

SKILL AND KNOWLEDGE MASTERY OF STUDENTS IN LEVEL I AVALANCHE COURSES

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ABSTRACT: Avalanche education began in the United States in early 1970's. The current entry level--often referred to as Level 1--avalanche curriculum focuses on the practical application of basic avalanche skills and knowledge. This study attempts to determine what avalanche information the learner can recall a week after and a year after completion of a Level 1 Avalanche course and to determine which skills learned are routinely put into praxis by the learner. A tertiary goal of this study is to offer a reflection on current Level 1 Avalanche curriculum and delivery. Students completing a Level 1 Avalanche course were surveyed one week and one year after course completion.

Two hundred and ten students completed the week-after survey and one hundred and eighteen completed the year-after survey. In the week-after survey 45% of students reported they had a beginner level of avalanche knowledge, this decreased to 33% in the year-after survey. Conversely, in the week-after survey 50% of students reported they had an intermediate level of avalanche knowledge, this increased to 61% in the year after survey. Respondents on the second survey scored 10% lower overall on the factual questions than the first survey; this is a decrease from 88% correct on the first survey to 77% correct on the second survey.

The percentage of students that always carried a beacon in backcountry avalanche terrain increased from 47% to 79%. Similar increases were seen in students carrying a probe and a shovel. Many students increased the frequency of using safe travel techniques such as traveling one at a time, grouping up in safe areas, and doing avalanche transceiver checks prior to entering the backcountry. Many other knowledge, behavioral, and action oriented outcomes are explored in this report.

KEYWORDS: Avalanche Education, Avalanche Curriculum, Learning Outcomes, Outcomes Assessment, Information Retention

1. INTRODUCTION

Each year an average of 26 backcountry travelers die in avalanches in the United States and 149 people die in avalanches per year worldwide (CAIC Website). To address this fatality rate, avalanche education professionals have developed many different avalanche education courses over the past 30 years. Avalanche education courses are generally divided into awareness, introductory (Level 1) and advanced (Level 2). This study will focus on the Level 1 course.

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The general learning outcomes in a Level 1 avalanche course facilitates the student in developing the knowledge and skills to: identify avalanche terrain, identify basic grain types, identify weak layers and strong layers, perform field tests to determine snow pack stability/instability, recognize weather and terrain factors contributing to instability, perform rescue through fast and efficient transceiver use, and apply safe-travel techniques (take from AAA Level 1 Course guidelines).

A paucity of research exists to assist the avalanche education practitioner in defining the specific learning outcomes for the Level 1 student. The profession is also lacking a concrete assessment methodology for measuring these outcomes in praxis. A better understanding of student learning and skills retention on a Level 1 Avalanche course will better inform the instructor of avalanche education in his or her practice.

This study investigates how well a student on a Level 1 Avalanche course masters, retains and applies the knowledge and skills presented. Our hope is that the more a student retains and applies the skills and knowledge learned in a Level 1 course, the less likely he/she is to be killed or injured in an avalanche. The overall goals of this study are to: 1) determine what avalanche information the learner can recall a week after and a year after completion of a level 1 avalanche course, 2) determine which skills learned in a level 1 avalanche course are routinely put into praxis by the learner, and 3) offer reflections on the current Level 1 Avalanche curriculum and delivery.

The following research questions guided this study:

1. What are the general demographics of the student's surveyed?
2. How much backcountry avalanche experience does a student have prior to attending a Level I Avalanche course
3. How many Level I Avalanche students owned a beacon prior to their course? How many purchased a beacon within the next year?
4. Did the number of students who carry a beacon, probe and shovel in the backcountry increase after taking a Level I Avalanche course?
5. How many students use the information and skills explored in this course in some form of professional and/or volunteer capacity?
6. What is the backcountry travel skill ability of the Level 1 student?
7. Did the learner's backcountry avalanche knowledge of factual questions increase or decrease over one year?
8. Does an increase in the student's avalanche knowledge correlate with continuing education, professional or volunteer of work in the field, or a large number of days per year spent in avalanche terrain?
9. Does a perceived increase in avalanche skill level correlate with the students factual test scores going up?
10. Did any participants get caught in an avalanche within 1 year of the course?
11. What is the level of retention on metamorphism facts?
12. A year after the course, did the student's behavior change significantly in the backcountry?

