Experiential Courses to Establish a Teaching Method for Ice Climbing and Indoor Rock Climbing

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Experiential Courses to Establish a Teaching Method for Ice Climbing and Indoor Rock Climbing

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アイスクライミングおよびインドアロッククライミングにおける指導法確立のための実践的授業

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ABSTRACT

This paper summarizes the planning and construction of an indoor rock climbing wall and an outdoor ice-climbing wall at Hokkaido University of Education's Iwamizawa Campus as part of the Outdoor Life Program. The aim of the climbing walls was to create an alternative physical education learning environment that provides an opportunity for students to develop confidence and hands on skills in climbing, belaying and safety procedures and equipment care. After training in a controlled environment, students will apply their skills in an outdoor setting. The students took an active role in the construction of the walls and this direct involvement has lead to higher levels of motivation and commitment to the up keep of the facilities.

1. Purpose

With very few qualified outdoor education teachers in Hokkaido pursuing non-traditional physical education classes such as rock climbing, the Hokkaido University of Education 'Outdoor Life' program's goals are to provide knowledge of alternative perspectives to physical and lifelong education to future teachers.

The sport of climbing has seen a rise in popularity in the last decade. (Ryan et al. 2001) With improvements in safety measures and risk management issues, physical education teachers are finding out that there are potential beneficial effects of including a climbing course in their curriculum for their students' physical and personal developments (Steffen & Stiehl 1995, Hyder 1999, Wallstrom 2005, Mittelstaedt 1997, Halliday 1999). Many elementary schools in the U.S. and some high schools in Hokkaido have incorporated climbing wall activities as part of their physical educations programs. Teachers

can afford to expand new gym space by including the "six walls' without the financial burden of a costly a new building (Steffen & Stiehl 1995). Given that children instinctively include activities that involve crawling or ascending over obstacles in their play, there is what seems to be an inborn interest for climbing (Mittelstaedt 1997, Steffen & Stiehl 1995).

Climbing can be used as any other traditional physical education activity to promote physical fitness (muscular strength, endurance, cardio-respiratory fitness and flexibility) and motor skill development in a fun and safe environment. (Mittelstaedt 1997) The basic skills required are akin to those of climbing a ladder (Steffen & Stiehl 1995). Research has shown that it can be done more safely than traditional physical activities, as there are fewer accidents per hours of adventure activity than traditional physical education activities (Steffen & Stiehl 1995). Administrators concerns of the perceived dangers in including a climbing course in the curriculum are a restricting factor in favor of building a climbing wall. Once again research suggest that low accident rates are the results of the development, implementation and adherence of a risk management policy designed to ensure safety for climbing participants, instructors and supervisors (Mittelstaedt 1996). Such precautions as regular inspections of the climbing facilities and equipment are used exactly as required of other traditional sports equipment in the gym, especially high-risk activities such as gymnastics. (Steffen & Stiehl 1995) Educational benefits of climbing courses for children can also include the development of interpersonal skills (cooperative and communication), personal skills (self-esteem, self-confidence), cognitive skills (decision making, problem solving) and overcoming fears (Hyder 1999, Mittelstaedt 1997, Halliday 1999). These skills can be taught with a focus on non-competition but still keeping challenges for all levels of participants. The focus is then more on personal challenges. (Hyder 1999, Mittelstaedt 1997) Climbing is not only considered an individual activity but it "encourages a sense of cooperation and community; a sense of interdependence and inclusion, not exclusion" (Steffen & Stiehl 1995). Novices can enjoy the activity with few required skills and by using "challenge by choice". (Steffen & Stiehl 1995, Halliday 1999) Other benefits of indoor climbing facilities include; access to the activity in an area with no natural facilities for rock climbing such as the area around campus. (Attarian 1989)

The indoor climbing wall is a tool to provide skills to train in order to diversify the knowledge of physical education. It is then hoped that qualified and knowledgeable teachers will in turn introduce the outdoor local environment through outdoor activities such as teaching the sport of climbing.

The climbing wall at the Hokkaido University of Education was built to introduce students to the sport of climbing in a controlled and safe environment suited to beginner and intermediate level climbers.

