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Framework for Leadership Skills Development with Experiential Learning: an Example of an Undergraduate Engineering Program

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Abstract- This paper presents a model of leadership skills development based on educational strategies that have been successfully implemented at Department of Engineering, United States Coast Guard Academy. The approach involves the integration of student learning in the classroom with service learning, community engagements, internships, and extra-curricular activities based on Kolb's experiential learning. These activities enable students to discover their own styles of leadership, hone the necessary leadership skills, and explore new leadership approaches. Concrete experience, reflective observation, abstract conceptualization, and active experimentation serve as platforms where leadership education develops. This approach to leadership development can serve as an educational model that could be adopted by other academic undergraduate institutions as they strive to develop leaders.

Keywords *Leadership education, experiential learning, service learning, engineering major*

I. INTRODUCTION

The ability of a nation to foster economic growth in the context of global challenges depends on the quality of leadership exercised at all levels of society [1]. Leadership involves a versatile process that requires working with others in personal and professional relationships to accomplish a goal or to promote positive change [2]. Several studies document that effective leadership is central to an organization's success [3, 4, 5]. The challenges of globalization and the emergence of information technology have significantly transformed the expectations and behavior of leaders in organizations. At the same time, institutions of higher education are increasingly responsible for providing educational opportunities that allow students to develop, master, and practice critical thinking and problem-solving skills; form intercultural acumen and ethical responsibility; and develop and practice effective leadership skills [6, 7]. Research demonstrates that leadership development enhances the self-efficacy, civic engagement, character development, academic performance, and personal development of students [8, 9]. There is consensus that student involvement in organizational activities outside the classroom fosters advancement of leadership skills [10, 11].

The United States Coast Guard Academy (USCGA) has been educating cadets to serve as leaders in the United States Coast Guard (USCG) for over 100 years. Within its academic programs, USCGA fosters leadership development through required leadership courses as well as others in the humanities, science, engineering, mathematics, professional maritime studies, organizational behavior, management and law. The development of leadership at USCGA has been achieved through the existing curricular and extra-curricular programs with a great deal of flexibility in instructional practices and activities.

This paper presents an approach for leadership development that is based on the Kolb's Cycle of Experiential Learning theory [12]. This approach allows students to progress through a cycle of four stages: concrete experience; reflective observation; abstract conceptualization; and active experimentation. Through this process, students recognize their leadership style and develop essential leadership skills while actively engaged in both in-classroom and out-of-classroom activities that include learning communities at the CGA and the local community. The educational leadership strategies developed and practiced at USCGA can be adopted by other academic institutions that strive to develop leaders of the 21st century.

II. TEACHING LEADERSHIP WITH EXPERIENTIAL LEARNING METHODS

The first and most renowned advocate of experiential learning was John Dewey [13] who emphasized that learning must be planned and provided with an experience. Experiential learning provides individuals with creation of knowledge through the transformation of their experiences into existing cognitive frameworks in order to change the way individuals think, act, and perform [14]. McCall [15] argued that in order to become a skilled leader, students must go through the experiences supported by experiential learning theory. The author investigated the experience in both learning communities and youth organizations and its influence on academic performance, retention, and graduation rate. Kuh [16] analyzed active participation in out-of-classroom activities that enabled students to develop leadership skills. A study by Ricketts and Rudd [18] and [19] supported results of the previous studies to argue that experiential learning with reflection is critical to maximize leadership development.

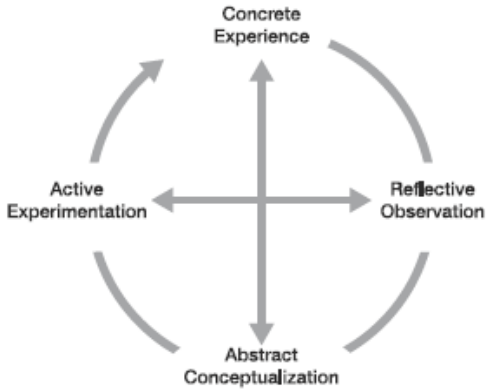

Figure 1. Kolb's Model of Experiential Learning

An experiential learning technique developed by Kolb [12] is presented in Figure 1. Kolb's model of experiential learning supports knowledge to be formed through experience that occurs in a cycle of four modes: concrete experience, abstract conceptualization, reflective observation, and active experimentation.

