# ARE YOU BEHAVING OUT THERE?: STUDENT REPORTED BEHAVIOR CHANGES AFTER RECREATIONAL AVALANCHE EDUCATION IN ALASKA

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ABSTRACT: Formal avalanche education has existed in Alaska since 1976. The Alaska Avalanche School (AAS) is the primary provider of this education and serves both recreationalists and professionals. Limited formal research exists on the actual impacts of these educational experiences on student behaviors, and this study is the first to assess the impacts of the AAS Recreational Level 1 curriculum on student behaviors in the backcountry. The study was conducted using two surveys. One survey was a retrospective post-test questionnaire given to students that examined the self-reported behavioral impacts of the AAS Level 1 curriculum on students' avalanche risk management behaviors. Respondents answered questions on 14 important behaviors identified from the American Avalanche Association Recreational Level 1 course guidelines. The survey was distributed to students who had completed the AAS Level 1 course in the 2023-2024, 2024-2025, and 2025-2026 seasons, and was distributed during the 2025-2026 season. The second survey, given to instructors, focused on understanding which Level 1 learning objectives were most valuable, and which learning environments were most effective for student learning, according to instructors. The student survey respondents were mostly male (61%) skiers (71%), with 2-5 seasons of experience (48%), and spent 6-10 days in the backcountry per season (34%). Instructors were relatively early-career (40% with 2–5 seasons), taught skiers/snowboarders (75%), and taught up to the rec 2 level. Participants in the student survey reported significant increases in 13 out of 14 behaviors after taking the course. Instructor survey results prioritized field-based teaching over classroom presentations, emphasizing terrain identification and travel techniques as the most critical skills for backcountry safety. Comparing the two survey results, instructors highly valued terrain-related behaviors, yet the student survey results did not reflect higher degrees of change for terrain-related behaviors. The results from this research will be valuable for refining recreational avalanche curricula and understanding the impact of different educational environments on the quality of these curriculums. Additionally, this study will provide practitioners with insights into the behaviors of recreational users with basic avalanche safety training.

KEYWORDS: Avalanche education, decision making, Alaska, backcountry behaviors, recreational courses

## 1. INTRODUCTION

Recent years have seen massive growth in the snow community in Alaska and throughout the country. According to Birkeland, Logan, & Greene (2017), backcountry skiing has grown eightfold in popularity between 1995 and 2017. During the COVID-19 pandemic and the following years, a surge in backcountry use was claimed by media reports and certified by a survey by Fiore et al. (2023) focusing on the 2020-2021 winter season. The authors found that a quarter of the new backcountry users have no formal avalanche education. Unlike at a ski resort, people traveling into the winter backcountry are exposed to unmanaged terrain with limited support resources. Because of this the chances for injury and death at times can be high.

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The American Avalanche Association (A3) is the governing body on avalanche education in America. A3 sets the nationwide guidelines for avalanche education that subsequently certified education providers must follow. A3 and the Alaska Avalanche School (AAS), a certified A3 provider, along with many other providers, deliver training to recreational and professional backcountry travelers. This training provides users with necessary knowledge and skills to assess avalanche conditions and travel safely in the backcountry.

Teaching risk and hazard recognition as it pertains to the assessment of avalanches is complicated in the mountainous winter environment, especially in Alaska, where short daylight hours and bitter cold make these courses hard to run. Teaching people how to recognize and manage a complex problem in a challenging environment can lead to ineffective learning and a need for continuous flexibility with teaching methods. Especially in outdoor experiential education, curriculum must be consistently adapted to the needs

of students as derived from an understanding of how the course is impacting the students.

Few studies have been published assessing the impacts of avalanche education on students. McNeil et al. (2023), Dassler et al. (2023), and Greene, Hendrikx, & Johnson (2025) are recent studies that aim to tackle this knowledge gap.

Recently, McNeil et al. (2023) presented the most updated and thorough study on the behavior changes in participants after a recreational avalanche course. While an overall positive behavior change occurred in participants, 20%-30% did not change their behaviors, and many reported not practicing important skills like avalanche rescue after the course. This study presents data that shows some of the challenges in learning within the current avalanche course environment.

