CREATING PE CLASS: CLIMBING

Interactive Qualifying Project Report completed in partial fulfillment of the Bachelor of Science degree at Worcester Polytechnic Institute, Worcester, MA

Submitted to:

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ABSTRACT

The scope of this Interactive Qualifying Project (IQP) is to determine the feasibility and put into practice the opportunity to earn physical education credit at Worcester Polytechnic Institute (WPI) through rock climbing. Interviews with the athletic department and local climbing gym have been carried out to gain a better understanding of what a climbing oriented PE course should entail. Following those interviews, an alpha version of the class was developed to lay the groundwork for a budget and a curriculum. Alongside this alpha phase, a survey was sent out to the students of WPI to ask the student body about the state of physical education at WPI and to learn their opinions about the possibility of climbing for PE credit. Going into C Term, the project entered into a beta phase. Student volunteers helped smooth out curriculum and class dynamics. Potential agreements were explored between the athletic department and Central Rock Gym (CRG). D Term will see the final budget decisions and making climbing a formal option for PE starting in the 2014-2015 academic year.

AUTHORSHIP

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TERMINOLOGY

AMGA	American Mountain Guide Association
ATC	Air Traffic Control device that is a type of belay device
Banner Web	Website through which Worcester Polytechnic Institute students register for classes
Belay Device	An aperture device that proves the connection point between the belayer and the climber, allowing a belayer to arrest a climber's fall
Beta	The sequence of moves or climbing techniques to complete a route that can vary from person to person
Bouldering	A form of rock climbing where the climber does not exceed 15 ft. in height and relies on crash pads for safety instead of a belayer
CAVE	Bouldering wall on the WPI campus
CPR	Cardiopulmonary resuscitation
Crag	A fairly accessible location for outdoor climbing
Crash Pad	A foam pad that can be portable, usually 3-6" thick, used to absorb the impact force and mitigate falling
CRG	Central Rock Gym is a rock climbing gym with four different locations, one of which is in Worcester and is located three miles north of the WPI campus
Gym	A place where artificial walls with plastic holds are constructed to provide people with a safe and convenient place to climb
Highball	Bouldering above the 15 ft. height that is deemed safe to fall without the protection of belay
Lead Climbing	Climbing above points of protection and placing protective gear to proceed up a climbing route
Route	The path the climber takes up the wall
SGA	The Student Government Association takes care of many of the extra-curricular and student-life activities that are available on campus
Spotter	A person who assists a falling climber to land on her feet
Top Rope	A safe form of climbing where the anchor point for the rope is above the climber, providing a lot of security and low impact forces
WPI	Worcester Polytechnic Institute is the school at which this climbing curriculum was developed
Yosemite Decimal System	A grading system developed in California in the 1950s to more accurately describe the difficulty of a rock climbing route

OBJECTIVE

The main goal of this interactive qualifying project (IQP) is to introduce climbing for credit at Worcester Polytechnic Institute (WPI). There are multiple ways to create a course for physical education at WPI, but the route followed will be to introduce climbing as a club sport. Solely creating a club sport would not be sufficient, so a course and curriculum must be designed as well. The hope is to design a course that can be adapted to the abilities of the students in the class. As with most other sports and activities, the learning curve will vary depending on the students' prior experiences or knowledge. Some students will pick up the sport quickly, and others will not. Fortunately for those who do not learn as quickly, physical education courses at WPI are based on participation. While an instructor may decide that students taking a course will have to learn certain skills, the main goal of a physical education course at WPI is simply to be an active participant.

A course and the curriculum would have to account for the reality that most students will not magically be capable of doing everything taught to them right away. Many techniques require practice, but there are also core concepts that all climbers should know to be safe, and many of these will be included in the curriculum. Many sports have rules to make the game more exciting, but as time has passed, many rules have been included to increase safety. In addition to rules, many sports have added in gear to increase safety. For example, football and hockey players have quite a bit of padding for protection. Climbers use varying amounts of equipment to protect themselves from injury, choices that are often judgment calls based on factors like location, objective, and skill. When bouldering, climbers use crash pads, and often have their climbing partners spot them to make sure they land safely. When climbing above a height that is safe to boulder, climbers will use more protection such as harnesses, ropes, and belay devices.

At WPI, the main focus of the climbing course will be bouldering. There are many reasons for this decision, but two reasons stand out. The first reason is that WPI already has a bouldering wall. The second reason is formatting the class this way cuts down on the amount of gear a student would need to own in order to participate in the class. By using the bouldering wall on campus, it will be easier to keep the cost of the course down and simplify logistics. In addition, reducing the amount of gear a student needs to own in order to take the class increases the likelihood that a student will be interested in the class. It is not a pleasant idea for a college student to have to pay a large fee for a class, especially if it is a PE class. This effect can be seen in the discontinuation of the SCUBA certification class at WPI. Having most of the necessary skills taught at WPI's CAVE reduces costs; the only requirements of the course needing more equipment would be rappelling and belaying. These skills can be taught at Central Rock Gym for ten dollars each, and equipment is included. This is a fairly minimal cost that could potentially covered by club dues, allowing the course to be much more beginner friendly.

As there is no clearly defined process for developing a new physical education class at WPI, the steps of this IQP will be well documented such that future students will have some guidelines to follow. Research and projects should help future endeavors, and having a well-formulated set of instructions on how to create PE class will be beneficial to future students and other colleges.

RATIONALE

WPI currently has a very low number of classes available to students each term. Approximately 2600 students can take a physical education course or club sport for credit each year, which means that over 1000 students each year cannot take a physical education course. Despite the flexibility that comes with being able to choose between a physical education class, a club sport, or a varsity sport, many students find it difficult to complete the physical education requirement. Sixteen out of twenty-nine classes have students on the waitlist for C Term of the 2012-2013 academic year. Nine courses have a full waitlist, meaning that there could be many students who did not even make it onto the waitlist. Varsity sports were not included in the count, because they require students to be well practiced in the sport that they choose. Club sports like pep band or men's volleyball were included in the count. According to Banner Web, club sports made up ten of the twenty-nine possible courses for C Term in the 2012-2013 academic year.

After conducting a survey of WPI students, the results made it clear that a climbing course at WPI would be well worth having. Many students indicated that they found scheduling a PE class difficult. Students were asked to indicate difficulty based on a scale of one to ten with ten being the most difficult. Twenty-four percent of students selected a difficulty from eight to ten. Forty percent selected a difficulty from five to seven. Forty-eight percent of students have been unable to be waitlisted for a PE class at least once which means that the number of students trying to sign up for a PE course is greater than the number of students that can have a seat in the course and the number of students that can be waitlisted combined. Fifty-seven percent of students have been waitlisted for a PE class at least once. In comparison, eighty-nine percent of students have been waitlisted for an academic class. While this seems that the percent of students being waitlisted for a PE class is not too bad, a student needs to take four PE classes or four twelfths of a credit of PE classes compared to a minimum forty-five thirds needed to graduate. Clearly the number is disproportionate. Finally, forty-nine percent of students said that they felt like they were stuck taking a PE class just so they could graduate. A complete version of the survey and results can be found at the following: Appendix G: Full Survey and Results.

In addition, climbing will add variety to the exercise options available for students. It is vastly different from team sports like basketball and football, where physical stature might provide a competitive advantage. There are twelve-year-olds like Ashima Shiraishi and Brooke Raboutou that climb among the elite but are shorter in stature than most WPI students. As opposed to basketball, where height is an advantage,

being tall may not be an advantage in climbing. Height may provide the advantage of reach but the challenge of foot placement. As opposed to football, where players need to be large to take the impact of a tackle, larger and more muscular athletes might find that they quickly become tired muscling their way through a route.

Rock climbing and bouldering provide challenges for people of all shapes, sizes, and abilities. Not only does it provide a physical challenge, but there is often an exciting aspect to figuring out the puzzle or beta of more difficult routes. A course like rock climbing will provide opportunities to receive physical education credit in a way unlike other opportunities available.

Rock climbing is an efficient and challenging exercise. Solely based on calories burned, climbing is among the top. According to Harvard Health Publications, a 155-pound climber can burn approximately 409 calories per half-hour. Aside from that, to improve in climbing, a climber will find that he will have to train in many different areas. Climbing requires balance, which is something that not all people are born with, but can be developed over time. While a climber completely new to the sport may not actually need a lot of strength, more challenging routes may call for more strength for overhanging walls or dynamic movements. Flexibility can make climbing a route easier. More flexible climbers might be able to high step or bend backwards in order to reach a higher hold. Finally, in climbing especially with longer routes, endurance is important. Endurance allows climbers to avoid becoming "pumped" or fatigued on longer and more strength intensive routes. While bouldering routes do not often help climbers develop endurance, games like add-on can help a climber train for endurance in a bouldering setting. It is clear that climbers are athletes and climbing is great exercise.

Contrary to what some may believe, climbing is a safe sport. While elements of safety appear to be missing in many Hollywood films depicting climbers and climbing as a sport, and videos of unsafe situations can be found on video sites such as YouTube, climbing can be as safe as or safer than mainstream sports. Climbing is not a contact sport. Even in bouldering, where a climber would land on a crash pad, climbers are not likely to be subjected to abrupt stops that might occur in a contact sport. When rope climbing, dynamic ropes are used and are designed to stretch as a climber falls, allowing for a smaller impulse. In addition, a good belayer knows how to "soften" a fall by slowly braking instead of braking hard, limiting peak forces. With top roping, due to the nature of the system, a falling climber may end up only a foot or so away from where he fell from. Because the anchor is above the climber, there is often little slack in the supportive rope, which means the fall is not as great in distance and does not generate a lot of force. More advanced climbers may decide to learn to lead climb, where they would clip in to bolts as they climb. Leading can be more dangerous, but it also requires more experience and practice. The advanced forms of climbing are often less accessible to new climbers, because a minimum climbing ability often is required at indoor gyms. Usually a

climber would have to be able to comfortably climb at least a 5.9 according to the Yosemite decimal scale on top rope before even considering lead climbing.

While adding another physical education class will not end all the problems with lack of physical education classes, it will certainly help to alleviate the challenges of registering for physical education course. Climbing is a very active sport and is popular amongst the student body. The class is expected to be able to seat 10 to 15 extra students per term and is planned to be conducted twice a year. In the future, it could be run each term if there is sufficient interest, and that would add up to 60 extra seats for students in need of physical education credits for graduation.

STATE-OF-THE-ART

Creating a physical education class at WPI is not a new concept. However, it is not well documented. One goal of this Interactive Qualifying Project is to establish the groundwork for developing a new PE class, using a climbing course as the model. Currently, students are lead through a confusing path of "do this to do that," only to find that they have to go back to where they started. Having clear guidelines on how to establish a new physical education course will allow students to develop new activities and help WPI grow as a college. Climbing lends itself well as a model, because it can be structured and has technical elements that require additional steps to make it a valid physical education class. To understand why climbing is used, a brief history of climbing and its culture in the college community should be addressed.

Climbing as it is know now started in the mid 1900's with the introduction of "clean" climbing and sport climbing. Beforehand the sport, such as it was, involved carrying up pitons and a hammer and climbing in lugged boots, a far cry from the sticky climbing shoes, stronger kernmantle ropes, and safer modern protection. Climbing has expanded from a small group of daredevil adventurers to a diverse, vibrant community. The adventure is still there, but it is more accessible and safer. Climbers are going faster, higher, and harder every day, and are often seen as leaders in conservation and environmentalism. Climbing has entered into this new era as an extreme sport and is quickly growing in popularity. With such a popular and involving sport, it is important to expose people to climbing and its nuances.

Climbing has long been a hallmark for many colleges, and the idea of a college kid spending his or her savings on shiny stoppers and a rope is a story that many climbers share. Most start in college, often because it is different way to experience the outdoors, as opposed to sports like track or soccer. Now after several generations of climbers, schools all across the United States are offering their students rock climbing in some form. Colleges are offering a safe way to learn a sport that can have a steep and dangerous learning curve and are providing an alternative form of exercise to the classical sports. Tufts, Stanford, Massachusetts Institute of Technology, North Carolina State University, and California Institute of Technology are all

examples of schools that offer climbing in some form as physical education. The classes range from summertime courses, where the students visit local crags with professional guides, to climbing in a student-built gym under the supervision of a coach.

The fitness gained by climbing cannot be disputed, with increased strength, flexibility, and endurance. Another part of climbing that is often overlooked by people who do not climb is the problem solving aspect. Every route is a puzzle. In fact in the sport of bouldering, routes are called problems due to the mental challenge presented. The sequence of techniques required to complete the route need to be planned out and quickly adapted in order to reach success. These problem solving skills easily transfer over to life skills that help a person succeed in society.

PE classes at WPI mainly revolve around classical sports, such as basketball or track. In recent years more diverse activities like Zumba and yoga have been added to the course offerings; however, these alternative classes are still small compared to the vast number of available seats for more traditional sports. Most of the sports at WPI are team sports that involve some form of competition. While this is fun and a great way to get into shape, it certainly does not appeal to all students.

There is a significant number of students that would rather exercise and participate in recreational activities in a less competitive fashion. Classes like Pilates and dancing have grown in popularity. They teach a skill and instill a sense of wellbeing without the competitive rush that some people find unappealing. Climbing is very self-driven sport. The only competition a climber faces stems from within the climber. There is definitely a climbing culture, and climbing is incredibly social, but when it comes down to the actual sport, it is just the climber and the wall. This can be very appealing, as it can allow students to learn and push themselves at their own pace.

With all of these positive attributes associated with climbing, it makes sense to add rock climbing to WPI's diverse mix of activities and lifestyles. Climbing will help students succeed mentally and physically and ease the burden on some students as they try to fulfill their graduation requirement. The process to develop the new course will also provide a model for future students to design a PE class.

APPROACH

Introducing rock climbing as a physical education course to WPI will serve as a model for other schools that have not yet adopted rock climbing as a sport. Instead of creating a course with undisclosed course information, the group aims to contribute to the general rock climbing community by not only introducing more people to the sport but by also making the course curriculum freely available. Introducing more people to rock climbing creates a larger demand for climbing-related goods, thereby promoting advances in climbing technology.

The first step to creating a class is to tailor it to the niche it needs to fill. The class should be able to fulfill the requirements presented to it comprehensively, without being too specialized. To do this, the student body should be surveyed to gain an understanding of what the students expect. The survey must be concise, but it also must gather all of the necessary information from the student body. Once the demand is understood, the class curriculum can enter the development phase.

Utilization of whatever existing facilities and resources is an excellent way to limit cost and reduce logistical complications of the class. This increases accessibility and inspires more backing from the administration. It is a simple fact that a class that is simple and inexpensive to operate is more attractive than a complicated or pricey class. Additionally, the utilization of existing resources increases the value those resources have for the school. WPI has an amazing opportunity with the addition of the bouldering wall in the basement of Harrington Gymnasium. This will allow students to practice their climbing skills regularly. Central Rock Gym is a valuable third party resource that is very close to campus and is well equipped for more technical aspects of climbing.

New and interesting concepts must be introduced. The class should be engaging, following upon WPI's mantra of Theory and Practice. The class should be informative and practical, helping students gain new skills and knowledge. Adaptability of the course is also key. To make a class that only works for WPI would not be very productive. The information and process taken and documented should be able to be applied at different schools. This will allow other colleges to add an entry level climbing to their physical education curriculums with minimal effort, as most of the scheduling and syllabus has already been determined and just needs to be applied to the schools' particular schedule.

METHODS

Formulation of the IQP

The decision to create a climbing class arose after the idea to expand WPI's climbing facilities came to an unsatisfactory conclusion. The thought process was that if the facilities could not be expanded, then maybe the awareness and knowledge of climbing could be. Climbing as a physical education class was not unheard of. However, a process and curriculum had never really been developed and documented. The goal became to create a climbing course for WPI, to create a model for which other schools could use, and to develop a guideline for future students who want to create PE classes.