TABLE I. KOLB'S LEARNING MODES

Modes	Description and explanation
Concrete Experience	Engaging directly in authentic situation and learning through direct experience emphasizing interpersonal relations and feeling as opposed to thinking
Reflective Observation	Learn by watching and examining different points of view to understand something and noticing and reflecting on what happened and relating to past experience and conceptual understandings
Abstract Conceptualization	Learn by thinking about an issues in theoretical terms, analyze tactics or strategies and their implications, distilling perceptions into abstract concepts
Active Experimentation	Learn something by doing it and judging its practical value, testing new ideas and apply skills in a new experience

Source: Smith, M.K. (2001). David A. Kolb on Experiential Learning, the Encyclopedia of Informal Education. http://www.infed.org/biblio/b-explrn.htm.

Kolb [12] argued that students can enter the learning cycle at any point but they learn when they go through all four modes. As shown in Table 1, concrete experience occurs as learning by encounter from a specific experience; abstract conceptualization is learning by thinking through analyzing ideas, planning systematically, and acting on an intellectual understanding of a situation; reflective observation is an element of learning through examination; and active experimentation is learning by doing. Each student's experience includes both personal (self-leadership) growth and the experiences of others [12].

Claxton [19] described a variety of teaching techniques that foster each of Kolb's learning modes. Concrete experiences can be induced by recalling past experiences, through role play, or via case studies; reflective observation is cultivated by group discussions, reflective papers, and journals; abstract conceptualization is stimulated by lectures, print sources, and films; and active experimentation is often encouraged by means of problem-solving exercises such as mock proposals or role plays. Claxton recommended that instructional designs should include all four kinds of learning, which in turn help ensuring a complete cycle of learning. Boud [14] argued that the potential for meaningful learning was inherent to the increased presence of both curricular and co-curricular leadership development trainings across various undergraduate educational programs. The approach to leadership development at USCGA incorporates Kolb's strategies and is discussed in details in the following sections.

III. LEADERSHIP EDUCATION AT USCGA

The USCGA, located in New London, Connecticut, is the smallest of the United States federal military academies. The Academy offers Bachelor of Science degrees in eight majors: Civil Engineering, Electrical Engineering, Mechanical Engineering, Naval Architecture and Marine Engineering, Government, Management, Operations Research and Computer Analysis, and Marine and Environmental Science, Management, Government, Operations Research, and Computer Analysis, and Marine and Environmental Science. The USCGA's mission is to educate, train and develop leaders of character who are ethically, intellectually, and professionally prepared to serve their country and humanity.

TABLE II. USCGA'S LEADERSHIP DEVELOPMENT FRAMEWORK

Leadership Categories	Leadership Competencies
Leading Self (Freshman Year)	accountability & responsibility, aligning values, followership, health & well-being, self-awareness, personal conduct, technical proficiency
Leading Others (Sophomore &Beyond)	effective communications, team building, influencing others, taking care of people mentoring, respect for others & diversity, management
Leading Performance & Change (Sophomore &Beyond)	conflict management, customer focus, decision making and problem solving, management and process improvement, vision development and implementation, creativity and innovation
Leading the Coast Guard (Sophomore & Beyond)	financial management, technology management, human resource management, external awareness, political savvy, partnering entrepreneurship, stewardship, strategic thinking

Source: Commandant Instruction COMDTINST M5351.3, Leadership Development Framework, United States Coast Guard, 2006.

Since 1876, principles of leadership and ethics have been infused into the training and education of the Corps of Cadets and addressed by the enforcement of the "Honor Code" and Leadership Training programs. An Academy-wide culture of leadership is required to facilitate learning across military, academic, and athletic programs. Cadets are exposed to the concepts of leadership and integrity through various curricular and service learning experiences. During four years of

academic, military and athletic programs, the Commandant of Cadets, academic faculty, Department of Athletics, and the Leadership Development Center work together with the Corps of Cadets to guide and monitor cadets' development and implementation of moral, ethical and leadership skills. The leadership competencies, that USCGA cadets are required to develop, are listed in Table 2. The leadership development is divided into four categories: leading self, leading others, leading performance and change, and leading the Coast Guard. The four categories consist of several competencies; such as team building, communications, accountability, conflict management, and technical proficiency; that cadets develop over four years at USCGA.