2. METHOD

This study provides a clear identification of the participants, the development of the instrument (surveys), and the development and implementation of a strict analysis procedure. All data was cleaned and verified. Most statistics were calculated using SPSS 14.0 for Windows®.

2.1 Participants

The participants in this study are students who took a Level 1 Avalanche course at one of 24 schools that participated in the survey during the 2004-2005 season (see Figure 1). A large proportion of week after survey respondents are from AAS (23%), NOLS (24%) and SAS (9.5%). The other schools each consisted of between .5% and 3.3 % of the total schools represented. In the year after survey, the respondents from AAS (29.7%), NOLS (16.1%) and SAS (11%) again made up the majority of the participating avalanche schools. Figure 1 shows the number of participants from each institution on the AES-W.

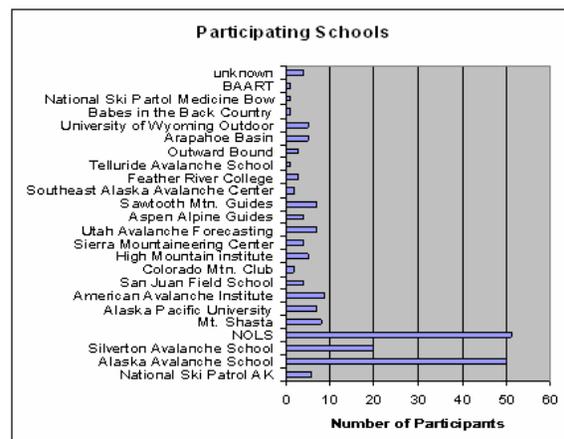


Figure 1. Participating Institutions and number of students from each on the AES-W.

In the week-after survey, the respondents' ages varied from 18-years-old to 70-years-old with a mean age of 30-years-old. In the year after survey, the respondents' ages varied from 19 to 72-years-old with a mean age of 32. Figure 2 shows the age spread of the participants.

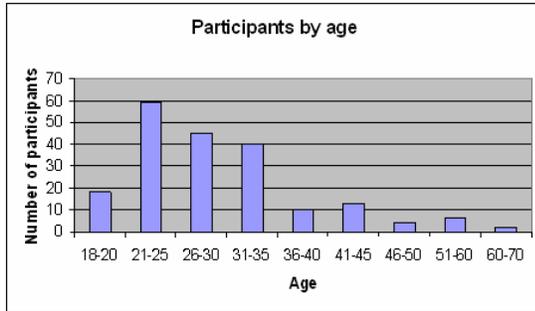


Figure 2. Participants by age.

In the week after survey 71% of the respondents were male and 25% were female with 4% not reporting. In the year after survey 73% of the respondents were male and 26% were female with 1% not reporting.

2.2 Instruments

The instruments were created through the synthesis of a multifaceted data collection method. First the course outlines, curriculum and course end examinations used by 15 avalanche education organizations were reviewed. An informal survey of avalanche education professionals was then conducted. Next, a poster session at the 2004 International Snow Science Workshop generated feedback on the rough draft of the questionnaires. After the ISSW, the surveys were reviewed and edited by those involved in the study and a number of outside avalanche professionals. Also, comments were collected from current and past level one student's that focused on the information they found most useful and the skills they anticipated using.

The Avalanche Education Survey – Week After Survey (AES-W) had 44 multiple choice, fill-in-the-blank, rank order, and yes-no questions. On average the survey was taken seven days after completion of the course. The survey had questions that encompassed general participant demographics, participant characteristics and factual questions on: avalanche rescue, safe travel procedures, signs of instability, terrain evaluation, weather factors, field tests, strong and weak layers, avalanche characteristics and terminology, the human factor, and overall understanding.

The Avalanche Education Survey – Year After Survey (AES-Y) included the same topics as the AES-W and contained 42 questions. A few of the questions were written to identify changes in attitude and behavior since the first test. This

survey was mailed via standard U.S. Postal Service to all of the completers of the AES-W.

