strategically about the class; they must self-monitor themselves, their study plan, and the changes needed.

Another term used to describe this proactive approach to metacognition is the *self-regulated learner* (Weinstein & Stone, 1993). According to their research, expert learners not only know more, their knowledge is better organized and more integrated; they possess more effective and efficient strategies for accessing and using their knowledge, have different motivations for doing so, and display more self-regulation in both the acquisition and application of their expertise. Expert learners possess four kinds of knowledge (a) themselves as learners (e.g., their cognitive characteristics), (b) cognitive demands of their academic tasks, (c) variety of strategies and study skills, and (d) the academic content material being studied. Weinstein and Stone (1993) identify how expert learners establish metacognitive control when studying: (a) create a study plan and revise it on the basis of personal feedback and grades received throughout the academic term; (b) select the specific strategies or methods they will use to achieve their goals;

(c) implement methods they have selected to carry out their plan; (d) monitor and evaluate their progress on both a formative and summative basis; (e) modify what they are doing when not successful, and (f) evaluate their academic performance and decide if their strategies are the best way to go about meeting similar goals in the future.

PAL facilitators are intentional about helping students develop skill as a self-regulated learner. One strategy is using informal, ungraded quizzes to provide feedback to students regarding their comprehension of course material. Waiting until scores from major exams are returned is too late in many cases for students to make needed changes. Another common session activity uses the post-exam survey, where students respond to 20 questions about what they did and did not do to prepare for the exam. The survey items cover a broad range of academic study behaviors. Students can observe a link between their behaviors and the exam score. The PAL facilitator and fellow participants openly discuss the prior and current use of these behaviors and study strategies and why they selected them.

3.2.3 Constructivism. Educational theorists such as Jean Piaget and those who followed him stated that deep and long-lasting learning is impossible unless the student is actively constructing the knowledge (Piaget & Inhelder, 1958). Friere (2002) argued that the *banking concept of learning*, in which students were passive receptors of new information, was not only ineffective, but an institutional form of tyranny. Modern-day proponents of active learning classrooms owe much to these early theorists.

The *Zone of Proximal Development (ZPD)* is a specific application of constructivism developed by Lev Vygotsky (1962). He argued the presence of an advanced peer within a student group serves as a catalyst for all students to perform at higher levels than they would alone. The goal of the group experience was to promote personal development so an individual student was not reliant upon their peers for high academic achievement. The ZPD explains why the PAL facilitator is so influential with students in PAL sessions. Facilitator modeling of how s/he personally uses learning strategies helps students experiment with their use until they are mastered. PAL participants can identify with PAL facilitators since they are fellow undergraduate students only slightly ahead in their academic degree. ZPD also explains how a PAL experience in one class can continue to influence students' learning behaviors in subsequent courses that do not use the PAL program.

3.2.4 Acquiring knowledge. A classic approach to learning is the *Information Processing Model (IPM)* (Dembo, 1998). It is similar to how computers operate: information is inputted, analyzed, and then used for a task. The approach by students is similar. Information must first be received, then entered into short-term memory, moved into long-term memory, and finally recalled for use with a task (e.g., completing examination questions, deeply learning and retaining new information and skills). PAL session activities are arranged in the same pattern as the IPM. Once the IPM is understood, PAL Facilitators see relationships among the activities and the purpose for each of them. It assists with planning PAL sessions by selecting a blend of activities to stimulate different stages of the learning process. IPM provides a basic framework to supplement with newer theories of learning sensitive to affective and cognitive learning preferences that attend to individual identities (Belenky, Clinchy, Goldberger, & Tarule, 1986; Graham, 2002; Steele, 1997; Treisman, 1986).

Situated cognition research and theory indicate most college students develop mastery of study strategies when they directly apply them to real-world course material (Stahl, Simpson, & Hayes, 1992). *Situated cognition* recognizes effective learning occurs when the context is personally meaningful and requires direct application of new knowledge and skills recently taught (Wilson, 1993). Immediate integration of new knowledge increases likelihood of further and more effective use of what was recently learned. Students are often unaware of their exposure and practice with learning strategies within the PAL sessions since they are directly used with the course content material. Most students do not benefit from isolated study skills instruction (Dembo & Seli, 2004; Hattie, Biggs, & Purdie, 1996; Simpson, Stahl, & Francis, 2004).