2. Goals

Recently the sport of rock climbing, indoor climbing and ice climbing have gained popularity in Hokkaido. With limited access to quality outdoor climbing areas near the university campus, it was necessary to find an alternative way to get climbing experiences for students. The building of an indoor rock climbing wall and an

outdoor ice-climbing wall on campus would permit the teaching of climbing skills, belay skills, safety procedures and equipment care in a controllable setting. The skills learned and experienced on the climbing wall can then be transferred to climbing outdoors on field trips.

The need for qualified and experienced outdoor instructors and guides is required by the newly created Hokkaido Outdoor Guide Association[i], which regulates and certifies its members for canoeing, nature guiding, horseback riding, climbing and more. Accordingly, the outdoor industry in Hokkaido is now required to maintain a high standard of competency in its services to satisfy anxious outdoor participants. As a post secondary educational provider of outdoor education, outdoor activity and 'Outdoor Life' philosophy, the program attempts to help students attain a minimal level of competency in a wide range of activities. Furthermore with basic knowledge and training in various outdoor activities the students can then complete their accreditation for specialty certifications with outdoor organizations or associations.

For the newcomer to the sport of climbing it can be a very intimidating activity. The use of a secure indoor wall creates an atmosphere where one can learn to control his/her perceived fears and try climbing. Climbing as an activity develops focus, concentration, self-esteem and the realization that a difficult task is possible to accomplish. (Halliday 1999, Hyder 1999, Steffen & Stiehl 1995)

3. Objectives

1. Transform the Outdoor Life's storage warehouses' indoor front wall into a 6m high x 3m wide vertical climbing wall.
2. Build an indoor climbing wall and an outdoor ice-climbing wall to accommodate novice to intermediate/advanced climbers.
3. Develop an interest in climbing among students.
4. Develop an introductory indoor climbing wall belay safety management course.
5. Develop a comprehensive approach to climbing as a tool in our physical education and outdoor education curriculum.
6. Provide a place to experience climbing on campus.
7. Continue to expand our climbing curriculum.

4. Methods

The vertical climbing wall was built using the inside north-facing wall of the storage warehouse behind the gymnasium. The building is framed on steel pillars and steel studs that reach a height of 6m at the highest point. The vertical height of the wall reaches just under 6m and is 3m in width. A foam fall mat used for track and field was installed under the wall to insure safety and three floor anchors were installed for belaying.

An ice-climbing wall was built using a galvanized pipe structure that had previously been used as a protective wall for the outside *kyudo dojo* (Japanese Archery). It is located on the north-facing side of the sports gymnasium; the ice wall itself is perpendicular to the building, so it is east-west facing. The location was chosen because it receives direct sunlight only in the early morning from 7am to 9am. Sunlight exposure is a significant limiting factor in the ability to produce and maintain an ice-climbing wall. Fortunately, the east-west facing façade

combined with a seasonal cold winter allowed the formation of ice to attain a maximum thickness of about 3m at the bottom and 60cm at the top. The dimensions of the ice wall were 4 meters in height by 4 meters in width.

5. Construction

The indoor climbing wall was framed using 45cm x 45cm studs directly screwed onto the existing steel stud frame of the building. Two 12mm sheets of plywood were used for every section of the wall, in total 12 full sections and 4 half sections were built. Three different levels of difficulty were built with the novice section a straight vertical section, the intermediate section with a slight overhanging face and the intermediate/advanced section with a pronounced overhang. A total number of 100 holds of various sizes are presently installed on the wall. To allow flexibility in changing route patterns on the wall over 500 T-nuts were installed in the plywood. Each hold is movable to a different location on the wall without any difficulties. Wall building websites, the local outdoor climbing stores in Sapporo and Asahikawa, and an engineer were consulted for ideas, suggestions and recommendations on constructing the climbing wall. The Shugakuso[ii] store provided us with all the hardware for the holds: t-nuts, bolts and hand-holds. The Taniguchi hardware store in Iwamizawa provided the lumber, hardware and services. The students and Outdoor Life staff provided the labor in constructing both climbing walls.