2.3 Procedure

The raw data from each question was entered into a coded Microsoft Excel® spreadsheet. Each answer was coded (AES-W) and cross coded (AES-Y) to ensure consistency and anonymity for the participants. All Excel data was converted to SPSS 14.0 for Windows®. Individual entries with no data were removed. No questions were thrown out. Each Excel spreadsheet and SPSS matrix was spot checked. All data is reviewed in the next section.

3. RESULTS

The following results were calculated with SPSS 14.0 for Windows®. The results are organized in the manner they appeared in the instrument and do not necessarily follow the order of the research questions. Two hundred and ten students returned the AES-W. One hundred eighteen students returned the AES-Y. Both surveys are discussed in this section as well as just the sub-set of week after participants who returned both surveys.

3.1 Reason the Course Was Taken

In the AES-W, 62% of the students took the course for personal reasons, 3% took the course for professional reasons and 35% indicated they took the course for both reasons.

In the AES-Y 15% of the respondents indicated they had worked professionally in a field requiring avalanche training. And, 13% of the respondents had performed volunteer work where their avalanche training was important.

3.2 Skill Level in Chosen Sport

Sixty-nine percent of the students have been participating for 9 years or less in the sport that takes them into backcountry avalanche terrain. Figure 3 shows the number of participants who participated in backcountry sports in avalanche terrain by number of years.

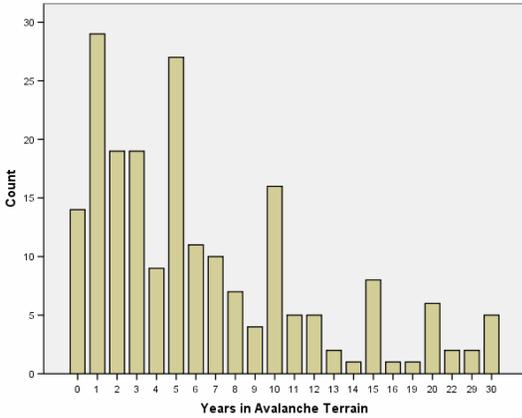


Figure 3. Years of participating in backcountry sports in avalanche terrain (AES-W).

3.3 Mode of Travel

In the week-after survey, Figure 4 shows a graphic representation of the different modes of travel that were reported by the respondents.

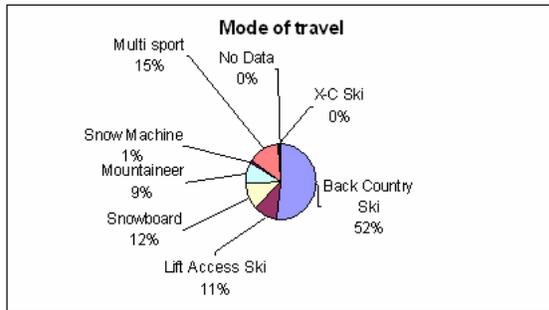


Figure 4. Mode of Travel (AES-W).

The mode of travel in the AES-Y was very similar with a slight increase (10%) in the number of backcountry skiers and a slight decrease in the number of mountaineers and snowshoers.

Seventeen percent of the students on the AES-W reported they rate themselves as a beginner in this mode of travel, 40% rate themselves as an intermediate, and 43% rate themselves as advanced in this mode of travel (Figure 5).

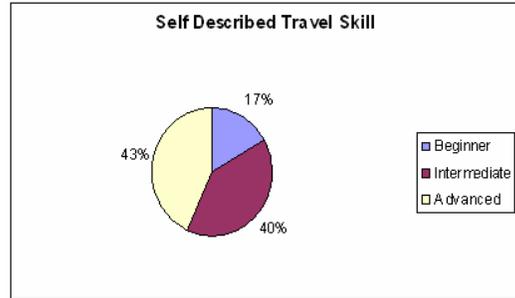


Figure 5. Self-described Travel Skill (n=210).

3.4 Self-Assessment of Avalanche Knowledge

Participants in the AES-W indicated that 45% considered themselves having a beginner level of avalanche knowledge, 50% having intermediate, and 5% having advanced avalanche knowledge (Figure 6).