3.2.5 Peer cooperative learning. Alexander Astin is a leading researcher and theorist for change during the college years. Building upon Kurt Lewin's (1936) theory that behavioral change is a result of the interaction between an individual and the environment, Astin quantified the impact of the environment using careful measurement. He also examined more intensely a person's characteristics while interacting with the environment. Lewin's equation for change was $B = f(P \times E)$; behavior was a function of the interaction of the person with the environment. Astin's model built upon this equation in his *Involvement Theory of Inputs-Environment-Outputs (I-E-O)*, which attributes behavioral and attitudinal change as outcome of a person's inputs (life experiences, skills, demographics, etc.) upon interaction with a rich environment (1984). This nuanced analysis of the college environment allowed consideration of hundreds of variables encompassing the students' inputs, environmental experiences, and resultant outcomes. Of hundreds of variables studied with more than 200,000 college students across the US, Astin (1993) found

Generally, students tend to change their values, behaviors, and academic plans in the direction of the dominant orientation of their peer group.... Viewed as a whole, the many empirical findings from this study seem to warrant the following general conclusion: the student's peer group is the simply most potent source of influence on growth and development during the undergraduate years.... The magnitude of any peer group effect will be proportional to the individual's frequency and intensity or affiliation or interaction with that group. (pp. 363, 398, 402)

While Astin identifies the peer group as the most influential variable, his research model does not identify specific practices to make one peer group more influential than another. Vygotsky also identifies the group leader as the catalyst for student learning in a small group through his *Zone of Proximal Development* (1962). The most influential researchers who identifies the specific practices and the principles for small group learning are David and Roger Johnson and their colleagues from the UMN (Johnson, Johnson, & Holubec, 2002; Johnson, Johnson, & Smith, 1991). These researchers identify five principles to guide effective groups (a) positive interdependence, (b) face-to-face promotive interaction, (c) individual accountability, (d) interpersonal skill development, and (e) group processing of activities. Meta-analysis studies validate the value of small group learning for students of predicted high and low academic preparation levels (Springer, Stanne, & Donovan, 1999). The PAL program follows these principles and implements many of the specific small group learning activities recommended by them.

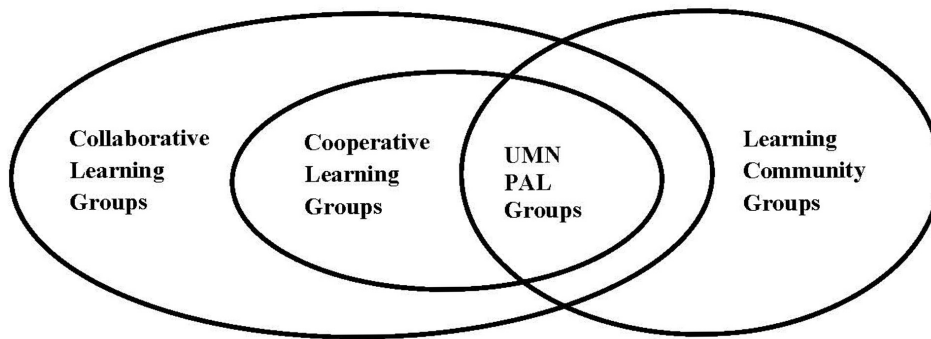


Figure 1. Relationship of PAL with Other Peer Learning Constructs

Description: The UMN PAL groups operate at the confluence of these three general constructs of student learning groups. While there are sharp differences among the three groups, their shared characteristics create an environment for the UMN PAL program to operate.

Section 3.2.5 identifies differences and similarities among these learning constructs. *Collaborative learning* describes any interaction among students occurring within groups regardless of their structure or lack thereof. *Cooperative learning* groups have specific structure and protocols that guide student interactions within groups. These groups form a subset within the larger construct. A *learning community* integrates academic content among several courses. This occurs through students working together, instructional staff from different course working together, or both. Since this final construct does not always involve student small groups, it intersects a portion of the other two. The PAL program operates at the confluence of these overlapping constructs and draws advantages from each (Arendale, 2004).