On the first day of construction, students diligently drilled out thousands of holds in more than 18 sheets of 12mm plywood. Markings were drawn out on the existing wall of the warehouse to identify the location of the steel studs. A scaffold was then set up. The backing wood studs were cut to length, and screwed into the steel wall frame. A few days later came the ordered t-nuts and they were placed in each hole that the students drilled previously. Each plywood sheet was doubled, to get a thickness of 24mm and secured together by screws. The wooden framed structure was completed and the plywood sheets with t-nuts were secured to the frame. The sharp edges were then sanded down.

The roof anchors were then drilled out from the steel c-beam roof rafters. I-bolts were installed and carabiners were hung using webbing tape to make the roof anchors. The next step was to install all of the 100 holds and design routes. The ropes then were secured to the roof anchors. The scaffolds were removed, a large floor fall mat was put in place and floor belay anchors were added. A carpet, a picnic table and a sofa now complete the climbing gym area.

5. 1 The ice climbing wall section

As early as March of 2007, an inspection of the Ice Festival site at Sounkyou Onsen was undertaken to understand how ice could be formed and attached to a wooden structure to create an ice wall. In May, a suitable location which had a proximate water source with a steel frame structure for the ice wall was discovered as part of the old kyudo dojo on the university premises. The structure is made of 2 inch steel pipe, 4 meters in height, 4 meters in width. A tennis court net was hung down from the top of the steel structure and tied to the piping. The net is to provide an attachment point for the ice. To prevent the freezing of the water supply, a hose and reel was installed and every morning the hose was retrieved and

brought indoors. Unfortunately, after construction was completed, on more than one occasion we had to thaw out the main water supply valve due to the frozen tap. The students helped in the construction of the ice wall and its maintenance by watering the wall every night. The watering began at the end of November and continued until early February. It took around 3 weeks to get ice thick enough to start climbing.

6. Climbing Program:

6. 1 Belay safety course

All users of the climbing wall are required to take a belay safety course. The course outlines the use of equipment and proper belaying techniques as well as equipment care. The course was divided into three sections: harness, belay/climbing and rope work. In each section the students had to learn and perform the required skills necessary for climbing. The following items are covered in the course. The harness section included fitting, inspection by partner, how to tie in the figure 8 follow-through knot, how to attach the carabiner and ATC[iii] and Grigri[iv] belay device. The belay section included: command words, belay devices (ATC, GriGri), hand sequences, lowering, helmets and rope burn. The rope section included: the figure 8 follow-through knot, rope construction, dynamic rope vs. static rope, rope stretch, rope inspection, rope care, storage of equipment, installation and repair of holds and set up of climbing ropes.

6. 1. 1 Harness Section

Two types of harness are used for our climbing wall: a single waist belt buckle type and a double waist belt buckle type. To put on the harness, the belay loop should be kept in front of the body, the leg loops are stepped in while the harness up is pulled up. Make sure there are no twists. (Figure 1)

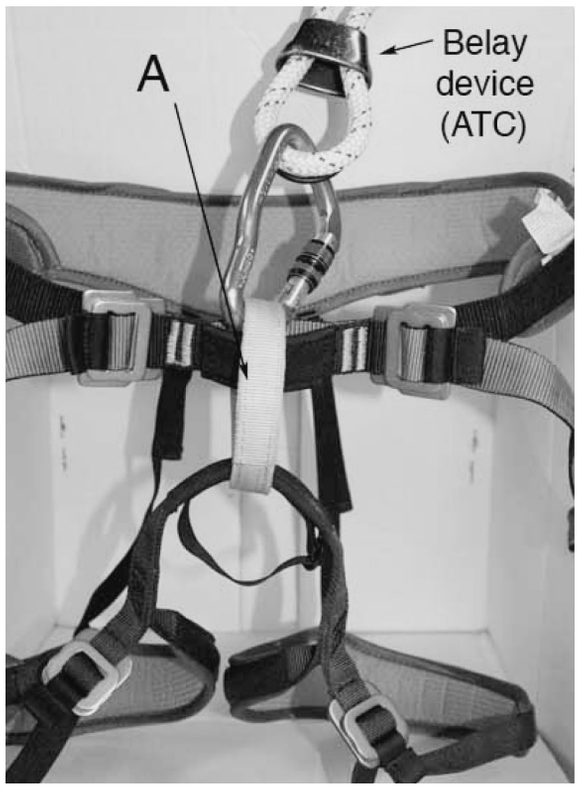


Fig. 1 Belay Loop

The waist belt should be fit comfortably around the waist, on top of the hipbone and below the rib cage. After threading the webbing through the buckle, it is absolutely imperative that the tail end of the webbing is doubled backed through the buckle. A tail of a minimum of 8 cm must be doubled backed through the buckle (figure 2). This also applies to the leg