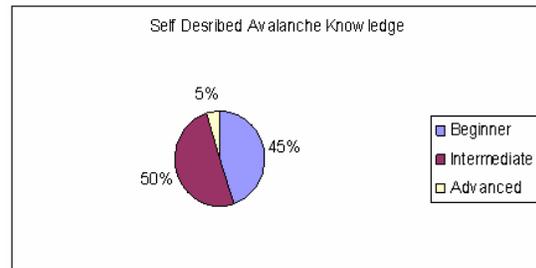


Figure 6. Self-described Avalanche Knowledge Week After Survey (n=210).

The following Figure 7 is representative of the week-after responses of the 118 students that returned both surveys.

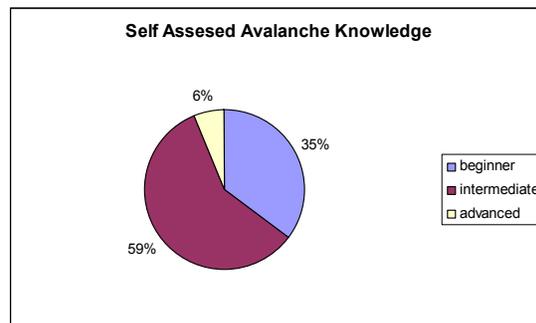


Figure 7. Self-Assessed Avalanche Knowledge for week-after participants that completed the year after study.

In the AES-Y 33% of the participants considered themselves having a beginner level of avalanche knowledge, 62% having an intermediate level of knowledge and 5% having advanced avalanche knowledge (Figure 8).

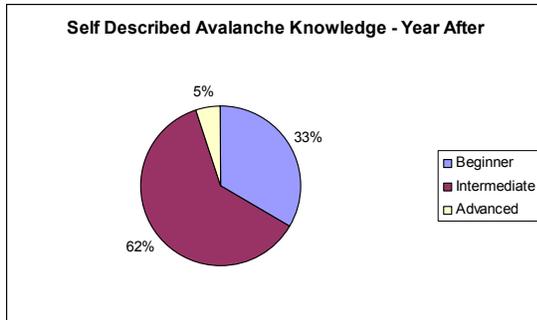


Figure 8. Self-described Avalanche Knowledge Year After Survey (n=118).

In the year-after survey, 91% of the students reported they had learned lessons in their avalanche class that resulted in more conservative decisions while in avalanche terrain. And 86% of students felt the skills and information they gained in class resulted in feeling more comfortable with a decision to travel on certain avalanche slopes.

3.5 Days per Year Traveling in Avalanche Terrain

On average, respondents of AES-W spend 20 days per year traveling in avalanche terrain. Respondents of the AES-Y reported traveling an average of 25 days per year in avalanche terrain. When looking at the week-after surveys of students that returned both surveys they averaged 21 days per year traveling in avalanche terrain.

3.6 Formal Training

Fifty percent of the students in the surveyed Level 1 Avalanche courses reported having no prior formal avalanche training. Twenty-seven percent had attended an Avalanche Awareness class, and nine percent had attended some form of a one-day avalanche class. Another 9% had already had a Level 1 course and 3% had attended course lasting five or more days.

In the AES-Y, 25% of the students had taken some form of continuing education since their Level 1 course. Nine students had taken another level 1 course, eight students had taken a Level 2 course, and 8 students had taken a refresher course.

3.7 Involved in An Avalanche

In the AES-W, 16% of the 210 respondents had been involved in an avalanche prior to their course. Nine percent had triggered the avalanche and one percent were caught and partially buried. The other respondents were traveling with people that triggered (3.3%) an avalanche and were caught (2.9%), and were partially buried (1.9%).

In the AES-Y, 2.5% (3) of the students had been involved in an avalanche since their Level 1 course. Two of these students had triggered and were caught in a slide themselves. Both had companions that were caught resulting in one injury. One student was with a companion who was caught in an avalanche.