4. Program Description

The PAL program offers regularly scheduled, out-of-class sessions facilitated by a fellow student. This student, called a PAL facilitator, has often taken the same class by the instructor, earned a high final course grade, and is competent in the subject matter. The PAL sessions are offered weekly throughout the academic term, beginning with the first or second week of class. The sessions are held in classrooms, often in the same area as where students attend their class. These sessions are free and open to any student enrolled in the course. Since the PAL program is open to anyone in the class who wants to improve their grades, it serves as an enrichment program. There is not a perception that the program is remedial. PAL sessions attract students of varying academic abilities. Regardless of their ability level, students discover new skills and knowledge.

PAL facilitators attend at least one lecture each week, take notes, and read all assigned readings. They prepare for their sessions and conduct two of them each week. The PAL professional staff is responsible for the administration of

the program. These individuals identify potential courses for PAL support, gain instructor approval, select and train PAL facilitators, observe PAL sessions, coach and supervise the PAL facilitators, and evaluate the program.

4.1 Three Variations of the PAL Model

PAL is a flexible approach that can be used in various formats: (a) voluntary attendance for students enrolled in the target class, (b) required attendance in weekly PAL sessions attached to a course, or (c) co-enrollment in a companion course to the target class. The decision about which of these three choices is made by the course instructor or department and the PAL program administrator.

4.1.1 Voluntary attendance variation of PAL. Similar to SI, the voluntary attendance format is simply just that. PAL support is prearranged with the instructors and the PAL facilitators are hired prior to the semester. Facilitators make announcements the first week of lecture and determine when to hold the session based on student input. Examples of these courses are calculus, cognitive development, physiology, and general chemistry.

4.1.2 Mandatory attendance variation of PAL. In a wholly different arrangement with the Math Department, PAL is fully integrated in two introductory courses – College Algebra and Pre-Calculus I. When students register for these courses, the system automatically puts in their schedule the Monday, Wednesday, and Friday lectures and two recitation meetings on Tuesday and Thursday; the Tuesday class is led by a graduate teaching assistant and the Thursday class period is the PAL session. With this variation, it is the individual instructor's decision whether PAL session attendance has an impact on their course grade.

4.1.3 Co-enrollment variation of PAL. In some arrangements at UMN, the PAL program supports cohorts of students who are part of a program, such as students in the Animal Science major, most of whom are enrolled in an entry-level chemistry course. PAL supports this defined set of students in the chemistry course (where they account for less than 10% of the 1000 students taking the course). Students are given points (for attending the chemistry PAL sessions) towards their grade in a companion one-credit course *Introduction to Animal Science* (Intro ANSC). It is a unique arrangement and one worth elaborating on: the weekly 2:15 hour block allotted for the ANSC course involves one hour spent exploring the ANSC major and the remaining 1:15 hours are dedicated to five PAL sessions, in adjoining smaller classrooms, where students practice problem-solving using the concepts in the chemistry material.

4.2 Professional Development of PAL Staff

The professional development component of PAL is comprehensive to prepare PAL facilitators for their work. Professional development for PAL facilitators involves five components (a) Participating in a two-day training workshop before the academic term. Extensive role-play and discussion occurs to guide their choices in preparation of and during PAL sessions. (b) Enrolling in PAL facilitator course emphasizing theory-to-practice (Arendale, in press), (c) Debriefing of several of their PAL sessions observed by fellow facilitators and the PAL program coordinator. These briefs reflect on choices made by the facilitator and reactions by the participating students. (d) Attending weekly team meetings with the PAL program coordinator and fellow facilitators (organized by discipline – math, sciences, or humanities) – to discuss their experiences in the classroom, to plan sessions around difficult concepts, and for ongoing training. (e) Engaging in private consultations with the PAL program coordinator to discuss issues not addressed during the weekly team meetings. An extensive training manual and workbook is used during the initial two-day training sessions and subsequently throughout the academic term (Arendale & Lilly, 2012).