Interviews

Dana Harmon

Dana Harmon is the Director of Physical Education, Recreation and Athletics at WPI. The team first met with Ms. Harmon to figure out what the necessary steps were to creating a new physical education course at WPI. During this meeting, Ms. Harmon stated that current WPI students are not permitted to serve as coaches for the class. Instead, either a faculty member or another coach is required to submit final grades for students. Funding for an instructor can be attained through the athletics department if the class is offered as an official PE class or through SGA if the class is offered as a club sport. Students can also help to pay for part of the class in the form of club dues. Finally, Ms. Harmon also suggested other faculty members to interview, namely Ann McCarron and Mike Curley. For a full version of the interview with Dana Harmon, please see Appendix I: Notes from Interview with Dana Harmon (2012, October 30)

Ann McCarron

Ann McCarron is the Associate Director of the Athletics Department at WPI. In order to create either a physical education course or a club sport for receiving credit, the program and budget must be approved by Ms. McCarron. In order to have an approved program, the class must have a class syllabus, instructor, and class curriculum. The class must also have a method for tracking student attendance in order to properly assign grades at the end of the course. For a full version of the interview with Ann McCarron, please see Appendix J: Notes from Interview with Ann McCarron (2012, November 6)

Joey Bianchi

Joey Bianchi is an American Mountain Guide Association (AMGA) certified instructor who works at the local rock climbing gym, Central Rock Gym (CRG) Worcester. The team met with Mr. Bianchi in order to get his feedback on a potential course curriculum, to get a cost estimate for students who intend to climbing at CRG for getting PE credit, and to find out what certifications the CRG staff had available.

Mr. Bianchi offered a discounted student rate for the team at $40 a month for a full student membership or $35 a month for a membership that only allowed students to climb before 5pm every day. The membership includes access to all three of Central Rock Gym's locations, belaying classes, discounts on climbing equipment, and free gear rental for 30 days. The membership is a very reasonable way to introduce new climbers to the sport, because of its comprehensive package.

The staff at Central Rock Gym is very well-equipped to teach students in various climbing-related matters, including climbing technique, top-rope belaying, lead belaying, setting, knots, safety systems, and climbing equipment. Each staff member of Central Rock Gym is both First Aid and CPR trained. In addition

to the safety training, staff members also go through a Central Rock Gym training program that allows staff members to teach students how to belay, lead climb, and rappel.

Finally, Mr. Bianchi also suggested that the team develop one unifying course for rock climbers. This ensures that both new and seasoned climbers alike will be able to learn from the course, and this could be used to prepare climbers for a more advanced course in the following years. The curriculum Mr. Bianchi suggested for the class consists of the following topics:

- Top-rope belaying
- Climbing technique
- Spotting and safety
- Anchor building
- Climbing knots
- Climbing equipment
- Climbing systems
- Lead climbing and sport climbing
- Traditional (trad) climbing
- Route setting

The majority of the aforementioned topics were incorporated into a class syllabus that the team developed and later tested. For a full versions of the interviews with Joey Bianchi please see Appendix K: Notes from Interview with Joey Bianchi (2012, November 6) and Appendix L: Notes from Interview with Joey Bianchi (2013, February 27)

Student Government Association (SGA)

The Student Government Association (SGA) is in charge of governing the extra-curricular and student-life activities that are available on campus. The team met with SGA to try and find out what steps were necessary for establishing a new club sport for PE credit. SGA could assist in subsidizing the cost of having a rock climbing course if the class operates under club sports. One member of SGA, Rachel Komara, is interested in creating new PE classes that include "extreme sports."

Student Survey

In order to gage student interest in a new rock climbing physical education course, the team created a survey that would be sent out to the undergraduate student body. The survey was designed to answer the following questions:

- Is there a need for a new PE course?
- Are students interested in rock climbing?
- If a rock climbing course were offered, what do students expect?

The entire survey consisted of the following 18 questions:

1. How difficult is it to schedule a PE class?
2. How many times have you been unable to be on the waitlist for a PE class?
3. How many times have you been waitlisted for a PE class?
4. How many times have you been waitlisted for an academic class?
5. How enjoyable are the PE classes that you take?
6. Have you ever felt like you are stuck taking a PE class that you won't enjoy just so that you can graduate?
7. Have you ever rock climbed before?
8. Did you know that WPI has a bouldering wall on campus and that it is called the CAVE?
9. Do you know where the CAVE is?
10. Have you ever had trouble getting to the CAVE?
11. Please elaborate on your answer to the previous question.
12. How many days per week do you visit the CAVE?
13. Did you know that you are able to access the CAVE through the main entrance of the REC Center?
14. If a climbing class were to be introduced, would you sign up for it?
15. If there were two options for a climbing class, a beginner class, and an intermediate class, which would you take?
16. How many hours a week did you spend in order to receive a PE credit (through varsity, club, PE class, or any other available option)?
17. When would you prefer to have a PE class?
18. What would you like to see in a climbing class?

The first six questions of the survey were used to determine whether or not students had difficulties scheduling PE classes, their interest in PE classes in general, and whether or not adding a new class would be beneficial for students. Questions seven through fourteen were used to gage student interest in rock climbing. Finally, the last four questions were used to determine what students might expect from a rock climbing class.

In order to get more students to respond to the survey, a prize of two climbing passes to Central Rock Gym were offered through a raffle. The survey responders, however, were not aware of the actual prize, except that it was worth $48. This was done in order to avoid potential skews in data, because the team did not want a disproportionately large number of individuals interested in rock climbing to answer the survey.

First Syllabus

After interviewing Joey Bianchi, analyzing the student survey results, and reading *Rock Climbing: Mastering Basic Skills* by Craig Luebben, the team composed a syllabus for a test run of the rock climbing physical education course. Because of the lack of funding, the test run of the course was conducted primarily in the CAVE and was led by the IQP team members. The syllabus was designed for one hour of instruction per week. In order to attain the necessary 21 hours for PE credit, students spend at least two hours a week practicing the material taught in the instructional period. The overview for the initial class curriculum is broken down by week as follows:

0. Class preparation
1. Climbing technique for bouldering
2. Rock climbing workout routines
3. Top rope climbing and belaying
4. Rope climbing technique
5. Rappelling
6. Setting
7. Introduction to lead climbing

Week 0: Class Preparation

Before the beginning of the class, the coach in conjunction with members of the CAVE must first set all of the routes necessary for teaching the class. These routes will serve as demonstrations for the different techniques used in rock climbing that will be taught to the students. In addition to setting these routes, the instructor will need to gather all of the necessary equipment for teaching the class, including but not limited to the following:

- Rock climbing shoes
- Climbing rope
- Belaying devices
- Rock climbing harnesses

Week 1: Climbing Technique (Bouldering)

The first instructional period begins with having students fill out liability forms and anti-hazing forms that are required for using the CAVE and participating in club sports. Next, students are then asked to fill out another form that includes fields for the following, which will be used to tailor the class to the participants:

- Name
- Email
- Class year
- Previous climbing experience
- Expectations for the class

The first instructional period of the class will be used to teach students how to spot climbers, which is the primary precaution for bouldering. Because bouldering does not rely on a rope or harness for safety, spotters are required to aid a climber to land on her feet if the climber falls. Appendix D: Spotting Instructions is a complete guide to spotting for bouldering.

In addition to teaching students how to spot, the instructor will guide students through a warm-up routine and demonstrate basic climbing techniques. The warm-up routine and climbing techniques will be applicable to all future climbing sessions that the students will experience.

- Run a warm-up lap with or without stairs
- Roll head around 5 times in each direction
- Roll shoulders forward and backward 10 times
- Spin arms forward and backwards (windmills) 10 times
- Legs Swings, parallel and perpendicular to wall 10 times each leg
- Roll around ankles 10 times
- Finger tendon glides

In colder areas or after not climbing for a long period of time, climbers should warm up again in order to prevent injury. By warming up and by using dynamic stretching before the workout, the climber will be able to climb harder with less chance of injury. See

Appendix B: Warm-Up Routine for more details and explanations.

After the students warm up, the instructor will lead the participants through a series of demonstrations for the different techniques involved in rock climbing. The three main categorizations for rock climbing fall in the following: footwork, hand and arm positioning, body positioning, and moving. Students will also be informed that the "final exam" for the course will be to set a route using a number of these techniques.

Footwork	Arms and hand	Body positioning and moving

• Backstep
• Froggy
• Flagging
• Toe placement
• Smearing
• Heel hook
• Toe hook
• Kneebar
	• Jug
	• Crimp
	  ○ Open
	  ○ Closed
	• Pinch
	• Mono
	• Gaston
	• Palming
	• Mantel
	• Matching
	• Sidepull
	• Undercling
	• Pocket
		• Stemming
		• Twistlock
		• Drop knee
		• Cross through
		  ○ Reach across body
		  ○ Stepping through
		• Dyno
		• High step
		• Hand-foot-match
		• Layback

Table 1: Climbing Techniques Covered

Table 1: Climbing Techniques Covered includes all of the climbing techniques that will be covered in the first day of class. Each of these techniques will be demonstrated on the bouldering wall and then attempted by each of the students. Because of the extensive list of techniques, the first instructional period will be an interactive learning experience that will likely take more than the one hour that is normally allotted for instruction. Any remaining time between when the instruction ends and the conclusion of the climbing session will be used to allow students to climb on their own and ask questions about any difficulties they might encounter. A full list of climbing techniques with images is supplied in Appendix A: Holds, Moves, and Techniques.

Finally, during the last ten minutes of class, the instructor will lead students through a series cool-down exercises. This is useful to ensure that students properly conclude the class to avoid unnecessary strains in the future. The stretches used are listed below:

- Place hand on wall and turn outward to stretch chest muscles
- Bring arm across chest to stretch back muscles
- V-sits to stretch calves

Week 2: Equipment

The instructional period of the second week will be committed to introducing the students of the class to rock climbing equipment. Students will participate in a hands-on learning experience by testing the equipment covered in class while the instructor lectures. The following equipment will be covered in the instructional period. *Mountaineering: The Freedom of the Hills* provides detailed explanations of equipment.

- Carabiners
    - Shapes
        - Oval
        - D-shape
        - Asymmetric D-shape
    - Locking versus non-locking
        - Auto-lock or screw lock
        - Keyed or tooth lock
    - Gate types
        - Wire gate
        - Bent gate
    - Gate strength
        - Open verses Closed
- Harnesses
    - Alpine harness
    - Full-body harness
    - Technical harness
    - Double back straps on older models
- Belaying devices
    - ATC, Grigri, Smart belay
- Climbing rope
    - Single, twin, and double lines
    - UIAA testing standards
- Helmets
    - Fitting helmets
- Shoes
    - Slippers, Velcro, laces
    - Approach, aggressive
- Chalk
    - Liquid chalk
    - Block chalk
    - Loose chalk

After the instruction is complete, students are permitted to either continue testing the equipment or boulder until the end of the class session. Before students begin climbing, they should perform the warm-up exercises that were introduced during the previous session. During the climbing period, students will also be introduced to a climbing game called "add-on" that is useful as a strengthening exercise. The rules for "add-on" are listed in Appendix E: Add-On Rules. To conclude the class, students perform the cool-down stretches.

Week 3: Belaying

Belaying is an essential ability for rock climbers who wish to participate in climbing that exceeds 15 ft. in height. Belaying is used in conjunction with a rope that will be used to arrest the fall of a climber. Thus, great care must be taken when teaching students how to belay, because belaying is a life-saving ability. Because the team believes that nothing can be taught without practice, the belaying class will be taught at Central Rock Gym, where facilities for belaying are available to students. For more details on belaying please refer to

Appendix C: Belaying Instructions.

- Review of gear
    - ATC, Grigri
- Demonstrate belaying equipment on an anchor
    - Instructor pulls on loose line
    - Belayer must demonstrate ability to release line and brake

- Tying in
    - Harness use
        - Belayer uses belay loop
        - Climber uses both harness loops
        - Make sure straps are doubled back
    - Figure 8 and double fisherman's knot
    - Peer check on safety precautions
        - Ensure figure 8 knot is double-double-double
        - Ensure that carabiner is locked
- Belaying commands
    - "On belay?" - "belay on"
    - "Climbing!" - "climb on"
    - Slack
    - Tension, take
    - Falling
    - "Lower?" - "lowering"
- Inform students on the rating system for rope-route difficulty

Once all of the students have demonstrated the ability to belay properly, they are encouraged to practice belaying by climbing top-rope routes and belaying for each other. It should be noted that the commands and double checks are essential to the integrity of the belay system. Communication must be established and all components in the system doubled checked to ensure both climbers work well together and climb safely.

Week 4: Technique, Training, and Conditioning

During the fourth week of the class, students have learned the basic techniques and essential abilities for rock climbing. At this point, students are then led through a review of climbing technique along with other exercises designed to condition and strengthen rock climbers. In addition to the climbing game add-on, students will learn a new warm up routine, re-grasp training, and low intensity high repetition training.

- Take a lap
- Arm rotations (windmills)
- Tendon glides
- Iron cross
- Scorpion

- Climb one or two V0s

The above list is the new warm up routine the students will perform before each climbing session. While the previous warm up routine did not include climbing, this one incorporates climbing, because the warm up routine should be more directed toward climbers than serve as a general warm up routine. At this point, it is assumed that students are comfortable enough with climbing that climbing a V0 will serve as a form of warm up as opposed to a significant strain.

Re-grasp training is also another form of climbing that will greatly improve climber ability. While making a move to a new hold, a rock climber will often place her hand on the hold in a poor orientation and be forced to adjust her grip before proceeding, which is a significant waste of energy. When practicing re-grasp training, a climber is not permitted to adjust his hand once he reaches a hold. This ensures that the climber takes proper care when making moves, and reduces the amount of effort needed to climb routes. Students will be encouraged to participate in this activity and critique each other's climbing techniques.

Another form of training that is useful for developing good strength is low intensity high repetition climbing. Instead of spending significant effort attempting to climb a route that is on the border of a climber's ability, the participant instead climbs a far greater number of routes that are significantly below her ability. This exercise can easily be combined with the game of add-on with a group of climbers of similar abilities.

Week 5: Rappelling

Another crucial ability for rock climbers, especially those who wish to climb outdoors, is rappelling. Rappelling is used by climbers to descend rock walls and other steep terrain that cannot be hiked down. This class must be conducted at Central Rock Gym, because the CAVE does not have the facilities for demonstrating rappelling. Students will be instructed how to rappel and how to use a fireman's belay.

Week 6: Setting Class

Although many students and climbers may not have an interest in learning how to set routes, the team determined that the ability to set routes is a clear indicator regarding a student's mastery of the material taught in the class. During the instructional period of the sixth week, students are taught the basics of route setting, namely choosing the correct bolt length, choosing the correct type of bolt, taping route, and tapping t-nuts. Next students are given the following list of moves:

- Mantle
- Palming
- Undercling
- Stemming
- Kneebar
- Heel hook
- Toe hook
- Knee drop
- Sidepull

- Gaston
- Layback
- Bump
- Match
- Bat-hang
- Backstep
- Hand-foot-match
- Crossthrough
- Foot swap
- Froggy
- Dyno

Students are then required to set a bouldering route in the CAVE that incorporates at least three of the climbing techniques in the above list. Students are given two weeks to finish setting their route and then must demonstrate the routes to the instructor. Students are also permitted to critique each other's routes or seek direction from the instructor.

Week 7: Climbing Systems

The final instructional period of the course is designed to provide students with a glimpse of what else they might experience in the world of rock climbing. During this period, students will be introduced to lead climbing, which is a form of climbing where the climber must attached himself to pieces of protection while climbing a route. The intent of the class is not to teach students how to lead climb, because it is very improbable that a student who has never climbed before taking the class will be capable of meeting the challenge that is presented by lead climbing. During the rest of the climbing session, students will be permitted to continue working on setting their respective routes. Finally, the class will be concluded with demonstrations of the students' routes.