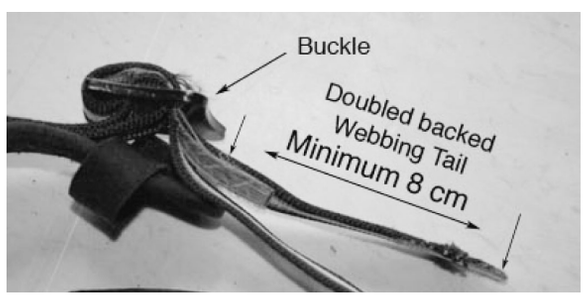


Fig. 2 Double Backed tail

loop buckles.

Once the harness has been put on, the next step of tying into the rope and anchors system is a very important safety procedure that must be followed properly. The figure 8 follow-through knot is used for tying into the harness. It is the knot of choice for climbers and mountaineers for it is easy to tie, strong and somewhat easy to untie after loaded by a fall. (Figure 3)

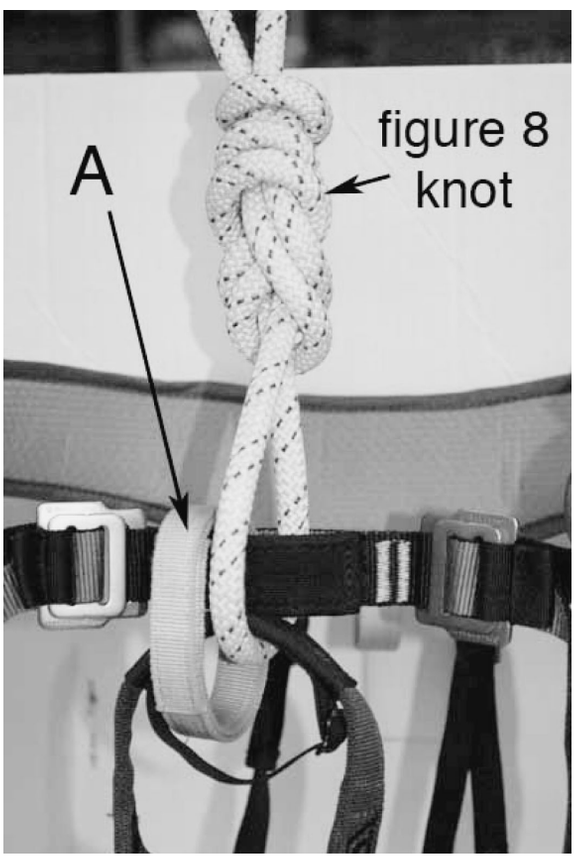


Fig. 3 Tying into Harness

Caution was taken to warn against tying the figure 8 follow-through knot into the belay loop (a). The belay loop is used for the tying in of belay and rappel devices (figure 1).

Proper care must be taken to ensure that the wire of the belay device (ATC) and the rope are clipped into the carabineer, the rope does not cross over the wire and the carabiner is locked. The knots, carabiners and buckles should always be double-checked, The figure 8 follow-through knot was demonstrated and practiced making sure the knot was 'properly dressed' and there was at least 8 cm of tail at the end to tie off an overhand or fisherman's knot.

Once again it was stressed that before climbing both climber and belayer have a responsibility to double- check each other's harness and knots. They must check that all harness buckles are double backed, all knots are properly tied and dressed and all carabiners are locked.

6．1．2 Belay Section

The hand sequence for belaying is very important for the belayer to master properly. The brake hand should never let go of the rope and in the case of a falling climber it should always be ready to stop the fall. Figure 4 demonstrates this sequence.