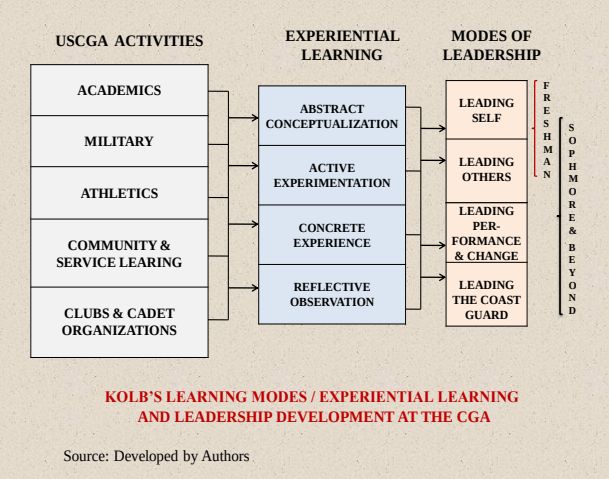

Figure 2. Experiential Learning and Leadership Development at USCGA

During freshman year, the focus is predominately on the competencies detailed in the leading self-category. Freshman year is one of the most important stages of a student's academic life and leadership development. This is when much of self-discovery, understanding of the academic system, and development of technical proficiency in the areas of study and learning take place. With each progressive year, cadets shift their focus to the next set of competencies, while still sharpening their skills in the previous categories. To achieve these competences, the USCGA approach uses three groups of activities or basic components: (1) academics, (2) non-academics (includes military and athletics), and (3) professional practice (community and service learning, and cadet organizations) as presented in Figure 2. As shown in Figure 2, not all of the learning goals for leadership development purposes are accomplished through credit-bearing courses. Some of the shared educational goals for cadets are achieved primarily through specially coordinated programs of military, residential life, and co-curricular activities out-of-classroom. Such learning is not based on a classroom instructive pedagogy, but on service learning with goals typically focusing on self-leadership skills, attitudes, and values. Developing leaders is a continuous process of experiential learning as highlighted in Figure 2.

The next section of the paper provides examples of how various academic and non-academic activities are used to address the four leadership components listed in Table 2.

IV. Leadership Development through Academic Learning

A. *Leading Self*

The academics component of leadership development is supported by a strong "Core Curriculum" of science, math, engineering, professional studies and humanities courses. This "Core" of approximated 100 credits must be successfully completed by every cadet prior to graduation in addition to the major specific requirements for each major of at least 40 credits. In addition to academics, cadets are challenged non-academically (militarily, athletically, and socially) through daily interactions with each other, USCGA faculty and staff, and through structured military and athletic training opportunities.

The USCGA's leadership development emphasizes an awareness and understanding of self-strengths and self-weaknesses. Cadets are required to embrace their personal characteristics, learn to guard their own health and well-being, treasure honor and devotion to duty, and grow technical proficiency. The engineering faculty and staff assist cadets with developing these competencies and skills by creating an environment that encourages self-discovery. Cadets study and go through abstract conceptualization of strengths and weaknesses of political and historical, political, military, and entrepreneurial role-models. In addition to technical courses, engineering cadets take a wide variety of courses outside of their specific major to widen their perspective, encourage self-criticism and discovery, and develop professional skills. Furthermore, cadets must take at least six credits of Health and Physical Education. This provides additional leadership opportunities under a different environment that is based on: concrete experience; reflective observation; abstract conceptualization; and active experimentation as well as enables cadets to develop the professional skills that are critical for success as officers and professional engineers.