Dassler et al. (2023) attempted to tackle these challenges through an adapted course with the goals of facilitating double-loop learning and encouraging life-long learning practices. The authors implemented double-loop learning methods to combat the wicked learning environments of avalanche education. Double-loop learning utilizes a self-reflective element that provides learners with a feedback loop and works to revise one's mental models, develop new skills, and integrate new information (Dassler et al., 2023). Using constant reflective moments through daily participant logs, daily group debriefs, and a participant reflection tool, the researchers found that participants put in a significantly higher amount of effort into conditions assessments. Despite the immense progression the researchers observed, they also found that “participants were still only doing a fraction of the things and assessments we would like for them to do”.

This project provides an understanding of how Alaska Avalanche School Recreational Level 1 Avalanche courses are impacting the behaviors of students in the backcountry after course completion. Through a comprehensive retrospective post-test survey of student’s behaviors from weeks to years since their last course, this project collected baseline information that can be used by the Alaska Avalanche School for evidence-based curriculum improvements.

## 2. METHODS AND MATERIALS

This project was developed in collaboration between the Outdoor Studies program at Alaska Pacific University (APU) and Alaska Avalanche School (AAS) and was inspired by the McNeil et al. 2023 & 2024 research for the American Institute for Avalanche Research and Education (AIARE) Level 1 courses. We used a retrospective post-test survey distributed to Level 1 students after their course to assess the impact of AAS Level 1 courses on students' behaviors. This project is part of an undergraduate senior thesis and approved by Alaska Pacific University Institutional Review Board.

The student survey was sent out during January through March 2026 via the Alaska Avalanche School email list of student graduates. Additionally, the survey was distributed through newsletters and social media posts to promote responses. The survey filtered respondents to only allow responses from students who had taken a Level 1 course from the 2023 through 2026 winter seasons. The instructor survey was distributed directly through email to all the instructors at the Alaska Avalanche School.

This study employed a 33 question, retrospective post-test survey to students who had taken an Alaska Avalanche School Level 1 course during the winter seasons from 2023 to 2026. The survey asked students to self-report on the frequency of 14 behaviors before taking their course and after taking the course. Additionally, a survey of the instructor team was sent out to inquire what behaviors and skills they find the most important for Level 1 students to perform. Behaviors in this study are understood as the way a respondent acts and implements skills and knowledge to their backcountry recreation.

The Student Survey had 33 questions in three sections: Demographics, Pre-Trip behaviors, and During Trip behaviors centered on 14 specific actions. Respondents of this survey were AAS students who had taken their Level 1 course in the specified three winter seasons. The survey had 118 responses, with 82 complete responses (70% completion) from a pool of 1,068 total number of AAS L1 students 2023-2026. (11% responsiveness).

The Instructor Survey had 7 questions, focused on understanding the experience instructors have, what behavior related learning objectives / skills are most important, and what learning environment is most effective for avalanche safety topics. Respondents of this survey were Alaska Avalanche School Instructors. The survey had 20 full responses with 100% completion rate.

### *2.1 Student Survey Scoring System*

The student survey was scored using a five-point Likert scale for all behavior questions. The 14 behaviors were split into two sections, Pre-Trip and During Trip, each assessed for before and after the course (Table 1). For ease of data analysis, all behavior scoring was smoothed to a 5-point scale. Never (1), Rarely (2), Most Trips (3), Every Trip (4), More Than Every Trip (5).