As the climber goes up the wall, the belayer takes in the rope. The top hand pulls in the rope toward the belay device while the brake hand pulls out the rope away from the belay device (figure 4 a). When both hands meet, the top hand slides up above the brake hand while the brake hand never lets go of the rope (figure 4 b). The top hand then takes both ropes between the thumb and the brake hand is slid back towards the belay device (figure 4 c). The whole sequence is repeated until the clim-

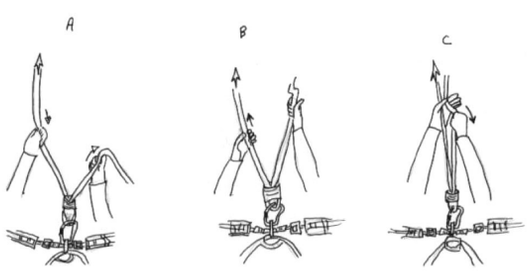


Fig. 4 Belay Sequence

ber calls off belay.

In the lowering of the climber the brake hand slowly feeds the rope through the belay device (figure 5 d, e). In the case of a falling climber, the brake hand pulls the rope firmly behind the belay device causing the rope to lock and stop (figure 5 f). Letting the climber down after completion of the route is done by guiding the rope in the reverse order of taking in rope, keeping the brake hand always on the rope.

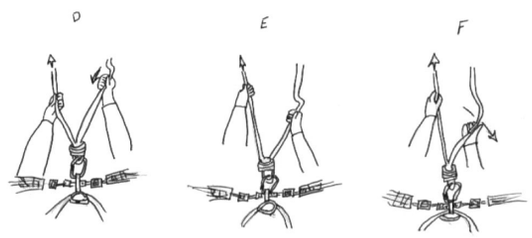


Fig.5 Lowering Sequence and Brake

The basic command word sequences for the climbing wall were introduced to allow clear communication between climber and belayer. (Table 1)

Table 1. Basic Commands

Climber		Belayer	
"Belay on?"	=Do you have me on belay?	"On belay"	=I have you on belay
"Climbing"	=I'm starting to climb	"Climb"	=Go ahead
"Slack"	=I need extra rope	"OK"	=Understood
"Up Rope"	=I have too much slack	"OK"	=Understood
"Falling"	=I'm going to fall	"OK"	=Understood
"Belay Off?"	=You can take me off belay. I am safe.	"Off belay"	=You are no longer on belay

For belaying practices the British Mountaineering Council recommends 3 "must do's" from their leaflet 'Belaying; Get it right',
1. Pay Attention 2. Know your gear 3. Get in the best position.

By recommendation of a commercial climbing wall manager in the U.K[v], and an article from the BMC (British Mountaineering Council), the Petzl Grigri belay devices have been replaced by Black Diamond ATC belay devices. The Gri-gri device is not suitable for beginners because it needs knowledge of belaying, experience and training to be use safely.

6．1．3 The Rope Section

To help reduce the risk associated with climbing, a good understanding of the design and construction of ropes is essential along with their intended use and care.

Climbing ropes are dynamic to allow a stretch when a fall occurs. This absorbs part of the energy and shock of the fall. Static ropes, on the other hand, have minimal stretch and the intended purpose is more for rappelling, caving, rescue or elevated working areas. Although static ropes look similar to dynamic ropes they should never be used for climbing.

A rope should be kept clean, inspected after every use and retired when damaged by rock fall, crampons, sharp edges, a severe fall, 3 years of occasional use or the mantle is badly abraded. 'Don't step on your rope' as dirt particles can get in through to the core and cause damage.

There are several types of ropes. We have seen so far the difference between static and dynamic ropes. But for specialized climbing situations different ropes are used. For our climbing wall, a single rope 30m in length is used, but for ice climbing a half rope system or a twin ropes system can be used to offer more safety protection. Basically, a single rope is used

for sports climbing or short routes. Half ropes used with double ropes technique have one rope strand clipped separately through different runners. The advantages are if there is a rope failure, there is always a backup and it reduces the rope drag. It is recommended for mountaineering, long ascents with abseil descents and ice climbing. Twin ropes are used as a technique where both ropes are clipped through runners. The advantages of using twin ropes are that it allows long abseils with a lighter rope than half ropes, it is stronger than a single rope but each strand must be clipped together through the runners. The manufactures recommendation on care and storage of equipment includes keeping the gear clean and in a dry environment, out of direct sunlight, away from heat sources and sharp objects.