Testing Class Syllabus

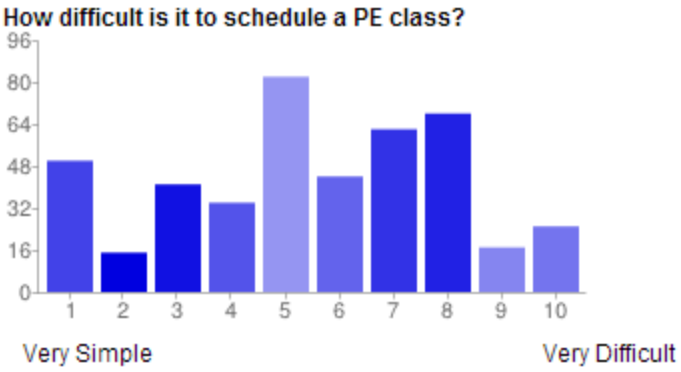
During C Term of the 2012-2013 academic year, the team tested the course curriculum with a number of Outing Club members who were interested in learning more about rock climbing. The lessons were conducted every Tuesday night, from 7 to 10pm, in the CAVE. At the end of the class, the students who participated in the class were asked to provide feedback for how the class was conducted.

RESULTS AND DISCUSSION

Student Survey

The survey successfully answered the three questions the team had in regard to creating a rock climbing physical education course. Some of the survey responses will be analyzed here, while the complete results of the survey will be provided in

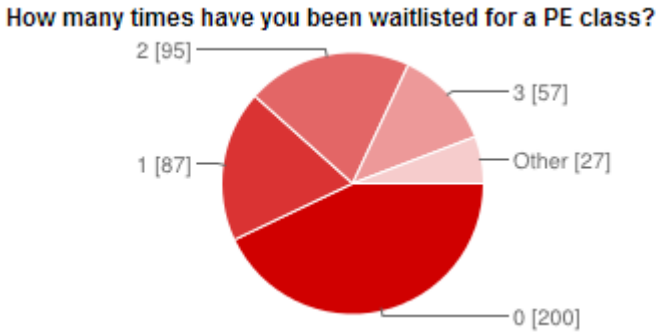
Appendix G: Full Survey and Results.



1 -	Very Simple	**50**	11%
2		**15**	3%
3		**41**	9%
4		**34**	7%
5		**82**	18%
6		**44**	9%
7		**62**	13%
8		**68**	15%
9		**17**	4%
10 -	Very Difficult	**25**	5%

Figure 1: Survey Question 1

According to Figure 1: Survey Question 1, the average difficulty of the responses is 5.46. This suggests that scheduling physical education courses is no trivial feat. By adding another physical education course at a convenient time, students will have fewer difficulties finding an appropriate time to fulfill their physical education requirement. Because the CAVE is open from 7 to 10pm every weekday night, students have great flexibility when it comes to completing the 21 hour requirement for class credit.



0	**200**	43%
1	**87**	19%
2	**95**	20%
3	**57**	12%
Other	**27**	6%

Figure 2: Survey Question 3

Figure 2: Survey Question 3 shows that 57% of students have been waitlisted at least one time for a physical education course. This is a significant number of students, and adding one more course will help alleviate this problem.

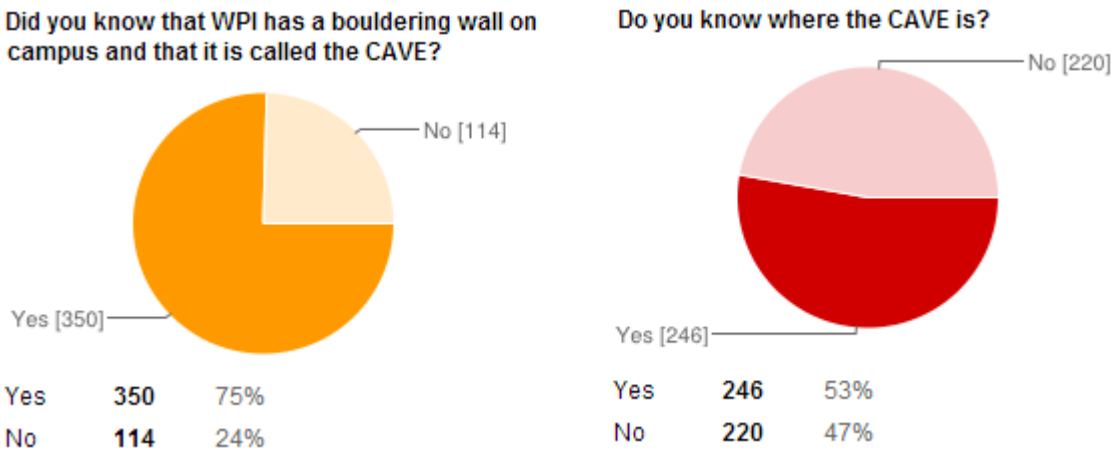


Figure 3: Survey Questions 8 and 9

Figure 3: Survey Questions 8 and 9 shows that about three quarters of students are aware that the CAVE exists, but only slightly more than half know the CAVE's location. About one quarter of the student body is unaware that there are rock climbing facilities available on campus, which is a significant portion of the students.

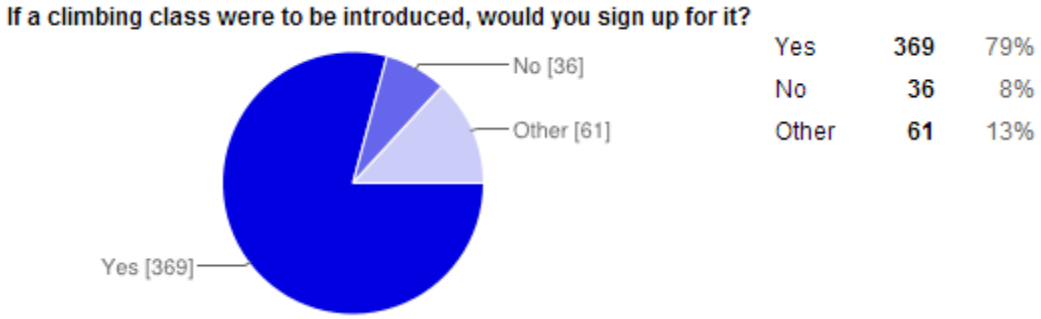


Figure 4: Survey Question 14

Figure 4: Survey Question 14 shows that more than 80% of students would be interested in taking rock climbing for a physical education class. Some of the students who answered "other" had either fulfilled all their PE requirements or were graduating but were otherwise interested in taking rock climbing as a class.

Increasing CAVE Awareness

In order to increase student awareness of the CAVE, the team put together a PowerPoint presentation with a series of images that led from the front doors of the Sports and Recreation Center to the entrance to the CAVE. This presentation was then shared with students who took the survey that were interested in rock climbing, but were unaware of the location of the CAVE.

In addition, greater advertisement efforts were made in conjunction with the WPI Outing Club. The efforts included teaming up with the WPI Social Committee during the campus-wide event, Quadfest, to have themed climbing open to all students. These advertisements, though not designed and run by the IQP team, were inspired by the IQP. The IQP motivated the community already involved with the CAVE to bring more students into the world of rock climbing. The healthy and physical activity has brought students out of their dorm rooms where many would spend the night surfing the internet or playing video games. As the awareness of the CAVE increases the more students will come out and climb. This alone helps WPI grow as a school.

Class Test Run

During the test run of the course, the team noted that the second week of the course in particular was very overwhelming for new rock climbers who have no belay experience. It proved difficult to demonstrate the use of gear when students were not aware of the different climbing systems available. Because of this, the team decided that the syllabus should be reorganized such that students are introduced to rock climbing equipment as the equipment becomes necessary to the student.

Revised Syllabus

Week 0: Class Preparation

Prior to the first week of classes, the instructor and other student volunteers will gather all the necessary equipment for the class and set routes that utilize the different climbing techniques that will be taught in the class. Instead of gathering all the difference belay devices available; however, the class will focus on two of the most commonly used belaying devices, the ATC and the Grigri. The team decided to not discuss uncommonly found belaying devices as to not overburden students with information. Learning how to use two belaying devices well is better than learning how to use a large number of devices poorly.

In addition to limiting the number of belaying devices covered in the class, the team also decided that more time should be spent regarding carabiners. Thus, the instructor must gather a number of different carabiners that serve different purposes. The applications for the different carabiners will be discussed during the top rope lesson of Week 3: Top Rope Climbing.

The team also decided that instead of having an official instructor or coach for the rock climbing class, the rock climbing techniques for the class will be taught by current WPI students who have more experience with climbing. In addition to climbing experience, all student instructors will have First Aid, CPR and AED certifications. By having multiple student teachers, the class can accommodate a larger number of participants. Each of the participants will thus have more personal instruction time. In addition to the

benefits to the students, teaching material greatly reinforces the teachers' knowledge and helps to highlight any missing pieces of knowledge the instructors might have.

Week 1: Climbing Technique (Bouldering)

Instead of teaching all of the climbing techniques listed in the syllabus only once at the beginning of the class, the team decided that it would be beneficial to cover the material during two different classes. During the first week, core climbing techniques that are more useful for new climbers and bouldering will be taught to the students. Students will first be taught the different climbing holds, proper use of legs in climbing, and the twist-lock technique. Other climbing techniques will be introduced to the students as necessary. Depending on how ambitious the students are, any more of the material from Appendix A: Holds, Moves, and Techniques may be covered.

In addition to teaching core rock climbing concepts to students, the first instructional hour will also be used to demonstrate spotting technique and a warm-up routine for new rock climbers. Spotting technique is documented in Appendix D: Spotting Instructions, and the warm-up routine is documented in

Appendix B: Warm-Up Routine.

Week 2: Workout

The team discovered that for new climbers especially, introducing all of the climbing equipment that climbers may encounter is very overwhelming. Climbers who have not encountered other forms of climbing had trouble linking the usage of a piece of climbing equipment to a type of climbing they had not seen before. In addition, with a physical sport, some things are easier to demonstrate than to describe. Thus, instead of spending one entire session committed to reviewing climbing equipment, the second week will instead be used to introduce some workouts and practices that are beneficial to rock climbers. The primary practice is a low-resistance, high repetition exercise that requires climbers to climb easier routes until form degrades. In addition to this, students will be introduced to the game of add-on. Instructions for the game of add-on are documented in Appendix E: Add-On Rules.

Week 3: Top Rope Climbing

The third instructional period of the class will be spent at Central Rock Gym Worcester, because the WPI CAVE does not have the facilities necessary to properly teach and practice belaying and top rope climbing. By taking the top rope lesson at CRG, students are guaranteed to be taught by a certified instructor. This limits the possibility of improper instruction. Commands and techniques used for belaying are documented in

Appendix C: Belaying Instructions.

Appendix C: Belaying Instructions is a set of guidelines and is not intended to be a replacement for taking belaying lessons from a certified instructor. The cost for taking the belaying class at Central Rock Gym is $10 per student. The remaining time will be used by the students to practice belaying and climbing top rope routes.

Week 4: Technique Review and Extension

The fourth instructional period will serve as both a review for climbing technique and an introduction to more exercises to improve climbing ability. Because roped climbing is far more exhausting when climbing without proper technique, the team deemed that a review of climbing techniques will be beneficial to students. In addition to reviewing, time will also be spent on teaching students new techniques that have not yet been covered in the class and are documented in Appendix A: Holds, Moves, and Techniques. The instructional period will also be used to teach students about re-grasp training.

Week 5: Rappelling

Rappelling will also be taught at CRG, because the WPI CAVE does not have facilities for teaching and practicing rappelling. The cost for the rappelling class is also $10 per student. The remaining time during the class period will be used by the students to practice belaying and top rope climbing.

Week 6: Setting Class

The sixth week of the class will be used to teach students how to set routes. The team decided that setting routes is a good method for determining whether or not a student has sufficiently learned the material covered in the class. Students are given one week to set a route and are required to use at least three of the climbing techniques as documented in Appendix A: Holds, Moves, and Techniques.

Week 7: Lead Climbing Introduction

The final week of the class will be used for introducing students to lead climbing. Students will get to practice attaching themselves to pieces of protection on a rock climbing wall. Students will also be taught the dangers and frequent mistakes made by lead climbers. The intent for this class is to show students what they might encounter after having mastered the basics of bouldering and top rope climbing. Appendix F: Sport Lead Climbing and Sport Lead Belaying Basics provides and introduction to Lead Climbing. The remaining time in the class will be allotted for completing route setting. Finally, the class will be concluded with demonstration of the routes set by the students.

Process Outline

Because part of the objective of this IQP was to document and streamline the process of creating a PE class at WPI, the team felt the need to commit a section of the paper to explicitly state the steps that the team recommends to develop a PE class.

1. Determine student interest, need, and expectations for a PE class. This can be done through a survey.
2. Determine whether the class should be a club sport or an athletic class. A club sport may require students pay an extra fee for participating. This can be helpful in covering the cost of hiring an instructor.
3. Determine what the Athletics Department expects of a club sport or athletic class. This includes but is not limited to the number of hours required for students to attain class credit and qualifications of instructors.
4. Create a course curriculum based on student expectations for the course. If time permits, perform a pilot run of the course to gage whether or not the curriculum is appropriate.
5. Find an instructor for the class, making sure the instructor has the proper qualifications.
6. Compile a syllabus and budget and have an instructor before submitting the class request to the Athletics Department. Be aware of budgeting time frames and deadlines.

Conclusion

The purpose of the IQP was to establish a process to design a new physical education class and apply the process using climbing as a focus. Along the way increased awareness of WPI's climbing facilities was made and many students were introduced to the sport. There is a large interest in the student body for the class and the faculty is supportive. Utilizing the revised syllabus and the club sport avenue the class is projected to be put into effect for the 2014-2015 academic year.

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APPENDICES

Appendix A: Holds, Moves, and Techniques

Name: Arête (Not Pictured)

Method of Identification/Description: An arête is a feature used such that an edge or corner of a wall can be used as a hold.

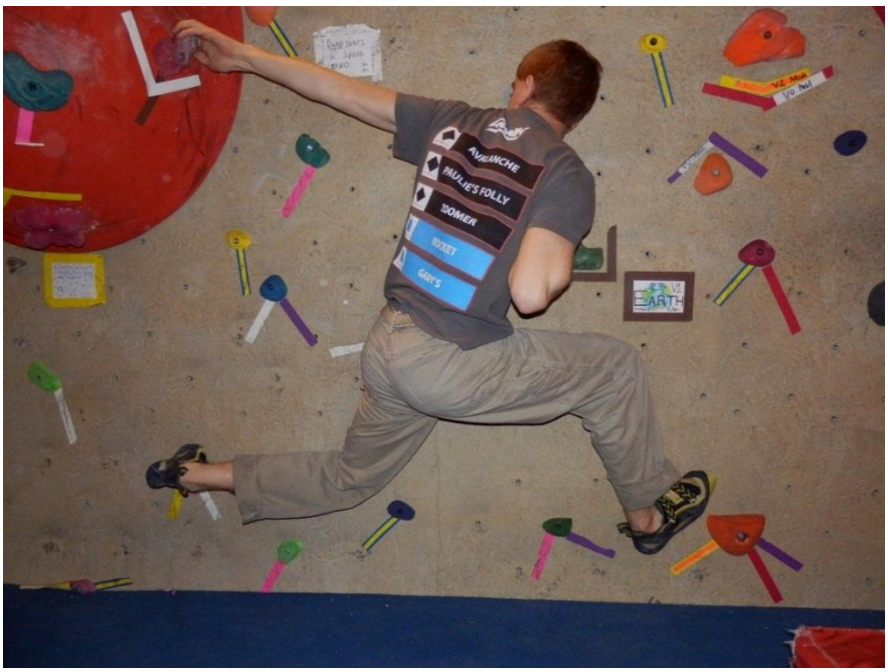
Application: Arêtes can often span over a long portion of the wall allowing a climber to work his way up a wall with no other holds.

Name: Backstep

Method of Identification/Description: A backstep will occur when the climber reaches backwards with one foot or the other in order achieve better footing behind the climber.

Application: This move can increase stability while climbing

Additional Information: This type of move can become more difficult if the better footing is farther back, causing the climber to do a split-like movement.



Appendix A Figure 1: Backstep

Name: Bump (Not Pictured)

Method of Identification/Description: Bumping is done by quickly moving a hand or a foot from one useful hold to another.

Application: Bumps can help a climber move across a wall by breaking up a long move into two parts. Additional Information: Bumping can be difficult on overhangs.