3.8 Avalanche Transceiver

Fifty-six percent of the AES-W participants owned a transceiver prior to attending the Level 1 avalanche course. Thirty-three percent had not practiced with a beacon prior to class, 10% had practiced with a transceiver only once, 33% had practiced several times, and 10% had practiced frequently prior to class.

Thirty percent of the year-after students had purchased a new, or replaced an old avalanche transceiver within the past year. Eighty-two percent of students practiced five times or less over the past year with 24% not practicing at all.

3.9 How Often Did The Participant Carry a Beacon, Probe and Shovel?

Prior to the Level 1 course, students reported that 47% always carried a beacon, 5% frequently carried a beacon, 5% occasionally carried a beacon, 4% seldom carried a beacon, and 36% had never carried a beacon when traveling in avalanche terrain.

A year after the Level 1 course, students reported that 79% always carried a beacon, 6% frequently carried a beacon, 2% occasionally carried a beacon, 1% seldom carried a beacon, and 8% never carried a beacon when traveling in avalanche terrain.

Prior to the Level 1 course, students reported that 40% always carried a probe, 9% frequently carried a probe, 8% occasionally carried a probe, 2% seldom carried a probe and 38% had never carried a probe when traveling in avalanche terrain.

A year after the Level 1 course students reported that 75% always carried a probe, 9% frequently carried a probe, 3% occasionally carried a probe, 2% seldom carried a probe, and 6% never carried a probe when traveling in avalanche terrain.

Prior to the Level 1 course 52% of students reported that they always carried a shovel, 7% frequently carried a shovel, 11% occasionally carried a shovel, 4% seldom carried a shovel and 23% had never carried a shovel when traveling in avalanche terrain.

A year after the Level 1 course, students reported that 78% always carried a shovel, 9% frequently carried a shovel, 2.5% occasionally carried a shovel and 6% never carried a shovel when traveling in avalanche terrain

3.10 Factual Questions

The overall performance on the year-after survey shows a decrease in correct answers from 88% correct to 77% correct. Out of 118 students that completed the second survey, 16% performed the same, 9% did better on the factual questions on the second survey and 75% did worse (see Figure 9). Of the 12 students that did better on the year-after survey, 92% (n=11) had some form of: continuing education, volunteer time utilizing avalanche skills, worked professionally in avalanche terrain, and / or spent 30+ days a year in the backcountry.

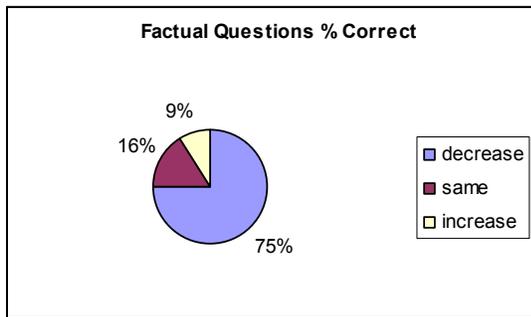


Figure 9. Factual questions with percent correct on a comparison from the first survey to the second survey on factual questions.

Figure 10 represents the students' self-assessed avalanche knowledge on a comparison of both surveys. Out of the 118 students that completed both surveys, 71% felt their avalanche knowledge stayed the same, 16% felt it had increased and 13% felt it decreased.

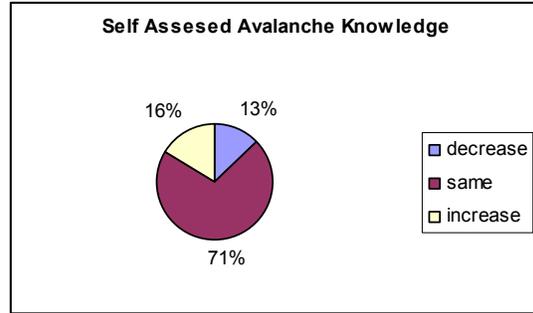


Figure 10. Students self-assessed avalanche knowledge on a comparison of both surveys.