6．2 Indoor climbing experience

Most students who had never climbed before expressed some apprehension and fears. They were mostly afraid of heights, but some were just plainly afraid to fail in front of others. To overcome these fears, the concept of "challenge by choice" was applied and the students were encouraged to simply try the beginner course and set an attainable goal before the climb. For example "I want to reach the second blue hold". Consequently, if their abilities lead them further up the wall they wouldn't feel disappointed. Once on the wall, encouragement from other students pushed many of the climbers past their original expectations.

The focus was not on techniques but rather on having fun. It builds self-confidence in an enjoyable setting. Certain basic techniques were demonstrated such as using your legs to hold your weight instead of your arms. A few climbing games were introduced such as Follow the Leader, Down-Climbing, Vertical Sprint and The Stick Game. Follow the Leader is a game played in small groups or with partners, where one member chooses a route to climb and the others must follow the exact same route. Colored tape and tags may be used to demarcate the designated hold to be used. The objective of the game is focused on movement skills. (Hyder 1999, Steffen & Stiehl 1995) Climbing literature mentions a variety of games that are used in school and commercial climbing wall curriculums. The game levels start from novice and up including all ages, intermediate skills and up age 9＋ and advanced skills ages 12＋ (Hyder 1999, Steffen & Stiehl 1995).

Since the opening of the wall, the interest in climbing has grown within the Outdoor Life programs and many students regularly use the facilities.

6．3 Other climbing program course for the Outdoor Life program.

In the summer of 2008, as part of the Mountain Field Experience course, the students learned more climbing skills. Those skills included practical situational experiences. The curriculum included a basic anchors course and a rappelling/abseiling course. The objective of the courses was to teach the knowledge of technical skills required to safely use anchors, in depth review of equipment and the uses for self-descent techniques. The goal was to bring students competency and skill level high enough to participate in an outdoor climbing and rappelling section of an adventure race. The rappelling/abseiling skills course used the safety recommendations from the BMC on abseiling as 1. Check your anchors 2. Use a prusik knot 3. Knot the rope.

6．4 Ice-climbing experience

In addition to the indoor rock climbing experience, there was also an opportunity to try the sport of ice climbing on campus. The same belaying basics from the indoor climbing wall apply to ice climbing plus a few other safety measures. Since there is more pointy equipment used for ice climbing, certain precautions must be taken to ensure a safe and enjoyable climb.

An understanding of ice and its properties is essential, and this knowledge is of major importance whilst on field trips in the outdoors. The ice conditions on the artificial wall on campus were relatively constant during the season, but in natural locations it can vary extensively depending on weather conditions and location in relation to the sun. Ice climbers rely heavily on experience and their knowledge of equipment. It take time and practice to learn to trust ice tools, crampons and eventually ice screws. Whilst training on campus, the correct use of equipment was taught. The equipment manufacturer's recommendations were followed to have a safe and controlled practice environment. The two basic tools of ice climbing are crampons and ice tools. Walking with crampons for the first time can be challenging, especially when on a slope. It is challenging enough not to poke holes in your clothes. The walking exercises were the first practical activities we did, the second was ice tool placement. The 'Golden Rule' (Gadd 2003) of ice climbing was stressed as 'Don't fall'. Climbing with two picks in your hands and 24 points counting all the points in the crampons can have serious consequences on flesh and clothes.

7．Ice climbing Wall

For the second part of the introduction to climbing activities, the Outdoor Life program envisioned winter ice climbing on the university premises. The purpose was to introduce to students the sport of ice climbing in safe and controlled surroundings.

Ice climbing is a dangerous sport that requires extensive knowledge of climbing techniques, equipment, safety, anchors, rope work, ice and weather conditions. The basics of climbing were to be taught in a course designed to create interest and awareness of the winter climbing possibilities.