Name: Chimney (Not Pictured)

Method of Identification/Description: A gap in the rock with vertical sides that are mostly parallel. A climber should be able to fit within it. A climber chimneys by applying pressure to both wall faces to prevent themselves from falling.

Application: This type of movement is found outdoors and is a useful climbing skill.

Additional Information: The act of chimneying can be practiced indoors by using a door frame.

Name: Crimp

Method of Identification/Description: A crimp is a type of hold that is small. Shapes of crimps can vary from holds that resemble small jugs to holds that are more like a flat ridge.

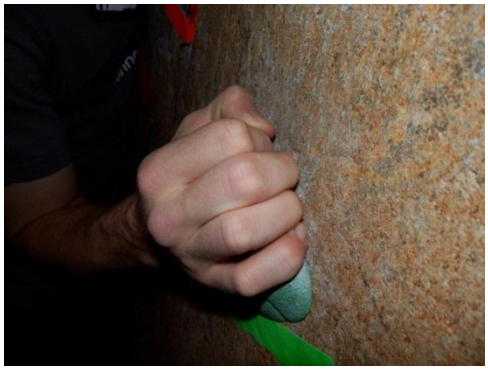
Application: Crimps are often found outdoors. In addition, increasingly difficult routes often have more crimps. Ability to crimp properly can increase climbing ability.

Additional Information: There are multiple ways to hold a crimp. The two main ways are described in the following descriptions.

Name: Full Crimp

Method of Identification/Description: A full crimp is when fingers are curled into the hold and the thumb is also used.

Application: Holding onto a crimp in this manner can increase the amount of power moving off of the hold. Additional Information: Holding a crimp in this manner increases the stress placed on fingers and increases the risk of injury.



Appendix A Figure 1: Full Crimp

Appendix A Figure 2: Open Crimp

Name: Open Crimp

Method of Identification/Description: Open crimps provide less power initially, but training can increase the effectiveness of this hand position and decrease the likelihood of injury.

Application: Open crimps translate well to all types of holds and should be practiced regularly.

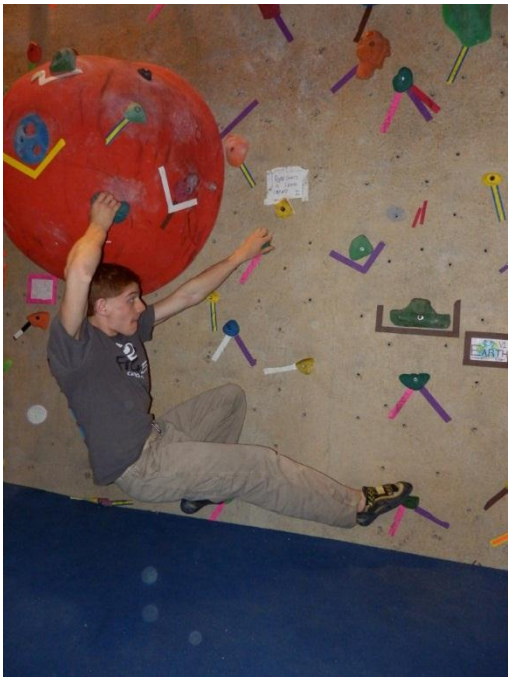
Additional Information: Not all crimp holds will be large enough to place multiple fingers on the crimp.

Name: Crossover/Crossunder

Method of Identification/Description: One arm is crossed over or under the other arm in order to make the next move.

Application: The beta of a route may force a cross.

Additional Information: This move can be more difficult for less flexible climbers. This move can also place addition strain on the shoulders and arms because of the additional twisting motion that it may require.



Appendix A Figure 3: Crossover/Crossunder

Name: Cutting Feet (Not pictured)

Method of Identification/Description: Cutting feet is the term for when a climber's feet lose their purchase on a foot hold. This can be intentional, but is often considered poor form and should be avoided.

Application: Some routes do require a climber to cut feet, in the event of a dramatic change in position where the energy wasted by hanging solely by arms is made up by a vastly improved position.

Name: Deadpoint (Not Pictured)

Method of Identification/Description: This is a dynamic move in which the climber grabs the hold at the apex of an upward lunge.

Application: Many routes with a long distance between hold can forces dynamic moves like a deadpoint

Additional Information: A deadpoint can often be done without cutting feet.

Name: Drop Knee

Method of Identification/Description: A drop knee is performed by rotating the knee downwards towards the ground.

Application: A drop knee can provide extra stability without the flexibility needed for other moves.

Additional Information: This move can be difficult when footing is small. The motion of rotating the knee can cause the climber to lose footing on a small foot hold or chip.

Appendix A Figure 4: Drop Knee

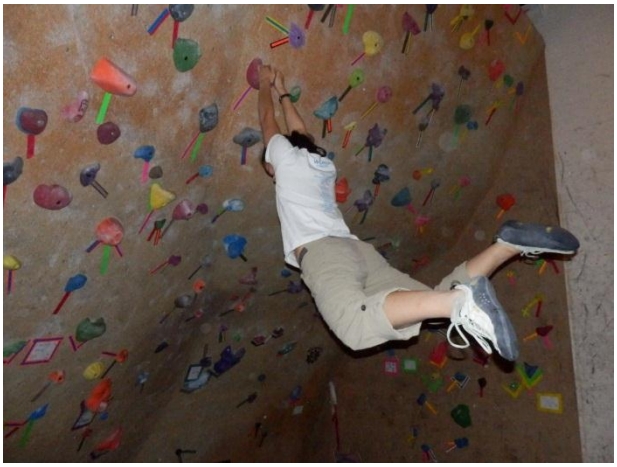
Name: Dyno

Method of Identification/Description: Dyno is short for dynamic, which aptly describe the type of motion for this technique.

Application: In a dyno, the climber launches herself from a lower spot to a spot that cannot normally be reached by simply stretching out and reaching upwards.

Additional Information: Dynos typically should not be attempted by beginner climbers.

Appendix A Figure 5: Starting Position of a Dyno



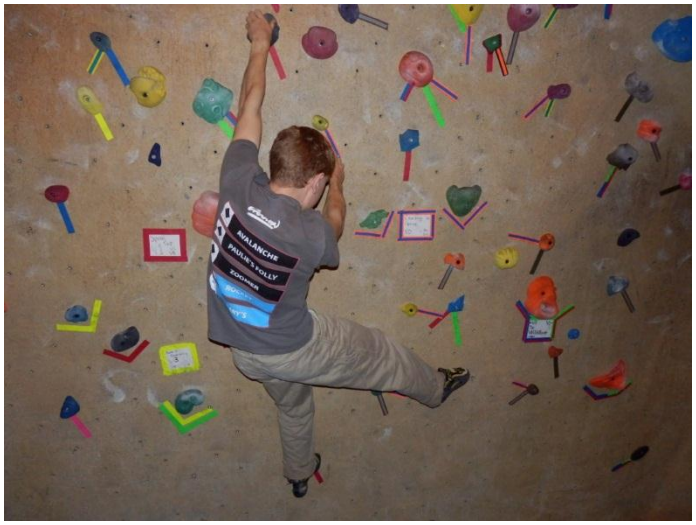
Appendix A Figure 6: Final Position of a Dyno

Name: Flag

Method of Identification/Description: The technique of flagging is done by placing a foot on the wall off to the side in order to increase balance. There is no specific place that a climber should place his foot each time in order to flag, but the climber should place the foot in a way that increases stability. Flagging places an extra point of contact on the wall and increases stability.

Application: Without flagging, a climber is very likely to become unstable and it can be very easy to spin off of a route, pivoting on one leg and arm. This event is known as a "barn door" because the climber resembles a door swinging open.

Additional Information: This technique is not very difficult to master but can be applied to routes of all difficulties.



Appendix A Figure 7: Flag

Name: Froggy

Method of Identification/Description: A froggy can be done in two ways: a toe froggy and a heel froggy. In each method, the feet are placed very close together and compressed in order to provide stability.

Application: A froggy is often used to increase the frictional forces between a climber's shoes and a foothold that is in an otherwise unusable orientation.

Additional Information: This move can be very difficult because it forces climbers to use muscles that they do not often use in everyday life or even everyday climbing.

Appendix A Figure 8: Froggy

Name: Gaston

Method of Identification/Description: A gaston uses one hand with the thumb pointing down and the elbow out.

Application: This move allows the climber to increase the friction on the hold.

Additional Information: A gaston is a move that will cause the climber to move more from one side to another than up. This move can allow the climber to shift weight from one side to the other.

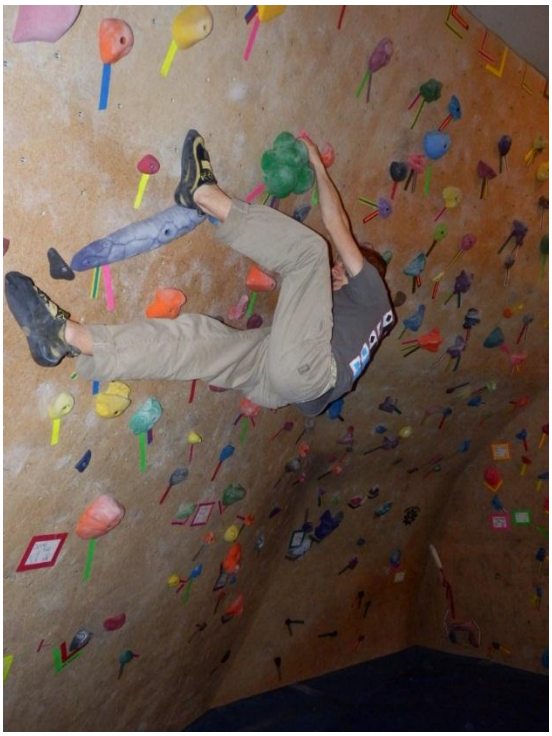
Appendix A Figure 9: Gaston

Name: Heel Hook

Method of Identification/Description: A heel hook is done by placing the heel on top of the hold and pressing downwards with the leg muscles.

Application: A heel hook can provide extra stability and can also help the climber get higher and higher up on the wall.

Additional Information: Heel hooks can put strain on tendons in the knee and can be an uncomfortable move for climbers.



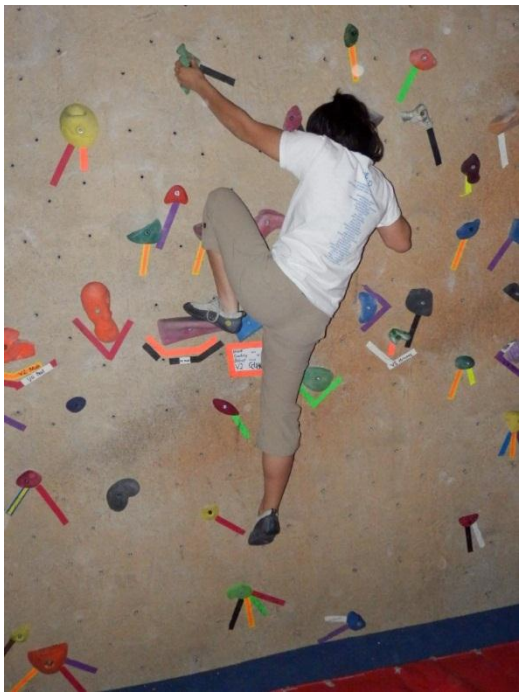
Appendix A Figure 10: Heel Hook

Name: High Step

Method of Identification/Description: A high step is done by getting a foot very high on the wall.

Application: High stepping can allow a climber to ascend a wall more rapidly. In addition, a high step to a good foothold can provide a comfortable rest position.

Additional Information: This type of move can be difficult for a climber that is not very flexible.



Appendix A Figure 11: High Step

Name: Jam (Not Pictured)

Method of Identification/Description: A jam is done by wedging a part of the body into a crack.

Application: Jamming is a useful ability in crack climbing and off-width climbing.

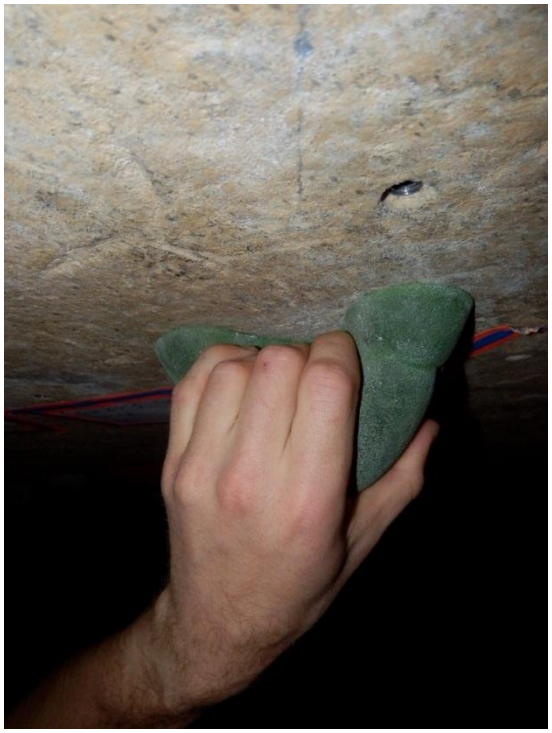
Additional Information: Jamming can put a lot of wear on skin and gear. Crack climbers often create gloves for their hands to protect the skin from rough rock.

Name: Jug

Method of Identification/Description: A jug is a positive hold that is very easy to hold on to.

Application: Jugs are often used in beginner routes as they are very easy to hold onto. They are also used on more difficult overhung routes, such as roofs, as they can be very useful for rest positions or in making long powerful moves.

Additional Information: Beginner routes are often made mostly of jugs in addition to large footholds. Holds can be described based on their positivity. Positivity is determined by how much outward force can be put on the hold without slipping off. A positive hold creates an angle less than 90 degrees between the hold and the wall.



Appendix A Figure 12: Jug

Name: Lie Back

Method of Identification/Description: This type move often occurs when traversing an overhung wall or on a vertical edge. Arms should be kept fairly straight to place more of the weight on the skeleton and feet should be kept on the wall to avoid cutting.

Application: In situations with limited feet or moves that require sidepulls, this technique can be necessary and energy saving.

Additional Information: A lie back is a type of technique that can be difficult for beginners because it puts more weight on the upper body.

Appendix A Figure 13: Lie Back

Name: Mantle

Method of Identification/Description: A mantle is done by placing both palms on a single hold and pushing down.

Application: This moves allows a climber to push down on a hold and raise themselves up. This move could be followed by a high step onto a large enough ledge to provide a good rest position.

Additional Information: The term "mantle" is sometimes used to describe palming.

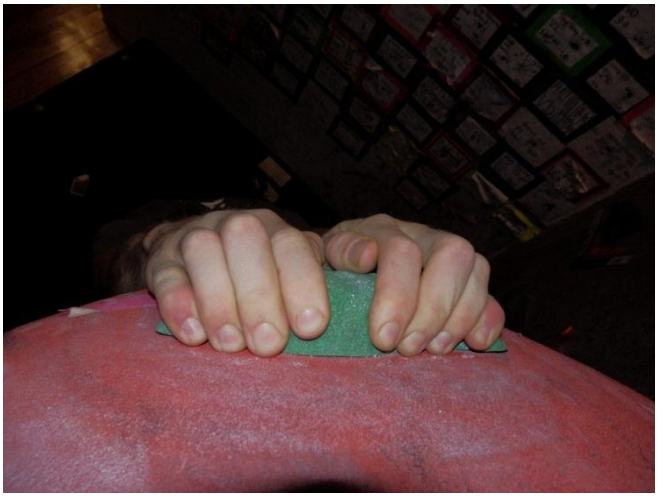
Appendix A Figure 14: Mantle

Name: Match

Method of Identification/Description: A match is when multiple hands or feet are placed on a single hold.