During the freshman year, cadets in the Department of Engineering take four non-technical three-credit courses which include English Composition and Speech, Writing about Literature, Leaders in US History, and Macroeconomic Principles. In the English courses, cadets develop writing and speaking skills, as well as develop their critical thinking. While they focus on developing their writing and speaking skills in these two courses, communication skills are reinforced throughout the engineering curriculum. While enrolled in Leaders in US History, cadets survey major developments in US History through the role of key leaders. In this course, via reflective observation cadets are exposed to models of effective and ineffective leadership and management, while developing critical thinking and communication skills. They are also required to take Macroeconomic Principles to understand basic economic concepts as well as develop competency in financial management.

"Ops Spot-Light" lectures provided to the entire USCGA Core of Cadets provide opportunities for abstract conceptualization and reflective observation of role-models of leadership. Guest speakers present examples of successful leadership and reinforce the importance of good leadership and honorable service. At this stage, cadets are accountable and responsible for leading self and aligning their values with the USCG values described by the USCGA mission statement. Active experimentation can be practiced in a classroom, but concrete experience and reflective observation takes place primary out-of-classroom.

B. Leading others

During the sophomore year, cadets take two courses: Leadership and Organizational Behavior and American Government. In Leadership and Organizational Behavior, cadets are exposed to fundamental leadership and management concepts. Through abstract conceptualization and reflective observation, as the first two stages of experiential learning, cadets focus on development of moral values, leadership and personality characteristics, self-awareness, goal setting, working in teams, motivation, and setting a vision with particular emphasis on practical leadership implications. The focus of the course is on leading self and leading others and how these components tie into the competencies listed in Table 2. Deepening their understanding of the political process and the making of public policy in the American Government course, cadets examine the framework of the U.S. democracy. Through abstract conceptualization of role models and their actions, cadets simultaneously explore topics such as political parties, election process, interest groups, and civil liberties as well as domestic and foreign policy including the policy making process and its consequences. Furthermore, cadets learn about leading others and understanding the working relationship with local, state and federal government agencies. While the curriculum at USCGA provides foundational knowledge and skills to graduate engineers who are ready to lead and manage effectively, cadets are given frequent opportunities to put these skills into practice outside of the classroom through their participation in military, athletic, and other extracurricular activities. At that stage cadets are developing leadership through concrete experience, reflective observation, and active experimentation.

C. Leading performance and change

The competencies in these categories include conflict management, decision making and problem solving, vision development and implementation, creativity and innovation, technology management, financial management, strategic thinking and entrepreneurship. An effective leader must understand the purpose of the organization and develop partnership with other organizations when required. As upperclassmen, USCGA engineering cadets take Morals and Ethics and Criminal Justice courses. As seniors, they continue their study of law with Maritime Law Enforcement. The Morals and Ethics course, with an approach of abstract conceptualization, allows cadets to examine a range of philosophical models and views regarding actions that can be considered right or wrong. By analyzing ethical and moral standards cadets reinforce their self-decision-making abilities and develop their own moral voice. They also study, explore, and analyze the basic legal concepts in criminal justice and maritime law enforcement, where they abstractly conceptualize and learn about the U.S. civilian and military criminal justice system and the legal issues associated with the Coast Guard's law enforcement mission in the maritime environment. In their senior year, cadets complete a Capstone project in which they work in groups. This provides additional opportunities for leadership development because they have to manage group members, rotate chairmanship of weekly project meetings, complete deliverables, etc. Each capstone group member besides abstract conceptualization and reflective observation is also required to go through concrete experience and active experimentation prior to completing a reflection paper that details group dynamics, assessment of group members' contributions and personal leadership style.

V. LEADERSHIP DEVELOPEMNT THROUGH SERVICE LEARNING

USCGA also recognizes the importance of community and service learning where experiential learning occurs through a cycle of concrete experience, reflective observation, and active experimentation. The service learning at USCGA is vital for development and enhancement of cadets' leadership skills. The rationale for the USCGA service learning is to develop professional leaders who demonstrate intellectual, physical-athletic, moral, and ethical excellence. Student-run service learning activities at the USCGA are excellent incubators for delivering the full spectrum of challenging situations which call for different styles of leadership. During community or service learning, cadets go through concrete experiences while working with others through a process of applying what they learned in a classroom. By working and solving community problems, they go through concrete experience and active experimentation followed by reflection as they seek to achieve real objectives for the community and obtain deeper understanding of their self-leadership and other leadership skills. The engagement of cadets in service learning, as a concrete experience and active experimentation, helps them acquire, practice and advance all types of leadership skills required of them upon graduation and employment in their CG careers and beyond. Through community work and service learning, cadets apply their academic skills and knowledge to address real-life needs in their communities and become enriched in ethnically and culturally diverse environments.