3.11 Safe Travel Procedures

According to the AES-W and the AES-Y, the number of students who always ski with a partner increased from 60% to 66% over one year. The number of students who always ski alone increased from 24% to 48% over one year. The number of students who always watch their partner while they ski increased from 35% to 54% in one year. The number of students who group up in avalanche-free areas increased from 29% to 48% in one year. The number of students who always had an escape route planned increased from 16% to 35% over one year. The number of students who never ski above their partner increased slightly (6%). The number of students who always check their beacons in the parking lot increased from 30% to 60%. The number of students who check their partner's transmit mode increased from 25% to 57%. And, the number of students who check their partner's receive mode increased from 16% to 39% over one year.

3.12 Test Preference

Almost seventy percent of the students had not performed the Rutschblock Test prior to their Level 1 class, and 90% performed the Rutschblock in class. Ninety-three percent of the students had not performed a Stuffblock test prior to their class and 34% performed the Stuffblock in class. Ninety one percent of the students had performed a compression test in class and 24% performed the compression test prior to class. Thirty-three percent of the students had performed a shovel shear test prior to class and 87% performed the shovel shear test in class. Thirty two percent of students had performed the 'jump on small rollovers' prior to class and 59% performed this test in class. Thirty-seven percent

of students had performed ski pole probe tests prior to class and 85% performed the ski pole probe in class.

In the AES-W the most preferred field tests are: compression test (28%), a ski cut (18%), ski pole probe (17%), shovel shear (16%), jumping on rollovers (12%) with the rest of the tests equaling less than 5% each. On the AES-Y the most preferred field test are: ski pole probe (41%), compression test (12%), shovel shear (11%), jumping on rollovers (9%). Of the 53 participants who had no previous training before their Level 1 course, none had done a Stuffblock, 9% had done a Rustchblock, 9% had done a compression test and 13% had done a shovel shear test.

3.13 Human Factors

Eighty-eight percent of the students on the AES-W report recognizing the human factors presented in class that had affected them on their prior outings. Sixty-seven percent of the students on the AES-Y report recognizing the human factors presented in class that had affected them on their prior outings in the past year.

3.14 Methods of Decision Making

The percentage of students always using the consensus method of decision making on outings increased from 18% to 26% over one year. Only 1% of the students reported always using a democratic decision making method on the first survey. This increased to 3% on the second survey. Having the most experienced person in the group frequently make the travel decisions decreased from 48% on the week-after survey to 28% on the year-after survey. The students tended to go with the most conservative opinion when judging avalanche terrain more often in the year-after survey than in the week-after survey.

3.17 Work Professionally

On the year-after survey, 15% of the students reported working professionally when using the avalanche information and skills they learned in their class. And, fourteen percent reported they volunteer in some manner that utilizes the avalanche information and skills they learned in class, with 24% having worked either as a professional and/or a volunteer.

4. DISCUSSION

One goal of this study is to determine what avalanche information the learner can recall a week after and a year after completion of a Level 1 avalanche course. The second goal is to determine which skills learned in a Level 1 avalanche course are routinely put into praxis by the learner. The third goal is to attempt to identify areas for improvement in Level 1 avalanche curriculum and delivery.

4.1 General Demographics

The participants in this study ranged in age from 18 to 72 years-old. Approximately $\frac{3}{4}$ of the students are male and the average age was 30-years-old. Only a small proportion (15%) of the students took the Level 1 course for professional reasons. Although the AES-W students indicated that they took the course for mostly personal reasons, 24% of the AES-Y students used their knowledge and skills in a professional or volunteer position. The majority of the students took the course with AAS, NOLS and SAS.

The students reported that on average they had participated in sports that took them into backcountry avalanche terrain for seven years. They spent an average of twenty days per year traveling in backcountry avalanche terrain. Over half (52%) of the students are backcountry skiers. Snowboarding is the next most popular sport closely followed by lift-served skiing. Only seventeen percent of the students in the AES-W consider themselves a beginner (AES-Y = 11%) at their chosen mode of travel. With 40% considering themselves intermediate (AES-Y = 47%) and 43% considering themselves advanced (AES-Y = 42%). These recreationalists are more than capable of pushing deep into backcountry avalanche terrain.