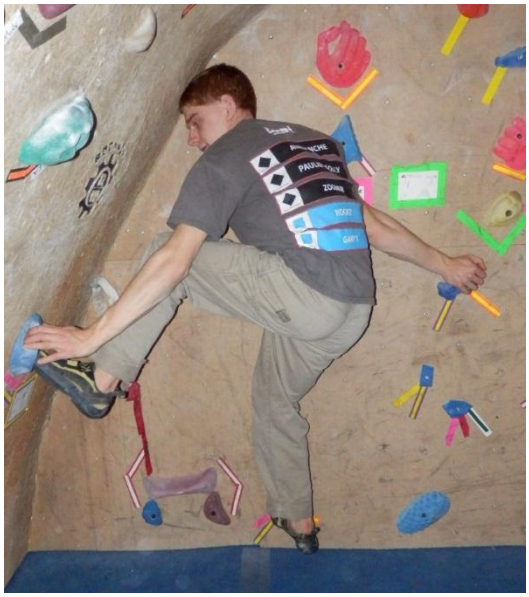
Application: Multiple combinations of limbs can be used to match. This can allow a climber to work her way through a route with limited holds without putting a lot of weight on only on limb.

Additional Information: Examples of a two-handed match and a hand-foot match (also called pied â main) appear below.



Appendix A Figure 15: Two-handed Match

Additional Information: A hand-foot match is another technique that can be very difficult for climbers who are not flexible.



Appendix A Figure 16: Hand-Foot Match

Name: Palm

Method of Identification/Description: A palm is similar to a mantle in that the palm is placed on a hold and pushed against it.

Application: Palming can allow climbers to stabilize and push themselves up to reach a higher hold.

Additional Information: This move when made repeatedly can put excessive strain on wrists.

Appendix A Figure 17: Palm

Name: Pinch

Method of Identification/Description: A pinch is a type of hold named for the way in which it is held. A climber holds a pinch by pinching it.

Application: Pinches are common holds in many routes. They often appear in increasingly difficult routes.

Additional Information: Depending on where on the wall the pinch is placed, the difficulty of the move can vary. The pinch can be very difficult to hold onto on an overhang, but can be much easier to hold on a vertical wall.

Appendix A Figure 18: Pinch

Name: Pocket

Method of Identification/Description: A pocket is a hold in which there exists a small cavity in the hold in which a climber can stick one or all fingers into. A mono is a pocket in which only one digit can be used.

Application: Routes like those found in Hueco Tanks, Texas are filled with pockets.

Additional Information: Because pockets can force climbers to use fewer fingers, pockets can be a cause of injury. Huecos are a large subset of pockets. Huecos have pockets greatly ranging in size from smaller than a finger to the size of a person. Huecos are known for the type of climbing holds found in Hueco Tanks, Texas.

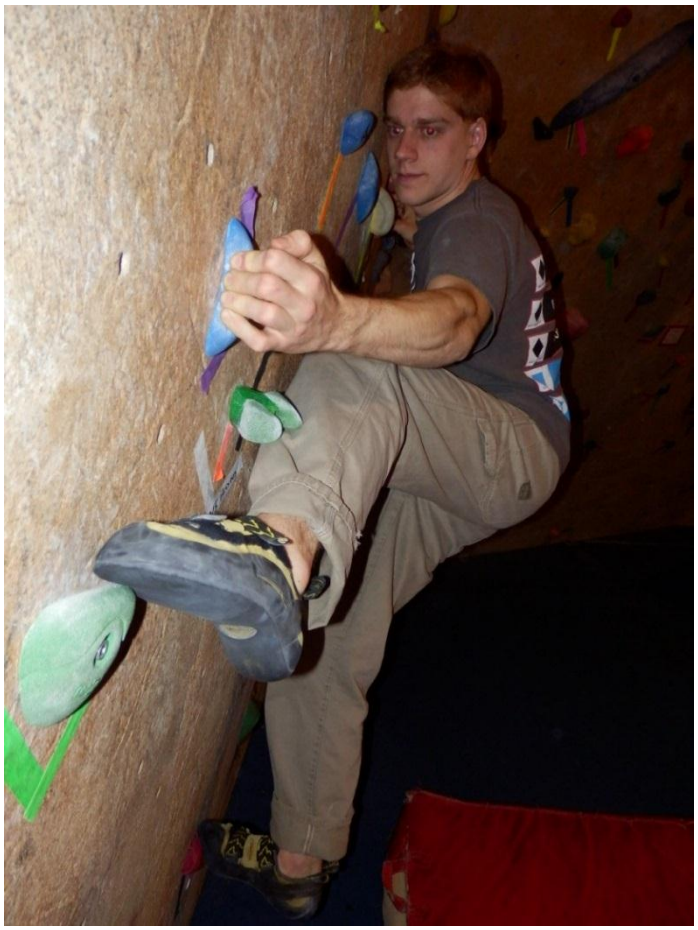
Appendix A Figure 19: Pocket

Name: Side Pull

Method of Identification/Description: A side pull is a hold that needs to be gripped sideways in order to increase friction. A side pull can help a climber move from one side to another.

Application: Side pulls can be very useful when traversing a wall.

Additional Information: Side pulls can require more balance in order to stay close to the wall.



Appendix A Figure 20: Side Pull

Name: Sit Start (Not Pictured)

Method of Identification/Description: A method of starting a route in which the climber starts by sitting on the floor.

Application: In climbing gyms, sit starts allow a setter to add an extra move into the climb.

Additional Information: Sit starts can vary in difficulty depending on how much weight can be placed on the feet when starting.

Name: Sloper (Not Pictured)

Method of Identification/Description: A hold that is not very positive or shakes confidence.

Application: In more difficult climbing, slopers can be found. Slopers often require climbers to lower their center of mass as low as possible to maintain grip on the hold.

Additional Information: Slopers can range in size from smaller than a hand to much larger than a head. A sloper is deemed as such because the hold is not very positive. The angle it creates between the wall face and itself is between 90 and 180 degrees.

Name: Smear

Method of Identification/Description: Done by placing the balls of feet on the wall and by pressing against it.

Application: Some routes that have few foothold can require a person to smear.

Additional Information: Smearing is not necessary on every route. To emphasize good technique, it can be good to take advantage of existing footholds if they are within reach. In addition, smearing more rapidly increases wear on shoes.

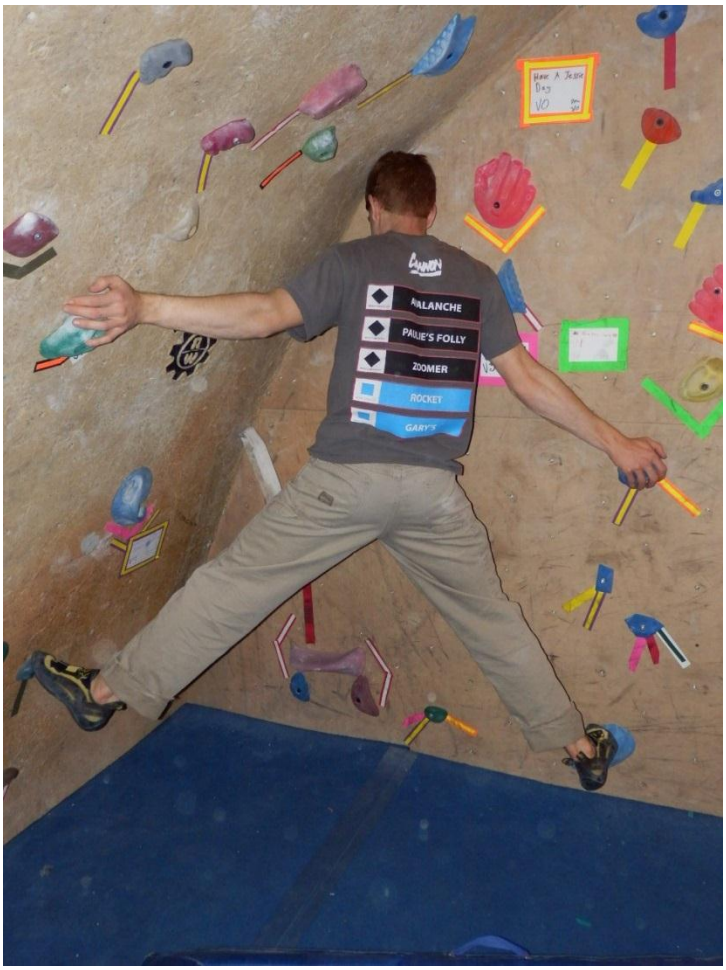
Appendix A Figure 21: Smear

Name: Stem

Method of Identification/Description: Stemming is done by placing feet on two connected wall faces that create an angle of less than 180 degrees.

Application: Stemming is a great way to create a rest position. Climbers can often balance while stemming without using any hands.

Additional Information: Using a stem as a rest position can allow a climber to rest for a long period of time by placing all of his weight on his legs.



Appendix A Figure 22: Stem

Name: Step Through

Method of Identification/Description: Stepping through is done by stepping sideways in front of the leg that the weight is on.

Application: Stepping Through is useful for traversing, or moving horizontally across the wall.

Additional Information: Stepping through can cause climbers to fall off of the wall if they push themselves too far away from the wall.

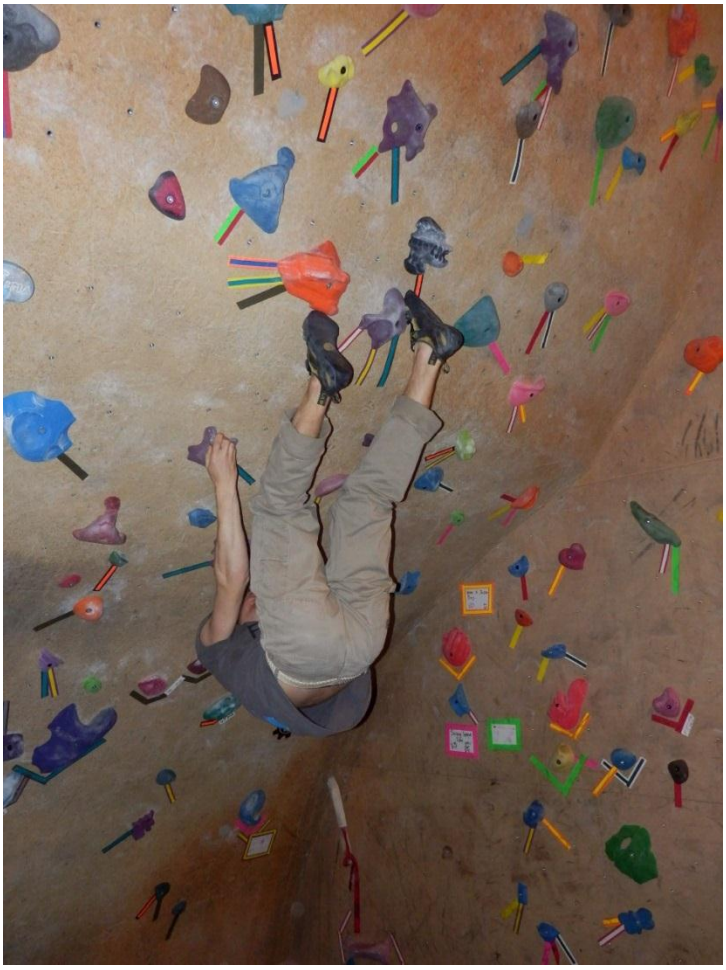
Appendix A Figure 23: Step Through

Name: Toe Hook

Method of Identification/Description: A toe hook is done by using the top side of the foot and toes to "hook" onto a hold.

Application: A toe hook can help the climber pull towards the wall.

Additional Information: Shoes that do not have a lot of rubber on the top of the shoe are more difficult to use for a toe hook.



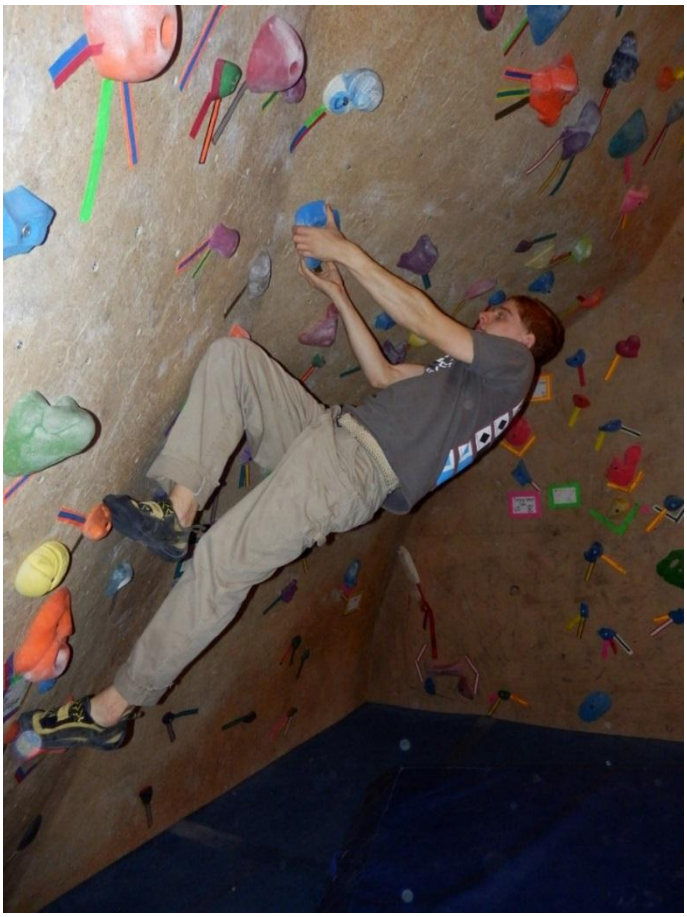
Appendix A Figure 24: Toe Hook

Name: Undercling

Method of Identification/Description: An undercling is a hold that is grabbed from below. A climber pulls upwards and must push up with his legs.

Application: Underclings do exist and the ability to use them makes climbing easier.

Additional Information: Many types of holds can be used as underclings.



Appendix A Figure 25: Undercling

Name: Volume (Not Pictured)

Method of Identification/Description: A large climbing feature that is bolted on. Volumes are often large enough and have spots for the placement of additional holds onto the volume.

Application: Volumes can add more variety to an indoor climbing wall.

Additional Information: Volumes can be very expensive depending on the material but can also be handmade. They can come in many varying shapes and sizes, from hemispheres to stars to amoeba-like shapes.

Appendix B: Warm-Up Routine

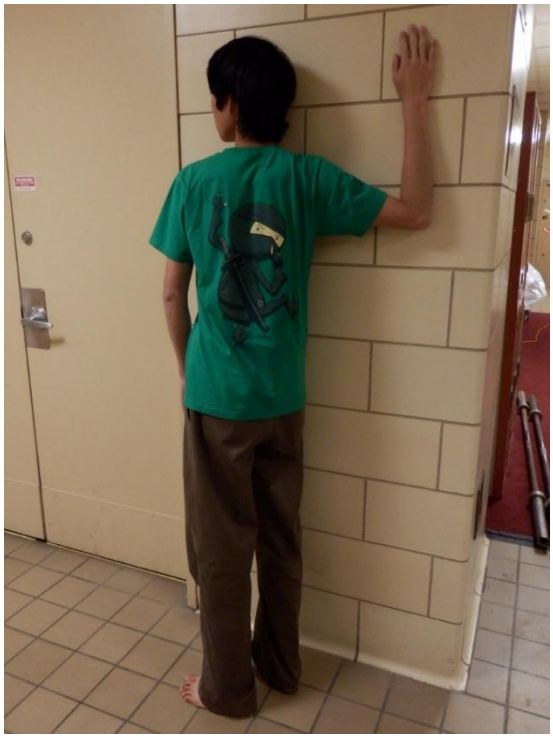
A warm up routine is first and foremost a way to prepare for exercise. The act loosens muscles and increases the heart rate, preparing one for physical exertion. Warming up is an important part of any exercise, because it significantly reduces the chance for injury and prepares an athlete to perform. Workout routines vary sport to sport and can be specialized or generalized, depending on the preference of the athlete.

Climbing is a full body sport, in that every major muscle group is used in some way at some point. Therefor the whole body to be limber and warm before attempting routes that require top performance. Many experienced climbers will warm up on routes well below the grade they normally climb at. This allows them to move about and increase their heart rate, while also monitoring their body for any abnormalities that may be particularly distressed when climbing hard. However, many new climbers find that even the easiest of climbs prove to be some challenge and should not be used as a warm up routine.