Table 1: Behavior Split

| ***Pre-Trip*** | ***During Trip*** |
|---|---|
| Check Weather Stations | Use Travel Techniques |
| Ruling Out Terrain for the Day | Travel Down One at a Time |
| Review Maps and Terrain | Perform Snowpack Tests |
| Impact of Danger Rating on Travel Plan | Tests Impacting Travel Decisions |
| Discuss Forecast with Group | Practice Rescue Skills |
| Check Rescue Equipment | |
| Check Communication Equipment | |
| Check Avalanche Forecast | |
| Tell Others Your Plan | |

## 2.2 *Data Analysis*

The data set from the student survey was ordinal and was imported and analyzed in RStudio software (version 2026.1.1.403). Cronbach's alpha test was used to assess internal consistency of the 14 pre- and post-course behaviors. Normality of the data set was assessed using a Q-Q Plot and the Shapiro-Wilk test for each behavior; all were determined to be significantly non-normally distributed. Non-parametric tests and descriptive statistics were employed for the majority of the analysis. Wilcoxon signed-rank test was used to assess per-person paired differences for each of the 14 behaviors as well as the Hodges-Lehmann estimator to report medians and median paired differences. A threshold analysis using exact binomial tests on discordant pairs examined whether respondents reached a score of 4 or above, representing consistent and routine behavior. Statistical significance was set at alpha = .05 throughout.

The data from the instructor survey was analyzed by compiling the responses for the free-write questions and simplifying into key terms and behaviors. This data became ranked lists (Table 2) for visuals.

# 3. RESULTS

## 3.1 *Who is taking these courses?*

The student survey had 83 full responses. The student survey respondents were mostly male (61%) skiers (70.7%), with 2-5 seasons of experience (48.4%), and spent 6-10 days in the backcountry per season (34.1%). The Level 1 user group had little winter backcountry travel experience at the time of taking their course and 24.4% of users get out in the field 20+ days per winter. 56.1% of respondents took their Level 1 course in the 2025-2026 Season, 37.8% in the 2024-2025 Season, and 6.1% in the 2023-2024 Season.

## 3.2 *How are these courses impacting reported behaviors in the backcountry?*

The Alaska Avalanche School Recreational Level 1 courses positively impacted respondents' behaviors in the backcountry. 13 out of 14 behaviors saw a significant increase in frequency (Fig.1). For all behaviors, a threshold score of 4 was used to assess if the change frequency reaches routine behavior. Check Weather Stations and

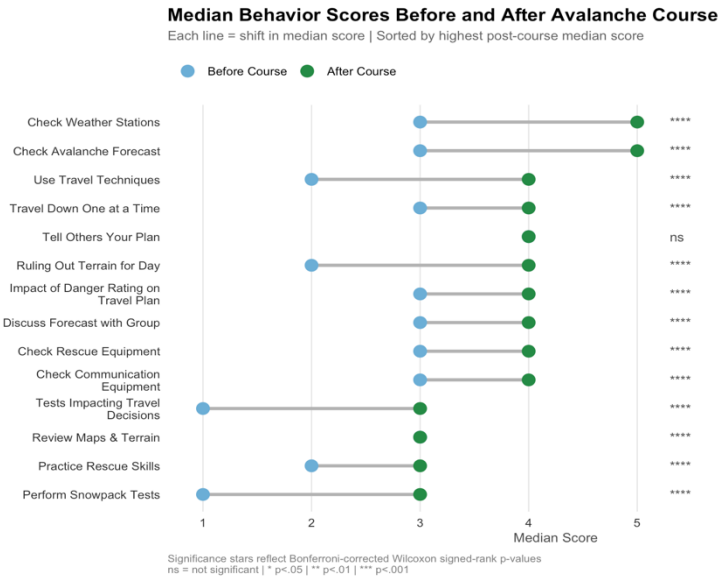



Figure 1: Median behavior scores before and after Avalanche Course

Check Avalanche Forecast showed the biggest change to the highest score of 5, a frequency of: Every Trip and Sometimes In-Between (Fig.1). All behaviors increased to be more frequent after the course, increasing mostly to a score of 4 (Every Trip). The only behavior that did not show a change was *Tell Others Your Plan*, before and after the course, respondents were already scoring at 4. This shows that recreational users are establishing an emergency contact and response plan for every backcountry trip as a habit external from their avalanche education. The two behaviors that relate to the use of snowpack instability tests (*Tests Impacting Travel Decisions* and *Perform Snowpack Tests*) started at the lowest rating of 1 (Never) and jumped significantly to a score of 3 (During Most Trips). Snowpack tests are a technical, hands-on skill that most respondents are not performing before their course, but after the course it is not quite routine but is being done much more frequently.