The demographic of the 'typical' student in the Level 1 avalanche course closely mirrors the statistics for avalanche accidents and fatalities (CAIC Website; Tremper, 2001). This indicates that avalanche education organizations are hitting the target participants who are at the highest level of risk to be caught and buried in an avalanche. Noticeably missing from this demographic are snowmobilers, but most of the courses that were included in this survey cater to non-motorized backcountry travelers.

Interestingly, 16% of the students in the AES-W had been involved in some form of avalanche incident prior to the class. Only 2.5% of the students in the AES-Y had been involved in an

avalanche incident in the year since they took the level 1 course. To add significance to this data, it would have been interesting to ask the AES-W students if they had been involved in an avalanche incident within the year prior to taking this course.

Approximately 30% of the students on the week-after survey had performed the Rutschblock, compression, and shovel shear test prior to their Level 1 experience. This indicates some backcountry travelers are taking avalanche awareness classes or a Level 1 course prior to the test course and / or there is a significant level of informal learning occurring. When considering students who had no formal training prior to their Level 1 course (n=53), none had done a Stufblock, 9 % had done a Rutschblock, 9 % had done a compression test and 13% had done a shovel shear test. Interestingly enough, this reflects the length of time these tests have been in popular use. It appears there is some level of informal learning taking place amongst backcountry enthusiasts through some means.

One year after the Level 1 course, there was a slight shift from students self-reporting their avalanche knowledge as being a beginner to being an intermediate level. The year-after students reported that 91% felt they had learned lessons in the Level 1 course that led them to make more conservative decisions in avalanche terrain and 86% felt more comfortable making decisions to travel on certain avalanche slopes. These percentages of change indicate the student perceives they have a higher level of knowledge, skill and ability since taking their Level 1 course.

4.2 Recall of Factual Avalanche Information

In general, students performed equally as well on the AES-W and the AES-Y on the questions pertaining to strong and weak layers (metamorphism). There was a 1% to 10% decrease in test scores on each of the metamorphism questions. This was consistent with the overall decrease of test scores and does not indicate a lower level of retention compared to the other factual questions.

Although the self-reported skill level of the students increased slightly from the AES-W to the AES-Y, the factual test scores decreased from 88% correct to 77% correct. Out of 118 students who completed the second survey, 16% performed the same, 9% did better on the factual questions on the second survey and 75% did worse. Of the 9% (n=11) who performed better they had some form of continuing education, worked professionally or volunteered, or had over

30 days in the field. This shows the importance of continuing education to the retention of avalanche factual information.

From the perspective of the students' knowledge retention percentages, there appears to be no significant correlation between the slight increase in self-reported skill level and the actual decrease in performance on the factual questions pertaining to the students that took both tests.

4.3 Skills Learned Put Into Praxis

The ability to retain and express factual knowledge is only one perspective of the overall retention paradigm. How the student performs certain learned skills when in the backcountry, and how their behavior and decision making has changed, is the other side to this paradigm.

4.3.1 Changes in Actions

If carrying and practicing with an avalanche transceiver is an indicator of an increased safety consciousness when traveling in the backcountry, then there is a marked increase in this type of safety consciousness over the year between the surveys. The percentage of students that always carried a beacon in the backcountry increased from 47% to 79%. The percentage of students who own a beacon increased from 56% to 71%. 82% of the students had practiced with their beacon five or less times in the year since their level 1 course. This reiterates the need to encourage routine practice with an avalanche beacon. The percentage of students who always carry a probe increased from 40% to 75%, and the percentage of students who always carry a shovel increased from 52% to 78%. This is a significant change in risk management behavior.

The use of safe travel procedures is a strong indicator of the student's ability to manage risk in the backcountry. There was a slight increase in the number of students who skied one at a time from 60% to 66%. The percentage of students who watched their partner while they skied a potential avalanche slope increased from 35% to 54%. The number of students who group up in avalanche free areas increased from 29% to 48% in one year. The number of students who always had an escape route planned increased from 16% to 35% over one year. The number of students who never skied above their partner increased slightly (6%). The number of students who always checked their beacons in the parking lot increased from 30% to 60%. The number of students who checked their partner's transmit

mode increased from 25% to 57%. And, the number of students who checked their partner's receive mode increased from 16% to 39% over one year.