7．1 Program

By the start of January 2008 the weather conditions allowed students to have their first climbing experiences. The first lesson was that ice climbing is a winter sport where participants should expect to be cold and should bring appropriate clothing that include a base layer not made of cotton. As cotton absorbs sweat and does not dry quickly body heat is lost rapidly. A layer of polypropylene will wick sweat away from the body into the second layer of clothing.

As participants of the rock climbing wall belay safety course done in the summer, the students already had the basic training for climbing safety, belaying, knots and ropes handling. Winter creates some different conditions for climbing. Extra precaution must be taken when belaying and rope handling in cold weather with crampons. Stepping on the rope with crampons is an absolute must not.

A classroom session covered the basic equipment of ice tools, crampons, ropes, helmet, harness, belay devices, clothing and nutrition for cold weather. The basics of crampon skills, movement on vertical ice, tool placement, the monkey-hang technique, crampon placement

and knowledge of ice conditions were covered in classroom sessions before the first outdoors experience. A short introductory video was watched to visually understand the basic working of equipment, safety procedures and the first step using crampons.

The first ice wall climbing experience focused on crampon techniques. The 'Golden Rule' (Gadd 2003) of ice climbing was clearly voiced "Don't fall". To fall or jump with crampons can have serious consequences, like breaking ankles, ripping clothes or tearing into flesh. Students practiced walking with crampons on flat ice and low angle ice. The next step was to practice tool swings and placement standing at the bottom of the ice wall. Eventually a top rope was set up to allow climbing following the monkey hang technique.

7．2 Extra curricular

On February 28th, 2008 two of the world's top ice climbers visited our university and gave a slide show presentation. Albert Leichfried, Markus Bendler and photographer Hernmann Erber stopped in Iwamizawa as part of their ice climbing tour of Hokkaido.

Some students had the chance talk with the trio at the reception after the slide show presentation. One lucky student, Taro Yoshimura even got the chance to join them on a climbing day in Sounkyou (Figure 7). His impression of his first real experiences follows:

"次は自分の番がきた。当初はグレードが高いためやらしてもらえるか分からなかったが，『Let's Try』と言われて，恐怖心や，緊張感よりも好奇心の方が大きくなった。"

"Next was my turn. I thought my teacher would not let me climb such a high-grade route. But he said 'go ahead and try it', then I was more curious than nervous or anxious." (Excerpt from the climbing diary of Taro Yoshimura, 3rd year Outdoor Life program student)

"はじめはアイスクライミングの写真を見て，こんなの普通の人がやることじゃないと思っていました。それが現実になりとても満足しています。"

"When I first saw pictures of ice climbing, I thought an ordinary person could not do such a thing. Once I accomplished the climb, I was really satisfied with myself." (Excerpt from the climbing diary of Taro Yoshimura, 3rd year Outdoor Life program student)

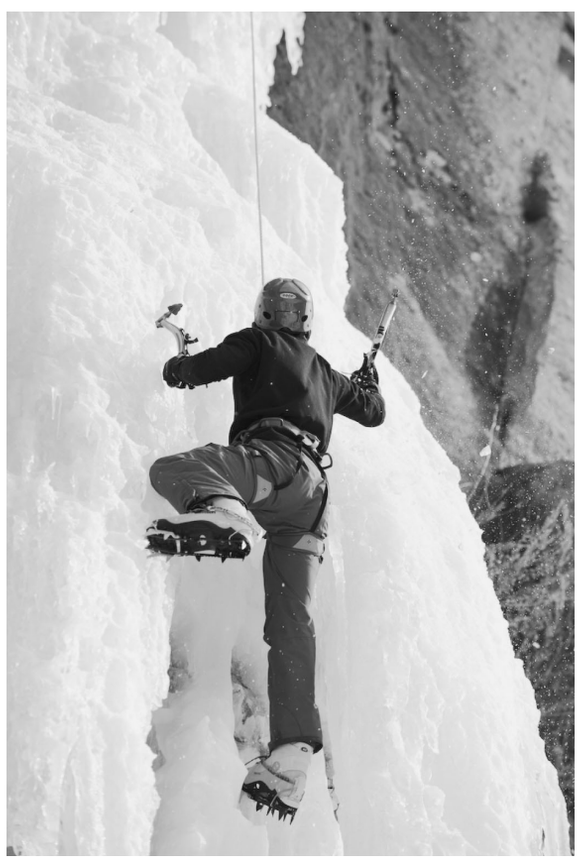


Fig. 6 Taro Yoshimura on 'Plug Falls'