For new climbers the main goal of a warm up is a general all body feeling of mobility and warmth. Cold, tight muscles are a recipe for injury. A warm up for a novice climber should include some light cardio and dynamic stretching. The cardio raises the climber's heart rate and promotes blood flow and the dynamic stretching helps loosen muscles and improve range of mobility. For the IQP, the team developed a simple routine based off of routines taught to them by athletic coaches and recommendations from physical conditioning books specifically for climbing. The warm up routine developed is outlined below:

- Take a lap (upstairs or two loops down hallway)
- Roll head around five times in each direction
- Roll shoulders forward and backward ten times
- Stretch arms and shoulders
- Stretch legs
    - Iron Cross
    - Scorpion
    - Ankle rolls
- Tendon glides

Arm and Shoulder Stretches



Appendix B Figure 1a

Appendix B Figure 1b

Appendix B Figure 1c

Appendix B Figure 1d

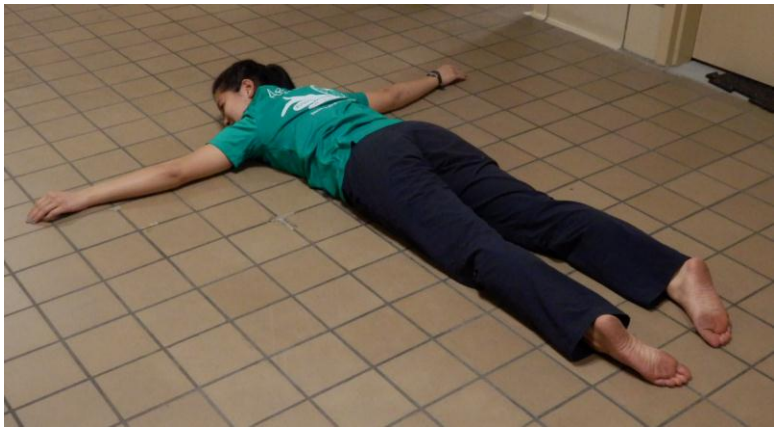
Iron Cross Stretches

Appendix B Figure 1: Iron Cross Starting Position

Appendix B Figure 2: Iron Cross Left Leg Stretch

Appendix B Figure 3: Iron Cross Right Leg Stretch

Scorpion Stretches

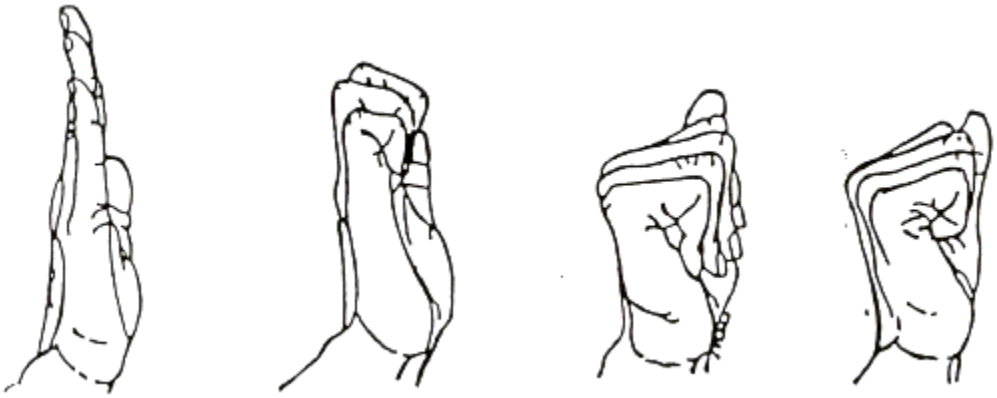


Appendix B Figure 4: Scorpion Starting Position

Appendix B Figure 5: Scorpion Left Leg Stretch

Appendix B Figure 6: Scorpion Right Leg Stretch

Finger Glides



Appendix B Figure 7: Finger Glides[1]

[1] (Exercise for Tendon Gliding and Finger Range of Motion, n.d.)

Appendix C: Belaying Instructions

Belaying is one of the most fundamental skills of climbing next to the actual act of ascending the wall. While not a necessary skill for bouldering, any climber worth their salt will know this simple but lifesaving skill. Belaying is the act of arresting a climber from falling. The belay system is simple and effective, but technique takes some time to master and should be practiced in a gym under the supervision of a certified instructor.

To understand how belaying works, an overview of the rope system should be addressed. For more information on belaying, refer to the chapter on belaying in *Mountaineering: The Freedom of the Hills*. There are three vital components to making an effective belay system: a method of applying a braking force, a strong anchor to withstand the forces generated in a fall, and a skilled belayer to operate the system. These three components work seamlessly to stop a climber from falling if she were to fall.

The first component is the belay device. These come in a variety of shapes and sizes and can be more or less effective for different situations. The options available can seem confusing; however, it is important to understand that they all work. The most common and versatile type is an aperture device, like the Black Diamond Air Traffic Controller (ATC). This device uses friction to apply a braking force during a fall. The rope is threaded through the device around a carabiner and back out through the device as seen in Appendix C Figure 1. The device, when activated by the belayer, applies a large amount of friction to the rope, stopping it from sliding through the device. Now that the device is "locked", the fall forces are then distributed through the anchor matrix and the fall is arrested.

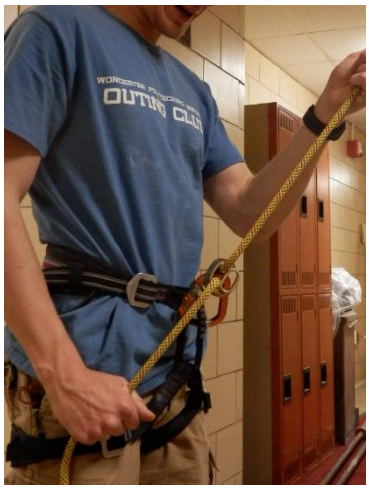
Appendix C Figure 1: Steps to Thread and Secure an ATC

The second component is a sturdy anchor to absorb the fall. Anchors can range from a sling around a tree, camming devices placed in cracks, bolts driven into the rock face, or a combination of these. It is very important to note here that placing protection is not for beginners and mentorship most be sought. Anchors are the backbone of the belay system and cannot fail. They are the component that actually absorbs the fall force after the belay device has stopped the rope. For all instances of this class, the anchors are going to be already bolted into the structure of the climbing wall.

The final component is a skilled belayer to operate the belay system. The belayer must be confident and observant away of what the climber is doing, the integrity of the belay system, and also away of the environment. The belayer must know how her climber is faring and whether he may be about to fall. The belay must also know instantly and without reservation that the belay system and the anchor is sound. Finally, the belayer must be able to handle any environmental hazards, be it an incoming storm or a careless bystander interfering with the belay area, and adapt accordingly. There are a lot of things to be aware of and remember, and this can be difficult for new belayers to handle. New belayers should always be supervised by one who is more experienced and should have a back-up belay if they are very new.

New belayers should be introduced through top roping. In top roping the main anchor is above the climber, so the falls are smaller and do not generate a lot of force. It also eliminates additional actions required in lead belaying. Top rope belaying allows the new belayer to become familiar with the braking motion and rope management and provides additional safety for the climber.

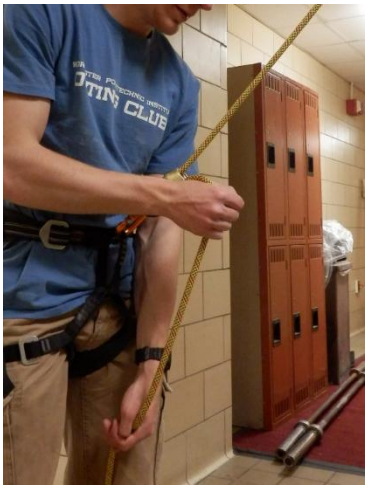
In top rope belaying, slack is continuously taken in while the climber ascends the wall. This ensures that there is limited extension in the system and reduces the distance a climber will fall. The brake hand is continuously on the rope and ready to apply a braking force if necessary. Appendix C Figures 2 a through f on the following page are pictures illustrating the motions of belaying.



Appendix C Figure 2a: The brake position

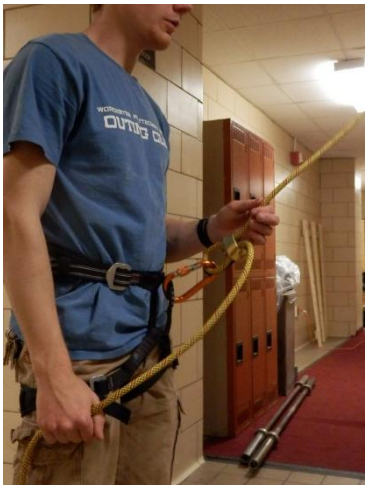
Appendix C Figure 2b: Taking in slack

Appendix C Figure 2c: Bringing line down to regain purchase



Appendix C Figure 2d: Ready to brake or take in slack

Appendix C Figure 2e: Taking in slack



Appendix C Figure 2f: Rest position

Appendix D: Spotting Instructions

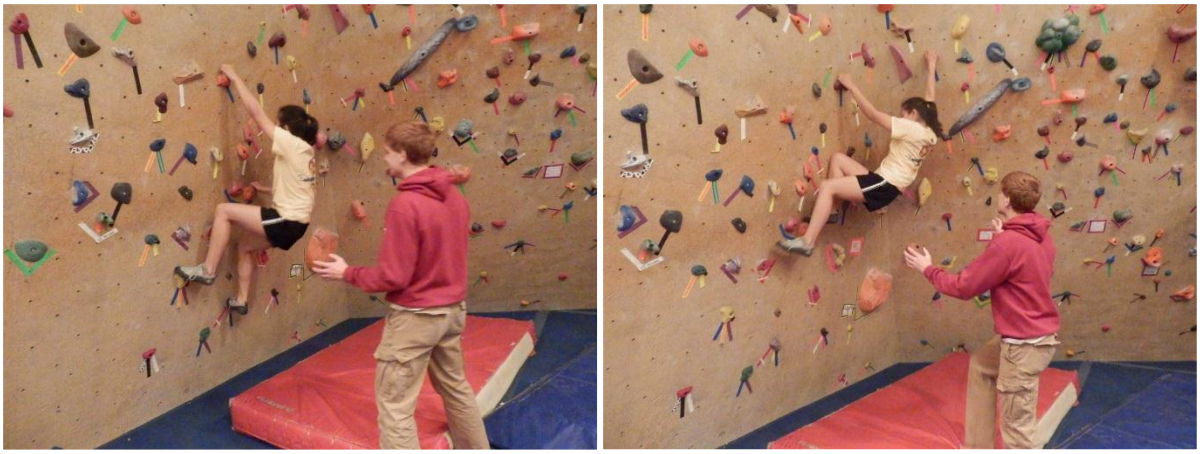
Spotting is an essential skill for climbers. Using good spotting technique can greatly reduce the risk of serious injury. Spotting is used in bouldering and in lead climbing during the period that the leader has not yet clipped in to the first bolt. Spotting is a safety measure that is used in tandem with crash pads, which will cushion the landing. Above a height of 15 feet, a climber should plan to have a partner belay him.

The purpose of a spotter is to prevent the climber's head or back from hitting the ground directly if he or she falls. (Raleigh, n.d.) This is done by holding arms up in the air and by guiding the climber to a safe landing on their feet or into a sitting position. In more complicated routes that may be higher off the ground and cover a larger area multiple spotters and crash pads may be needed. In a route that covers a large area, crash pads should be placed under where the climber will land or should be moved by another spotter as the climber ascends the route. In this case, one spotter would move the crash pad and the other spotter would focus on helping the climber land safely.

In outdoor settings where the area below a route can be rocky, it is also a good idea to mark any large rocks covered by crash pads with an 'X' using chalk. (Raleigh, n.d.) This can help prevent rolled ankles which can be very difficult to deal with in outdoors areas with a difficult approach hike. Climbers can also roll ankles on the edges of crash pads. If multiple crash pads are used, they should not be stacked haphazardly. They should be placed in a way such that the edges are avoided as much as possible.

When placing crash pads, it is important to make sure that the climber is going to land on them if he falls. On tricky overhung routes, it is reasonable to bring an object that can be used to simulate the fall of a climber and to see where the object might land. Some climbers use a child sized doll to determine where to place crash pads (Raleigh, n.d.).

The following images demonstrate proper spotting technique in a bouldering setting. Whether the bouldering is done indoors or outdoors, spotting is important. The spotter should actively track the climber, making sure that he place himself in the best position to help the climber land safely. In all images it is important to note that the spotter is not directly below the climber, but is standing closely behind the spotter. (Smith, n.d.) If the spotter is afraid that the climber will fall on him, the climber and spotter should practice prior to climbing a difficult route, or the climber should get a different spotter. The spotter is not there to catch the climber, but to guide her to land safely.



Appendix D Figure 1: Spotting a Climber at Low Height

Appendix D Figure 2: Spotting a Climber at Greater Height

Appendix D Figure 3: Spotting a Falling Climber

In the image below, the spotting is done in the first phases of a lead climb. In this case, the spotter must feed the rope to the leader and spot the climber at the same time. A common way to multitask is to provide enough slack for the leader to reach the first clip. Once the leader has clipped in, the belayer should take in slack and then feed the rope to the leader as they climb in order to limit the distance that the leader might fall. Belaying for lead climbing is described in Appendix F: Sport Lead Climbing and Sport Lead Belaying Basics.

Appendix D Figure 4: Spotting a Lead Climber

Appendix E: Add-On Rules

The core rules of the rock climbing game Add-On are as follows:

1. A climber begins by getting on the wall at any location
2. The first climber makes one move with her hand to a hold different from where she starts
3. Once the move is completed, the first climber takes her free hand and taps the wall twice, indicating that she is in a stable position
4. The climber then gets off of the wall
5. The next climber must start on the same holds as the first climber and must perform the same move
6. Once the next climber has completed the previous climber's move, he gets to add a move of his own
7. Once the next climber completes his move, he must tap the wall to indicate stability
8. The remaining participants then take turns to add more moves
9. A climber wins a game of add-on when no other participants can complete the final move she has done

The game also has the following additional rules that are modifiable, and should be defined at the beginning of every session:

- Feet can be placed on anything on the wall
- The sequence of hands is significant
- A hand "match" is considered a move
- If there is a small number of participants, participants may perform two moves instead of one

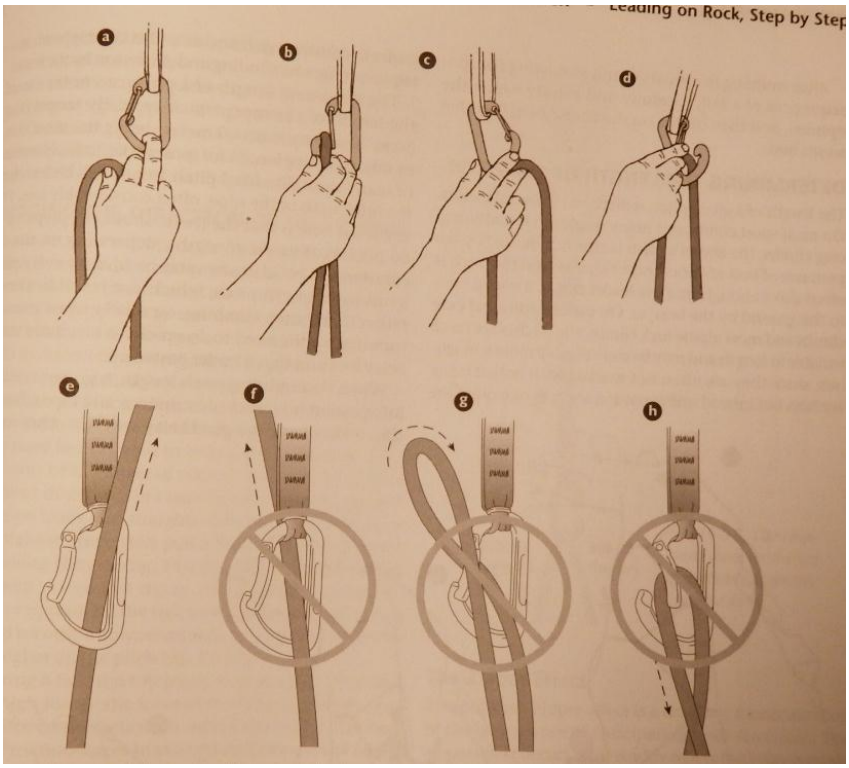
Appendix F: Sport Lead Climbing and Sport Lead Belaying Basics

In the final week of the course students will learn the basics of lead climbing. Lead climbing can be more difficult than top rope climbing, because there can be more to focus on, and lead climbing can be more tiring. That being said, many climbers enjoy the additional challenges that lead climbing offers.