As briefly mentioned above, nearly all PAL facilitators voluntarily enroll in a course offered by the UMN Office of Undergraduate Education: *Exploring Facilitated Peer Learning Groups* (OUE 3050), where they explore peer learning groups and factors that enhance their effectiveness including: facilitating the learning process, integrating learning skill development and content knowledge acquisition, and applying appropriate theories of learning. The course connects the experience of serving as a facilitator of a peer-learning group with deeper examination of underlying assumptions, learning theories, active learning strategies, group management protocols, and best practices for such groups. Participants submit weekly reflection papers relating course readings and class discussion to their facilitation experiences (Arendale, in press).

4.3 PAL Session Principles

PAL sessions integrate *what to learn* with *how to learn it*. Students who attend the sessions discover new learning strategies, connect ideas in the class, review key concepts from lecture and text, and increase their confidence. These sessions are highly interactive with the PAL facilitator managing the discussion and not providing answers. Instead, the questions are redirected back to the group and answers are sought in lecture notes, a review of the textbook and assigned readings.

The PAL facilitator training guide provides 180 pages of narrative, protocols, and procedures to manage PAL sessions (Arendale & Lilly, 2012). A collection of activities and situations encountered by previous facilitators is also used for training purposes (Walker, 2010). The following general principles guide facilitators as they select activities and processes to accomplish what to learn with how to learn: (a) Guide effective PAL learning activities through educational theories; (b) Express multicultural competency during PAL sessions by the PAL facilitator; (c) Blend different activities during the session; (d) Shift more authority and ownership to PAL participants over the academic term; (e) Model productive learning behaviors by the PAL facilitator and participating students; (f) Vary PAL sessions based on the academic and learning requirements unique to them; (g) Develop higher skill in self-monitoring comprehension of course material and adapting to each learning task; and (h) Actively engage students with the course material and with each other through intentionally planned group activities.

4.4 PAL Administrative Principles

While the previous principles guide actions within PAL sessions, the following are actions taken by PAL facilitators and professional staff to administer the program: (a) PAL facilitators understand what occurs during the classes they support through review of the course syllabus, study of assigned class readings, attendance at one or more lectures each week, and discussion with the class instructor. (b) PAL facilitators participate in a robust professional development program as described earlier. (c) The PAL program is administered, supervised, and coached by professional staff with training in peer study groups. Formal training for the PAL program coordinator provided by attending the SI Supervisor workshop hosted by the national SI center at UMKC. In addition, I informally advise the PAL program coordinator. (d) PAL is offered in classes where the department chairperson is supportive of the program. His or her stable support is essential since the instructor may be a Graduate Teaching Assistant or another instructor assigned just before the academic term begins. (e) The PAL program is evaluated for PAL participants and facilitators each academic term. The evaluation results are used by the PAL program coordinator to coach PAL facilitators, revise the program as needed, and provide reports to faculty members teaching the courses and the administrators to whom the PAL program is responsible. (f) The potential stigma of the PAL program is eliminated since students from a wide range of academic preparation areas participate. This is especially true when participation is mandatory. (g) Classes supported through the PAL program are historically difficult for 30 percent or more of the enrolled students (indicated by D, F, or W – course withdrawal). (h) PAL sessions start at the beginning of the academic term and continue on a weekly basis throughout the semester. (i) The typical PAL facilitator is an academically competent upper classman who has completed the course with a high grade – often majoring in the subject area, demonstrates social skills conducive to leading groups, and has shown a genuine interest in helping others.

5. PAL Program Evaluation

Research from UMN validates effectiveness of PAL with higher final course grade (grading scale A through F). Cheng and Walters (2009) studied over 500 undergraduate students enrolled in two different mathematics courses during fall 2008. Success was operationally defined as passing the math class with a C- or above, and failure as receiving a D+ or below, including withdrawal. A through C- final course grade was accepted as success since some students were satisfied with just passing the class if they were not STEM majors. In addition to measuring PAL attendance, 16 other factors were considered in this analysis. The achievement gap was closed for students of color and those with lower levels of academic preparation as measured by high school graduation ranking and scores on the ACT college entrance examination. Despite these attributes, PAL participants earned higher final course grades than nonparticipants. Attending all PAL sessions during the semester corresponded with ten times higher odds of success than attending none of the PAL sessions.