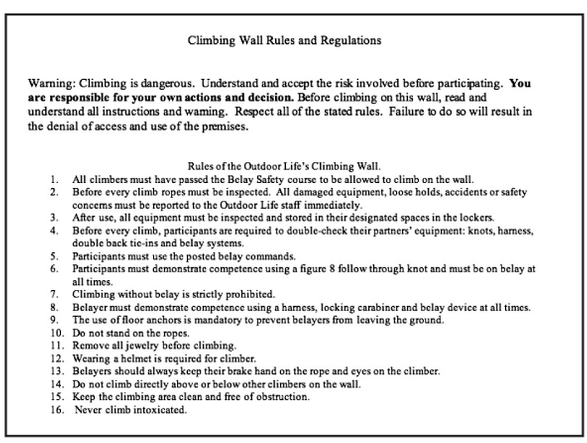
8．Risk Management

Following some recommendations from

Robin Mittelstaedt's paper on Risk Management and Vertical Adventures, a policy was developed with specific guidelines for equipment, facilities and participants.

The equipment and facilities is locked and access is controlled by a master key that can be requested and signed out at the Outdoor Life's section on the 3rd floor of the western building. There are posters with warnings and dangers of climbing around the climbing wall along with the rules of climbing (Figure 8), belaying, waiting and command words. The equipment is inspected and documented every three months. A first aid kit is on hand and readily available on site with emergency phone numbers. All incidents are to be reported promptly and documented with the staff of the Outdoor Life program.

To access the climbing wall, participants must have completed the basic belay safety course.



Climbing Wall Rules and Regulations

Warning: Climbing is dangerous. Understand and accept the risk involved before participating. **You are responsible for your own actions and decision.** Before climbing on this wall, read and understand all instructions and warning. Respect all of the stated rules. Failure to do so will result in the denial of access and use of the premises.

Rules of the Outdoor Life's Climbing Wall.

1. All climbers must have passed the Belay Safety course to be allowed to climb on the wall.
2. Before every climb ropes must be inspected. All damaged equipment, loose holds, accidents or safety concerns must be reported to the Outdoor Life staff immediately.
3. After use, all equipment must be inspected and stored in their designated spaces in the lockers.
4. Before every climb, participants are required to double-check their partners' equipment: knots, harness, double back tie-ins and belay systems.
5. Participants must use the posted belay commands.
6. Participants must demonstrate competence using a figure 8 follow through knot and must be on belay at all times.
7. Climbing without belay is strictly prohibited.
8. Belayer must demonstrate competence using a harness, locking carabiner and belay device at all times.
9. The use of floor anchors is mandatory to prevent belayers from leaving the ground.
10. Do not stand on the ropes.
11. Remove all jewelry before climbing.
12. Wearing a helmet is required for climber.
13. Belayers should always keep their brake hand on the rope and eyes on the climber.
14. Do not climb directly above or below other climbers on the wall.
15. Keep the climbing area clean and free of obstruction.
16. Never climb intoxicated.

Fig. 7 Climbing wall rules and Registration

9. Conclusion

Thanks to efforts of the staff, administration and students of the Hokkaido University of Education two different climbing walls were completed in 2008. As a result, further curriculum development could include indoor wall climbing and ice climbing experiences into the Outdoor Life's program. The students were able to develop practical knowledge of climbing through a variety of experiences. Furthermore a dramatic and positive change in self-esteem, self-confidence and cooperative attitudes was noticed among the students who have used the wall regularly. Other unrelated skills to climbing were also learned during the construction process, including the use of carpenter tools. The overall perception is that the climbing experiences have had a positive effect on the participants of the courses. The successful results can be attributed to the cooperative effort between teachers, students and administration.

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i　北海道のアウトドア情報が満載のホームページ　http://www.h-outdoor.com/

ii　http://www.shugakuso.co.jp/

iii　Black Diamond Equipment, http://bdel.com/

iv　Petzl, www.petzl.com

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