There are new aspects to lead climbing for both the climber and belayer. For that reason, this section of the appendix will be broken into two parts: Lead Climbing and Lead Belaying. The lead climbing section covers clipping in and some tips on climbing safely. The lead belaying section, which is not covered in the course, covers various aspects of lead belaying. It is important to note that this appendix is only meant to supplement other sources and to introduce climbers to the basics of lead climbing.

Sport Lead Climbing

In sport climbing, the major difference that makes lead climbing more difficult than top roping is that on lead, climbers must clip in to protection as they climb. They are not kept safe by an anchor at the top of the route. The following figure shows proper ways to clip in:

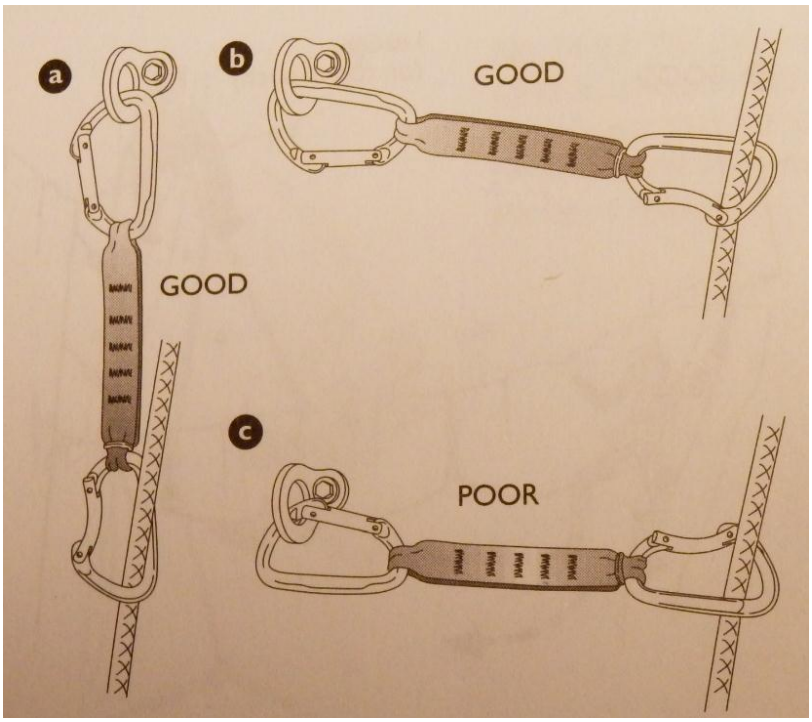


Appendix F Figure 1: Clipping In[2]

[2] (Eng & Van Pelt, 2010)

In the previous figure, parts a through d demonstrate how to grab a clip and then clip the rope into the hold. Part e demonstrates proper clipping. Parts f through h shows improper ways to clip that could cause the rope to become unclipped during a fall.

The next figure demonstrates how a quickdraw should be clipped into a bolt. The gate of a carabiner should be placed in a way such that when the rope is pulled upon the gate of the carabiner faces away from the bolt hole. In addition, a climber should never place her fingers inside of a bolt hole in order to pull herself up. If the climber slips, the bolt hole could sevearly damage the finger if not sever the finger.



Appendix F Figure 2: Clipping Draws into a Bolt[3]

Sport Lead Belaying

While this portion is not covered in the class, it is important that it be addressed in the appendix, because a lead belay is not the same as belaying for top rope. In lead climbing, it is important to minimize the distance that the climber will fall towards the ground in order to prevent him from hitting the "deck" or the ground during a fall. In order to do this the belayer must feed enough rope for the climber to ascend the wall without being restricted by tension in the rope, and the belayer must avoid providing so much rope that the climber falls too great of a distance. Clearly, there must be a balance between feeding rope and taking in slack. This balance is learned over time through practice. In addition, the belayer must be able to reach brake

[3] (Eng & Van Pelt, 2010)

position very quickly after a fall occurs. The following table shows what the belayer should be doing based on the climber's actions.

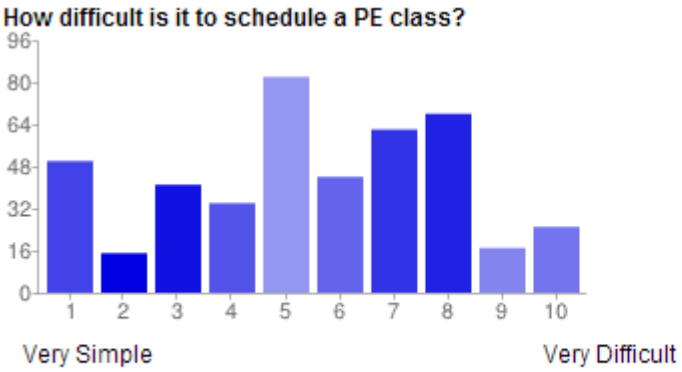
Leader's Action	Belayer's Action
Asks, "on belay?"	Checks gear and takes in slack. Belayer should be ready to belay. Responds with, "Belay on"
Says, "climbing"	Respond with, "Climb on" Begin to belay
Ascends wall	Feeds Rope
Is clipping or says, "clipping"	Feeds Rope (at least and arm's length)
Says, "slack"	Feed rope
Has already clipped or says, "clipped"	Takes in extra slack
Says, "tension"	Takes in extra slack
Says, "take"	Takes in slack and then goes into brake position
Says, "watch me"	Take in slack be prepared to go into brake position
Falls or says "falling"	Goes into brake position
Says, "on me"	Climber is secure and does not need belay at that point. Relax until further instructions are provided
Says, "off belay"	Climber is secure and no longer needs belay
Says "rock", "ice," or the name of any other falling object	Watch out for falling objects
Says, "rope"	Watch out for falling rope. It can be very painful to be hit with a falling rope

Appendix F Table 1: Belayer's Action in Response to Leader

The table above is not exhaustive and climbing commands vary from person to person. It is important to talk about commands between leaders and belayers before climbing, especially if the team has not climbed together before.

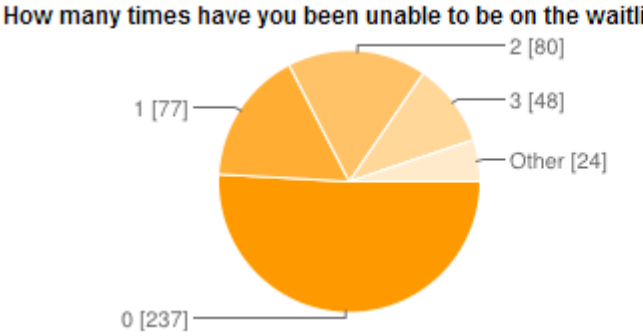
On routes where the belayer and climber become a far distance apart and cannot hear each other, it is reasonable to bring low weight walkie talkies. Belayers should avoid losing communication with the climber. Before the climb begins, the leader and belayer should discuss protocol for such a situation.

Appendix G: Full Survey and Results



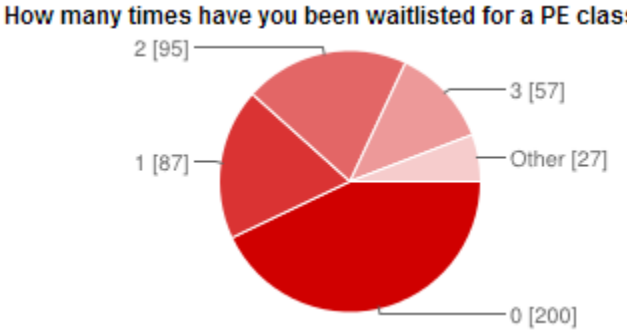
1 -	Very Simple	**50**	11%
2		**15**	3%
3		**41**	9%
4		**34**	7%
5		**82**	18%
6		**44**	9%
7		**62**	13%
8		**68**	15%
9		**17**	4%
10 -	Very Difficult	**25**	5%

Appendix G Figure 3: Question 1



0	**237**	51%
1	**77**	17%
2	**80**	17%
3	**48**	10%
Other	**24**	5%

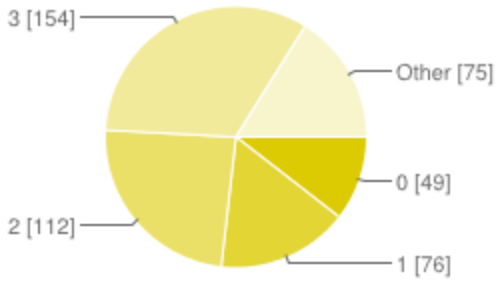
Appendix G Figure 4: Question 2



0	**200**	43%
1	**87**	19%
2	**95**	20%
3	**57**	12%
Other	**27**	6%

Appendix G Figure 5: Question 3

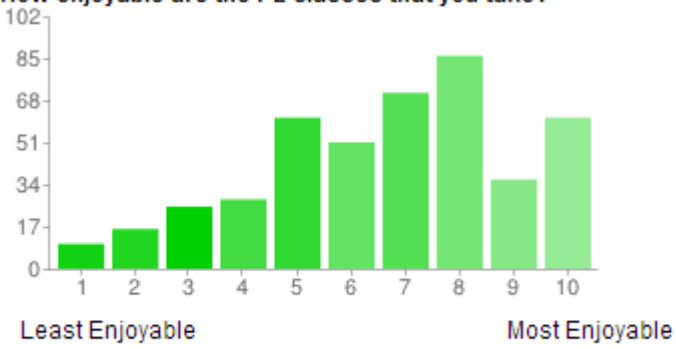
How many times have you been waitlisted for an academic class?



0	**49**	11%
1	**76**	16%
2	**112**	24%
3	**154**	33%
Other	**75**	16%

Appendix G Figure 6: Question 4

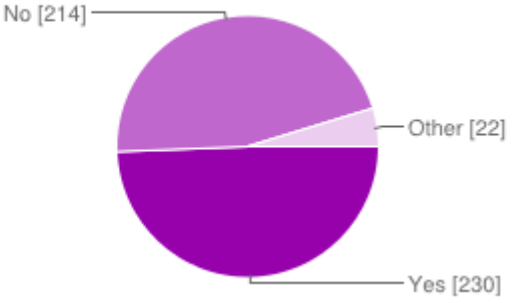
How enjoyable are the PE classes that you take?



1 - Least Enjoyable	**10**	2%
2	**16**	3%
3	**25**	5%
4	**28**	6%
5	**61**	13%
6	**51**	11%
7	**71**	15%
8	**86**	18%
9	**36**	8%
10 -Most Enjoyable	**61**	13%

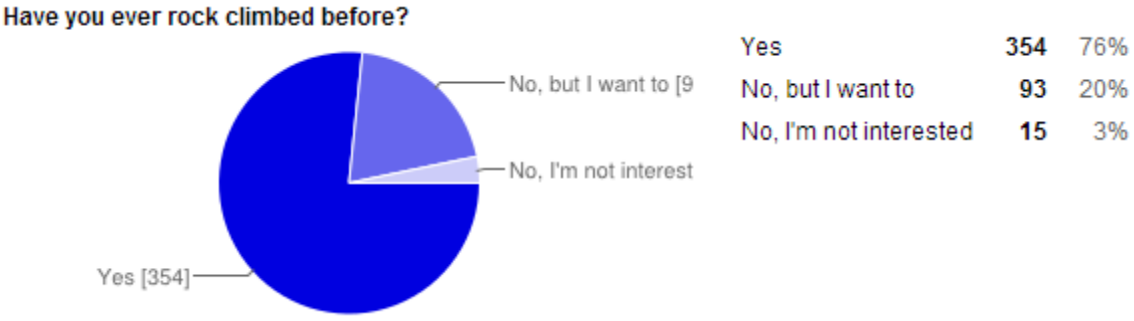
Appendix G Figure 7: Question 5

Have you ever felt like you are stuck taking a PE class that you won't enjoy just so that you can graduate?