A. Leading Self

An important area of measurable service learning is achieved through the cadets' involvement in the social and residential life at the CGA. Cadets are exposed to self-leadership development and learning opportunities by living together, designing their own social interactions, and collaborating socially and professionally regularly with faculty, staff, coaches, and administrators outside the classroom. They are also governed by a standard code for cadet conduct and academic integrity. The military, residential, and social environments are critical platforms of concrete experience and active experimentation that are designed to bring together

talented, engaged, and energetic cadets with various leadership abilities, interests, racial, socioeconomic, and ethnic backgrounds to promote self-leadership and USCG's a code of conduct.

The responsibility for the physical-athletic development of the Corps of Cadets rests primarily with the Athletic Division. Physical fitness is an important component of cadet life, and the benefits of instilling into each cadet an appreciation for maintaining an active personal fitness regime is a life-long element of leadership development. The Athletics Division considers physical fitness as part of self-leadership development process with a focus on the concrete experimentation and concrete experience where mental discipline, personal relationships, and moral strength are acquired through participation in competitive sports. These athletic activities emphasize that teamwork, self-leadership, and leading other are expected to be strongly practiced and developed. Physical-athletic and leadership development is accomplished through interscholastic, intercollegiate, and intramural sports, physical education classes, and physical fitness training which all provide concrete experimentation for self-leadership development.

The linkage between physical-athletic development and leadership development has been observed. The emphasis on health fitness is also evident at USCGA in the leadership learning outcomes and the curriculum of the Physical Education through the Athletics Department. In all these areas, health fitness is the logical choice because it enhances the individual's capacity to handle the physical demands of the job, reduces the risk of injury and chronic disease, assists in weight management, and helps individuals pursue physically active recreational activities which constitute the elements of self-leadership. Through self-leadership and discipline all cadets are expected to improve their health because fitness levels are dependent on a sound exercise program, not inherent athletic ability.

Cadets support self-governing organizations and clubs to promote and develop self-leadership training outside the academic classroom or military training. USCGA faculty and staff assist by mentoring cadet clubs and activities in which cadets elect officers and develop bylaws and missions. Cadets become leaders of these organizations or clubs. They practice self-leadership skills by becoming responsible for the clubs' budgets, development of quality educational and ethical programs that meet the mission statement of the USCGA. Through concrete experience, reflective observation, and active experimentation cadets have numerous opportunities to develop and practice their leadership skills. Through these basic components, cadets are introduced to balancing competing time demands for themselves and others. Successful cadets learn to manage their time in meeting their academic and non-academic responsibilities at the Academy.

B. Leading Others

Participation in non-academic activities is part of the USCGA culture where cadets are required to fit these extracurricular activities into their busy schedule. In order to learn how to lead others, they are also encouraged to participate in approved social clubs and community service. Cadets are involved in athletic or intramural sports and encouraged to participate in at least two seasons of sports each year. Cadets coordinate and run the intramural sports program and serve in leadership roles within their chosen sport or activity. Throughout these activities, cadets practice teamwork, goal setting, diversity appreciation, tolerance, conflict management and communication. Furthermore, during the summer, cadets have additional opportunities to apply their learning in the operational USCG or internships or are at the Academy training incoming cadets.