The tests that students prefer to use are: the compression test, the ski cut, and the ski pole probe.

4.3.2 Changes in Behavior

The human factor was recognized by 88% of the students on the AES-W as having affected the group dynamic on prior outings. The participants on the AES-Y reported recognizing the human factors presented in class as having affected them on their prior outings in the past year. It appears that addressing the human factor in Level 1 avalanche courses helps students stay attuned to factors such as fatigue, peer pressure, differing abilities and time constraints.

When making decisions concerning route selection and safe travel, the year-after survey indicates students are more likely to use consensus and less likely to have the most experienced person make the decision. The democratic method of decision making was not widely used.

A year after the course, the students utilized much safer travel procedures and performed more frequent equipment safety checks. Specifically, students appear to check their beacon's transmit mode more frequently and an even greater increase was seen in checking the receive mode.

4.4 Other Findings

Some of the concluding questions in both surveys were framed on the use of the English and / or metric system in Avalanche Level 1 courses and the use of maps in the backcountry. Seventy percent of the students answering the year-after survey stated a general preference for utilizing the English measurement system on course. On the AES-W the majority of the students indicated they primarily use the English measurement system, but they did understand metric well enough to use in class. Nine percent of the responding students felt that using the metric system was too difficult for a Level 1 class.

A majority of the students reported they had good to excellent map reading skills prior to the course. Eighty-eight percent of the students stated they use maps on multi-day outings in unfamiliar terrain. Only twenty-nine percent use maps on familiar terrain.

4.5 Reflections on The Current Avalanche Curriculum and Delivery

The students enrolled in the Avalanche Level 1 courses are the target audience for preventative avalanche education. The students are of the same age, gender and recreational user type as the national statistics for avalanche incidents and fatalities. The snowmobile enthusiasts are somewhat under-represented.

No national benchmark exists against which one could compare the factual test scores. Also, no pre-test was done to set a base line for the study group. These factors aside, the relative retention of factual avalanche information appears to be consistent and within normal parameters. One of the research questions addresses the debate over the inclusion or exclusion of snow metamorphism content in the Level 1 curriculum. It appears there is not a significant difference between the retention of this material and other topic material in the Level 1 curriculum.

It appears that participating in an avalanche course does have an appreciable effect on changing specific actions of students traveling in avalanche terrain. The most noticeable effect is the carrying of safety equipment and a change in travel behavior. There was a strong indication that continuing avalanche education and working or volunteering in avalanche terrain has a positive effect on the retention of factual avalanche information. With a quarter of the students using the information in the Level 1 course for professional and volunteer work, it is imperative to ensure consistency and quality in the Level 1 curriculum.

5. CONCLUSION

This study determined what factual avalanche information the learner can recall a week after and a year after completion of a Level 1 Avalanche course. The avalanche student, on average, does 10% worse on the factual avalanche knowledge assessment one year after course completion. Students who scored well on this information tended to be those who took continuing education or worked in the avalanche safety field.

This study also determined which skills learned in a Level 1 Avalanche course were routinely put into praxis by the learner. It appears students who take a Level 1 Avalanche course are more likely to carry safety equipment and utilize

safer travel techniques than they had prior to taking the course.

Avalanche education appears to be a valuable and effective method to instill basic avalanche knowledge and skills in backcountry travelers that work and play in avalanche terrain.

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- ❖ Siskiyou College/Mt. Shasta Avalanche School
- ❖ Alaska Pacific University
- ❖ American Avalanche Institute
- ❖ San Juan Field School
- ❖ Colorado Mountain Club/BMS
- ❖ High Mountain Institute
- ❖ Colorado Avalanche Information Center
- ❖ Sierra Mountaineering Center
- ❖ Friends of Utah Avalanche Center
- ❖ 10th Mountain Division Hut Association and Aspen Alpine Guides
- ❖ Sawtooth Mountain Guides
- ❖ South East Alaska Avalanche Center
- ❖ Feather River College
- ❖ Telluride Avalanche School
- ❖ Outward Bound
- ❖ Arapahoe Basin Ski Area
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