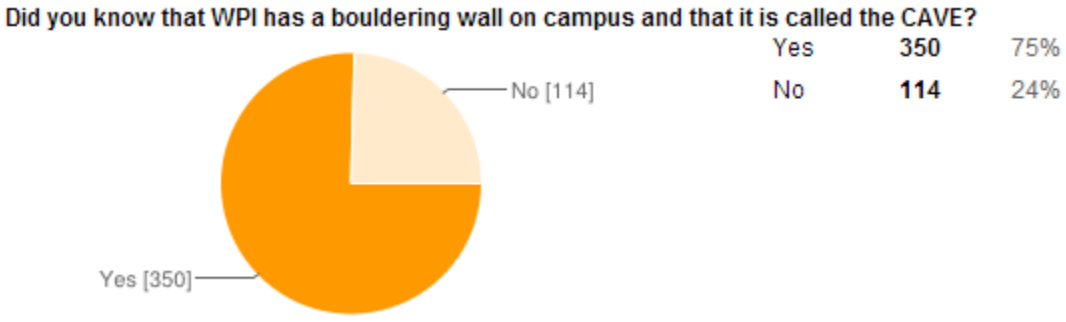


Yes	**230**	49%
No	**214**	46%
Other	**22**	5%

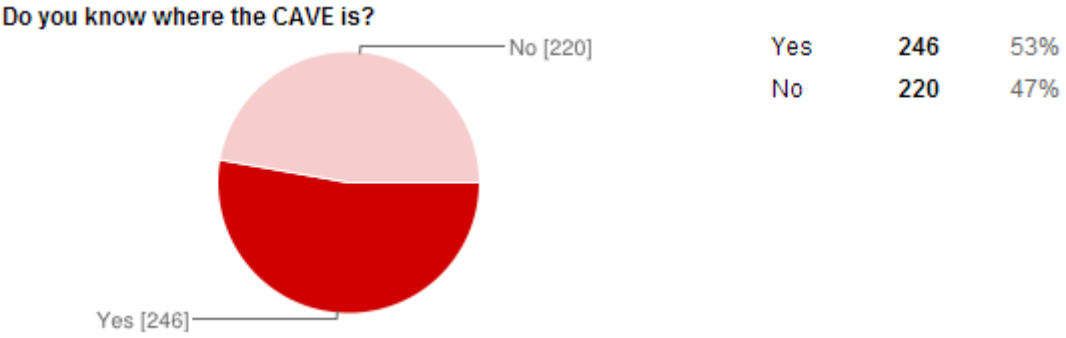
Appendix G Figure 8: Question 6



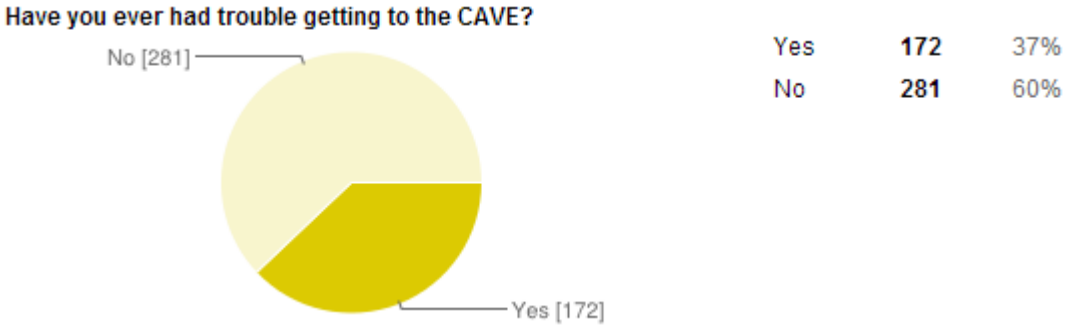
Appendix G Figure 9: Question 7



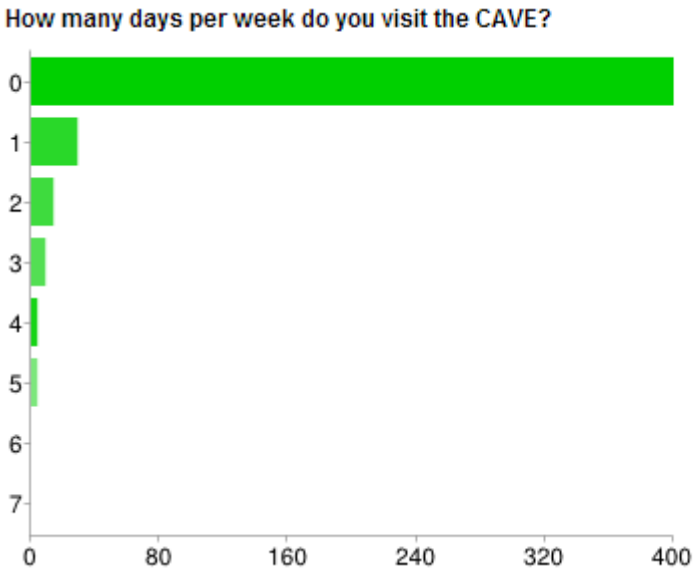
Appendix G Figure 10: Question 8



Appendix G Figure 11: Question 9

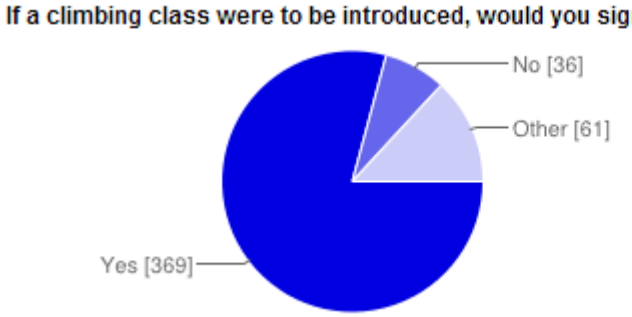


Appendix G Figure 12: Question 10



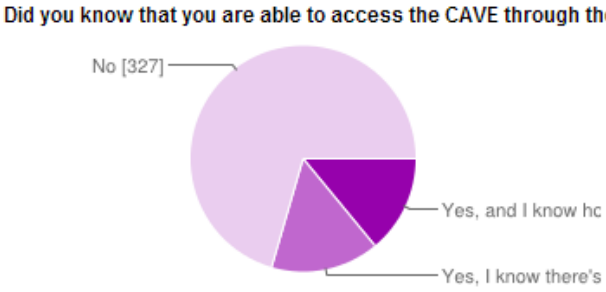
0	400	86%
1	29	6%
2	14	3%
3	9	2%
4	4	1%
5	4	1%
6	0	0%
7	0	0%

Appendix G Figure 13: Question 11



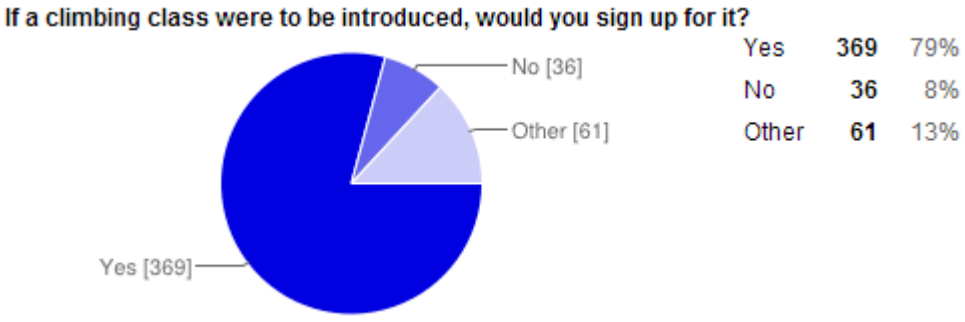
Yes	369	79%
No	36	8%
Other	61	13%

Appendix G Figure 14: Question 12

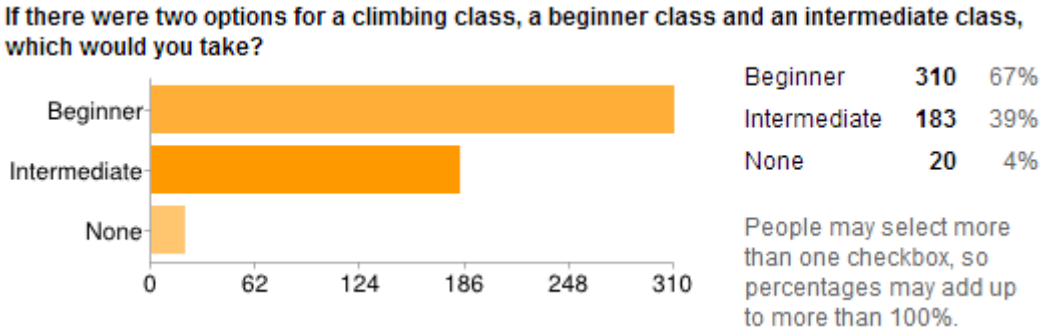


Yes, and I know how	65	14%
Yes, I know there's access, but I don't know how	72	15%
No	327	70%

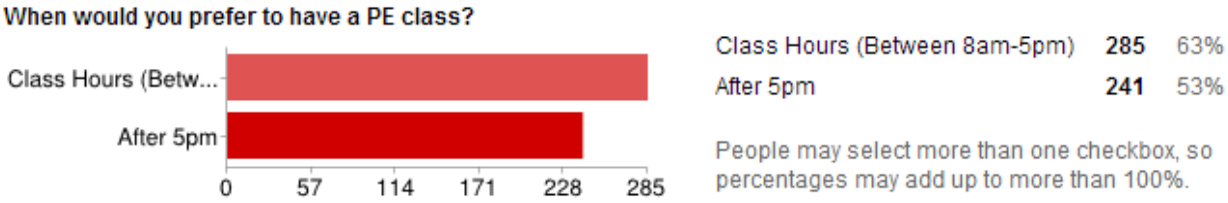
Appendix G Figure 15: Question 13



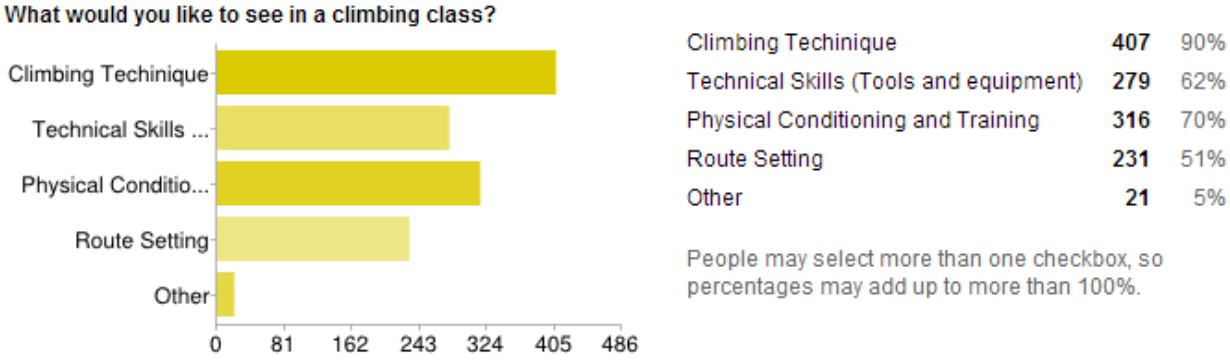
Appendix G Figure 16: Question 14



Appendix G Figure 17: Question 15



Appendix G Figure 18: Question 16



Appendix G Figure 19: Question 17

Appendix H: Rating Systems

Rating systems help climbers communicate the apparent difficulty of different routes. These ratings are very subjective and are more of a number given to a "feeling" than an empirically determined value. Route difficulties are often decided upon when a climber suggests a rating, and the community either agrees or changes it until a majority is satisfied. In general, routes with lower number ratings are easier than routes with higher number ratings. Below are some of the most common scales used for climbing.

Bouldering Rating Systems	
Hueco (USA)	Yosemite Decimal System (YDS)
V0-	5.8
V0	5.9
V0+	5.10a/5.10b
V1	5.10c/5.10d
V2	5.11a/5.11b
V3	5.11c/5.11d
V4	5.12a
V5	5.12b/5.12c
V6	5.12d
V7	5.13a
V8	5.13b/5.13c
V9	5.13d
V10	5.14a
V11	5.14b
V12	5.14c
V13	5.14d
V14	5.15a
V15	5.15b
V16	5.15c

Appendix H Table 1: Bouldering Rating System Comparison

This text focuses on US systems, as they are more commonly used in the region. Please, refer to local climbers for more information on the preference of a particular region.

Free Climbing Rating Systems	
Yosemite Decimal Scale (YDS)	Font. (French/International)
5.5	4
5.6	4+
5.7	5
5.8	5+
5.9/5.10a	6a/6a+
5.10b/5.10c	6b/6b+
5.10d/5.11a	6c/6c+
5.11b/5.11c	6c+/7a
5.11d	7a+
5.12a/5.12b	7b/7b+
5.12c/5.12d	7b+/7c
5.13a	7c+
5.13b/5.13c	8a
5.13c/5.13d	8a+
5.13d	8b
5.13d	8b+
5.14a	8c
5.14b/5.14c	8c+
5.14d	9a
5.15a	9a+
5.15b	9b
5.15c	9b+

Appendix H Table 2: Free Climbing Rating System Comparison

Though the class is based on bouldering, a reference for free climbing ratings is useful for a student to progress beyond a small gym.

Appendix I: Notes from Interview with Dana Harmon (2012, October 30)

- Things to pay attention to:
    - Bouldering wall on campus, not just a "climbing wall"
        - Bouldering wall is under 14'
- PE credit was already discussed with Felipe Polido
    - Felipe suggested waiting and coming back to discuss
    - Club credit is probably going to be the easiest way to get credit
- Students cannot be in charge of bouldering to give credit
    - Need a coach to record times and submit grades
        - Electronic recording is nice, but still need a coach
        - Randomly check club attendance
    - Need a teaching aspect for club
    - Can spread out credit over an entire semester
    - Need to spread out credits
        - Going for regular, long-term fitness
- Meet with Ann McCarron to figure out programs that are eligible for PE credit
    - Entire group is not required to get credit
    - Other people can just tag along
    - Minimum hours is 21 per term for club sport
        - Can get hours at CRG as long as coach is present
        - Can get multiple coaches
        - Look into getting a graduate student for a coach
    - Minimum hours for actual PE class is 14 hours
- An actual PE class will go through faculty
    - SGA will pay for an instructor for club sport
    - PE department must pay if it is actually a class
- Other notes
    - Look for discount rates with CRG for the class
    - Generates more exposure by decreasing cost
- Look into how the tennis and golf clubs are structured
    - Can go to clinics to fulfill hours
    - Competitive aspect is not required
- Questions and answer:
    - Certifications for instructors?
        - CPR and First Aid certifications
        - Research official climbing certifications
        - Different strata for safety qualifications
        - Run by risk manager (Mike Curley)
    - Can we run a trial class for PE credit?
        - Budgeting cycle inhibits hiring someone so quickly
        - Starting at beginning of next year will work better
        - Potential for having student pay for instructor
- Final notes
    - Perhaps have an instructor come in for instruction on Fridays
    - Have a grad student check hours during the week

Appendix J: Notes from Interview with Ann McCarron (2012, November 6)

- Things that we are asking Ann McCarron
    - Instructor
        - Hired by school or has agreement or contract
        - Coach to sign off hours at CRG
    - How are we fulfilling requirements?
    - How soon can we start?
    - Specifics on First Aid training and other certifications
    - American Mountain Guide Association
    - Waivers included in course registration?
- Notes from the meeting
    - Things to include for the class
        - Safety in terms of spotting
    - Recommend 21 hours
    - Where are we teaching this class?
        - We will be incorporating other activity
        - Stipend for instruct is from SGA
        - Take attendance
    - Get examples of syllabus
    - How many people do we limit for the class?
        - 10 to 15. 20 people is the hard cutoff
    - What is the cost of rock climbing and what certifications are requirements?
    - Can we get an agreement with CRG to get hours?
        - Have a WPI sign-in sheet at CRG
    - Get a requirements page put together
        - Seems like it is approximately on page long
        - Talk to Phil Grebinar
        - Groups to look at:
            - Social dance, karate, pep band
        - Guidelines are available for club organizations
        - Need to put down specific times and locations
            - We structure this as a 7 week course
        - Make sure students know that there are any extra costs
            - Extra money to go to CRG
            - Free to climb in the CAVE (for term registered)
    - When are we looking to start this class?
        - We can SFR for an instructor
        - Ann will be meeting with SGA. Need to know cost for next year's budget
            - Employee needs to fill out W9 and background check
        - Need to get budget in by approximately end of the month
        - Need a cost per term
    - Hiring a graduate student?
        - Requirement is usually someone who is out of undergrad for at least 2 years
            - There have been some exceptions
        - CPR and First Aid not required
            - For competitive sport, there needs to be a trainer during matches
            - Want some sort of certification
        - Next time we meet, should send a proposal first

Appendix K: Notes from Interview with Joey Bianchi (2012, November 6)

- Things to ask Kevin Pickren:
    - What are the certifications for CRG employees?
    - Ask curriculum for climbing, frequency
        - Suggested website or books to read
    - Ask Kevin if we can get passes for survey (two passes)
- Meeting with Joey Bianchi (Kevin couldn't make it)
    - Compensation for attendance at CRG
        - Discount membership for students
        - Students discounts are $45 a month
        - If we can ensure we come in before 5pm (awkward hours)
            - Set number of people come in
            - Pay by semester
            - Between 12 and 4pm $35 per person with 15 people minimum
            - Equipment is included
            - 2 month period will be minimum
            - Discounts with local retailers (nice little benefit for new climbers)
        - Compensation may be required for lesson planning
    - Certifications at CRG?
        - CRG can provide instruction
            - Pay the instructor and talk to current employees
            - This will be extra (bi-weekly or weekly)
        - Most of full time staff (primary job)
            - Frist Aid and CPR certification
            - American Mountain Guide Association (Joey is the only one certified)
                - Single pitch instruction
            - CRG has their own training
                - All staff certified to belay and lead climb
            - No legal restrictions in terms of politics
            - Staff has skill and lot legally "certified" to be an instructor
    - Select a bunch of different topics to cover in class
        - CRG can send in a different instructor for each topic
        - $50 per one hour block
        - Instruction can be done at CRG
        - Hands-on rappelling is apparently available!
    - Books suggested:
        - AMGA certified book:
            - Outdoor anchor building
            - Outdoor climbing technique
            - Look out for beginners
        - Craig someone-or-another
    - Suggested topics for 7 weeks:
        - Beginner class (unifying class, not necessarily beginner)
            - Belay
            - Technique and spotting
            - Touch base on lead and sport climbing (class but not practice)
                - Trail a rope on top-rope

    - Z-clipping, heel in front of the line
- Touch on anchor building
    - Material, gear, knots
- Knots
    - Prusik
- Equipment
- Climbing systems
    - How anchors are built outdoors
- Outdoor traditional or 'trad' climbing
- Rappelling class (10 to 15 minutes per person)
    - Kind of a little time consuming
    - Easy, safe, valuable skill
    - Kind of expensive
- Route setting clinic (either at CAVE or in the little room)

Appendix L: Notes from Interview with Joey Bianchi (2013, February 27)

- For 10 people, get a cost estimate for membership
    - $35 a person
    - $40 per group of 10+ after 5pm
- For 15+ people, get another estimate
- Classes: belaying and rappelling
    - Belaying $10 a person
    - Rappelling $10 a person for 10 or more
        - Has to be done in the late evening when it's slow
        - Sometime around 9pm during the week
- Sign-in sheet
    - Keep it in a binder
    - Have some staff sign off on arrival and departure times
    - Require student ID
        - Have student just check in
        - Have CRG print out an electronic copy of attendance
- Look into outdoor climbing with CRG
    - Going to Crow Hill
    - Bouldering and single-pitch lead climbing