Cadets, as the members of the Corps of Cadets, have opportunities to take active leadership roles in the running of daily life on campus and managing other cadets. Sophomore cadets serve as mentors and tutors to the freshman, overseeing the new cadets' transition to military, college, and academy life. Juniors and seniors, in addition to leading the freshman and sophomores, play an active role in running the day-to-day operations of the Academy and the Corps of Cadets. By graduation, each cadet would have had several opportunities to serve in positions that involve leading other cadets thus developing and honing the competencies in this category. Throughout the process, cadets rise to the challenge of experiencing, developing and practicing their leadership skills in the Coast Guard by training and mentoring other cadets, lead a student organization, active participation in sports, active in the community, organize and run activities for the Corps of Cadets and the Academy.

For example, various groups of cadets participate in planning the annual Ethics Forum, Parent's Weekend, Homecoming, Research Symposium, and Graduation. Furthermore, each cadet is required to complete some mandatory community service each semester. Most of this is accomplished by partnering with local organization such as the Habitat for Humanity and Engineers Without Borders. Cadets are also actively involved in several professional organizations. In most academic institutions, involvement in student governing academic organization is typically dominated by non-STEM (science, technology, engineering and mathematics) cadets as engineering students have very limited time to explore other avenues of their leadership development. However, engineering students at USCGA all complete real world capstone design projects as seniors. Some projects are community service oriented while others are geared toward serving the nation by assisting with Coast Guard challenges. The contact with professionals at CG units and in the community and other outside the classroom experiences during the capstone projects serve as avenues for conceptualizing, experimenting, experiencing, and reflectively observing in order to develop and practice appropriate leadership skills. In fact, ABET criteria call for development of leadership skills and many other soft skills that contribute to the experiential learning framework. In many cases, engineering students gain experiential learning through five-week summer internships at various Coast Guard units or the national labs.

C. Leading Performance and Change

Another aspect of USCGA approach addresses moral and ethical development and this is emphasized throughout the

process. Concepts such as fair play, teamwork, and sportsmanship are moral constructs that are derived directly from the understanding of leadership, honor, and respect supported by the mission of the USCG. The mental discipline, healthy life-style choices, and personal bonds of commitment to teammates properly developed through competitive sports are manifestations of moral reasoning and support the primary learning objectives of leadership education that prepares cadets for their professional careers. Cadets learn, go through experience, reflection, conceptualization, and experimentation in order to develop skills at which they become capable of leading the organization that requires high skilled leaders and professionals. Through community service, ideas are generated and cadets are able to make decisions with appropriate facilitation from experiential learning within communities. Their experiences are in line with research-based models for self-leadership, leading others and leading performance and change that ultimately positions cadets as leaders who are capable of leading the USCG.

VI. CONCLUSIONS

Experiential learning strategies based on Kolb's approach can be successfully developed and implemented in leadership education and development programs. Kolb's approach on experiential learning is based on concrete experience, reflective observation, abstract conceptualization and active experimentation for leadership development. Leadership development at the USCGA incorporates Kolb's approach and consists of four modes of leadership: leading self, leading others, leading performance and change, and leading the organization. Student learning and leadership development is achieved through a combination of curricular and service learning activities. Equally important to providing direct leadership instruction in a traditional classroom is offering students opportunities to not only observe, but to engage with effective leaders in hands-on and real-world experiences.

The USCGA provides numerous opportunities for structured and focused experiential learning beyond the classroom. Through abstract conceptualization, everyday experience is supported through the ongoing reflective process which facilitates an individual's learning. The USCGA leadership development model together with the Kolb's experiential learning can be adopted by other academic institutions in order to effectively develop leaders of character. The USCGA leadership model stresses on training leaders who are ethically, intellectually, and professionally prepared to serve as officers in the Coast Guard. Aspects of this model could be adopted by other academic institutions as they strive towards preparing future leaders.

In conclusion, the paper described a distinctive leadership development framework that was incorporated into an engineering program at USCGA in the context of the total cadet experience. The leadership framework, described in this paper is continuously assessed to identify and implement relevant changes. The full assessment of the effectiveness of the USCGA leadership framework is not included here and is the scope of another paper. The discussion on this paper contributes to the literature on leadership education by focusing on the role of experiential learning in the development of: leading–self, leading others, and leading performance and change. This approach to leadership education with experiential learning based on Kolb is appropriate for adaptation by non-public undergraduate academic institutions.

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