Ediger (2007) examined the first three years of the PAL program. She employed matched-pairs analysis on basis of their ethnicity, gender, and level of academic preparedness as measured by high school rank percentile and scores on ACT college entrance examination. The evaluation revealed benefits for PAL participants and the facilitators. Some PAL courses examined had a mandatory attendance policy and others were available to those who attended voluntarily. For PAL courses where attendance was mandatory, a student was deemed a nonparticipant if they failed to attend at least half of the PAL sessions during the academic term. Both a quantitative and qualitative study was conducted. The quantitative study revealed statistical significance for the PAL participants at the $p < .05$ or lower for earning a higher percentage of A grades and lower rates of C, D, F, and course withdrawal as compared with PAL nonparticipants during the first two years of the program. During the third year, higher grades trended in favor for PAL participants but did not reach statistical significance.

Ediger's qualitative study of PAL facilitators identified five outcome themes in their experience in the PAL program (a) enhanced personal learning and study skills, (b) increased group facilitation and decision making skills, (c) increased confidence and enjoyment during learning, (d) positive relationships with participating students, and (e) sense of community in helping others grow and learn. PAL facilitators also perceived changes among their PAL participants (a) increased analytical skills; (b) increased confidence and risk taking behaviors; (c) increased importance and effectiveness of working in small groups; (d) increased comfort when engaging and sharing ideas with other students; and (e) increased academic autonomy, diversity of study strategies, and self-reliance.

Lilly and Goergen (2011) examined academic outcomes for PAL participants in college algebra and precalculus in the 2009, 2010, and 2011 academic years, focusing on the variable of PAL session attendance. Students attending nine or fewer sessions were considered nonparticipants. Attending PAL sessions ten or more times placed them in the participant category. For purposes of the study, a high threshold was established to qualify as a PAL participant. Two different introductory mathematics courses were examined repeatedly over the three-year period. The PAL participants earned a higher final course grade that was statistically significant ($p < .05$). The difference in grades between the PAL participants and nonparticipants ranged between one-half to a full-letter grader higher for the PAL participants. These findings reinforced the UMN model for the PAL program of requiring attendance so students will realize PAL's maximum positive benefits.

Arendale and Hanes recently completed qualitative research studies that reveal additional insights about the PAL experience with facilitators and participants from data collected 2008 through 2010. PAL participants displayed the following themes: growth in academic engagement, confidence, interpersonal skills, and critical thinking skills (2014b). Themes that emerged from the PAL facilitators included academic growth, ranging from the more concrete learning and re-learning of information and vocabulary to higher order critical thinking skills such as applying, explaining, and evaluating the material (2014d). Often the facilitators described growth with self-perception as leaders. For many, seeing themselves, and being seen as a leader, was a surprise (2014a). Experience as a facilitator often initiated or confirmed vocational interest in teaching (2014c). Facilitators described unanticipated development of their own professional identity (2014e). While some of these outcomes have been reported in a cursory fashion in previous research studies of programs similar to PAL (Arendale, 2014), these new reports identify new student development outcomes in more depth.

6. Conclusion

Since 2006, the PAL program at UMN contributes to improved academic performance of participating PAL students in rigorous introductory-level college courses. The program is built upon best practices from previous international peer learning models like Supplemental Instruction, Peer-led Team Learning, Emerging Scholars Program, and others. PAL is also guided by learning theories such as Universal Design for Learning to make the model more culturally-sensitive and embedded within the courses to increase its effectiveness for all students. Both quantitative and qualitative studies of PAL validate its effectiveness for increasing academic success of participating students and fostering development of personal and social skills. In addition to benefits for the participants, the PAL experience benefits PAL facilitators through deeper mastery of rigorous course material, increased confidence in public speaking and small group management skills, and encouragement to pursue a teaching career. While the PAL program was started to address the achievement gap in courses, it has bloomed into one that also enhances personal and professional skills for all that are involved. Built upon principles identified by other academic support programs and innovations of its own creation, PAL is an integral part of UMN's overall academic support efforts.

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