### 3.3 Have these behaviors become routine?

Assessing the impact of the Level 1 course by applying a behavior threshold score of 4 (Every Trip) shows if these behaviors / skills are being done routinely in a recreational user's backcountry trip (Fig.2). Behaviors with a higher percentage of green are the ones where the majority of respondents are routinely engaging with the related skills covered in the Level 1 course. Pre-trip behaviors that relate to checking avalanche and weather conditions, as well as *Ruling Out Terrain for Day* showed significant (+2) improvement in frequency. Safe travel technique behaviors also improved to be a routine behavior (4). *Perform Snowpack Tests* and *Test Impacting Travel Decisions* performed the worst with 78% and 63%, respectively, of respondents not routinely performing these behaviors.

### 3.4 Is there a difference between Pre-Trip and During Trip Behaviors?

Generally, most pre-trip behaviors (except *Review Maps & Terrain*), met or exceeded the threshold score of 4 after a course (Fig.3). Students are planning and being better prepared for their backcountry trips after taking a Level 1 course. During trip behaviors generally started at a lower score and significantly increased to a higher score (Fig.4), though most did not meet the threshold. The pre-trip behaviors are behaviors that often crossover with other recreational outdoor activities a respondent might also engage with. These behaviors are also easier to grasp and practice without having to be in or near avalanche terrain, nor do they generally require a more in-depth understanding of snow science (like *Tests Impacting Travel Decisions* in During Trip). Survey respondents showed significant improvement in During Trip behaviors, yet the snowpack test related behaviors and *Practice Rescue Skills* did not meet the threshold score. These behaviors and skills are taught in the classroom and in the field during an avalanche course but require more in-field practice and coaching than a three-day avalanche course can usually provide.

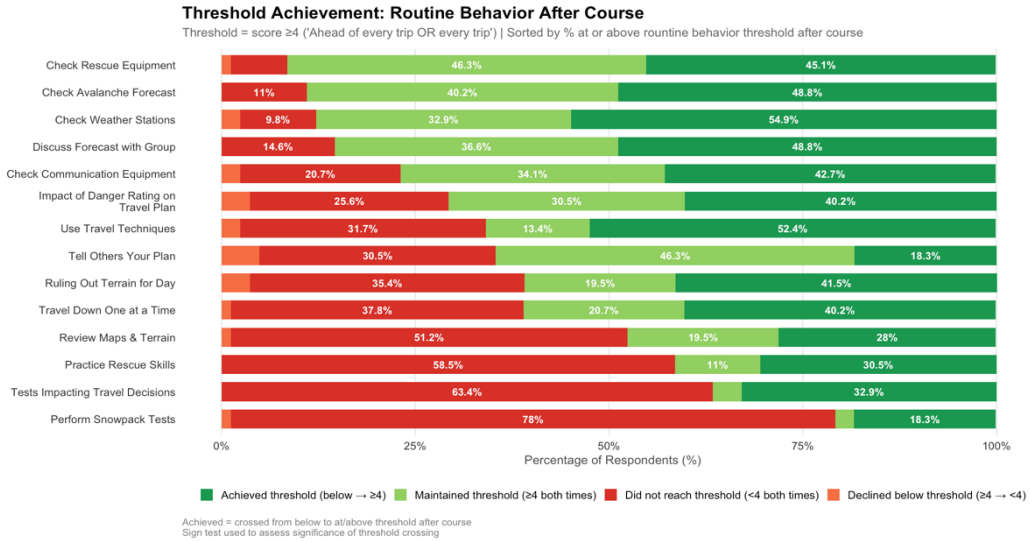



Figure 2: Threshold Achievement sorted by highest achievement to lowest

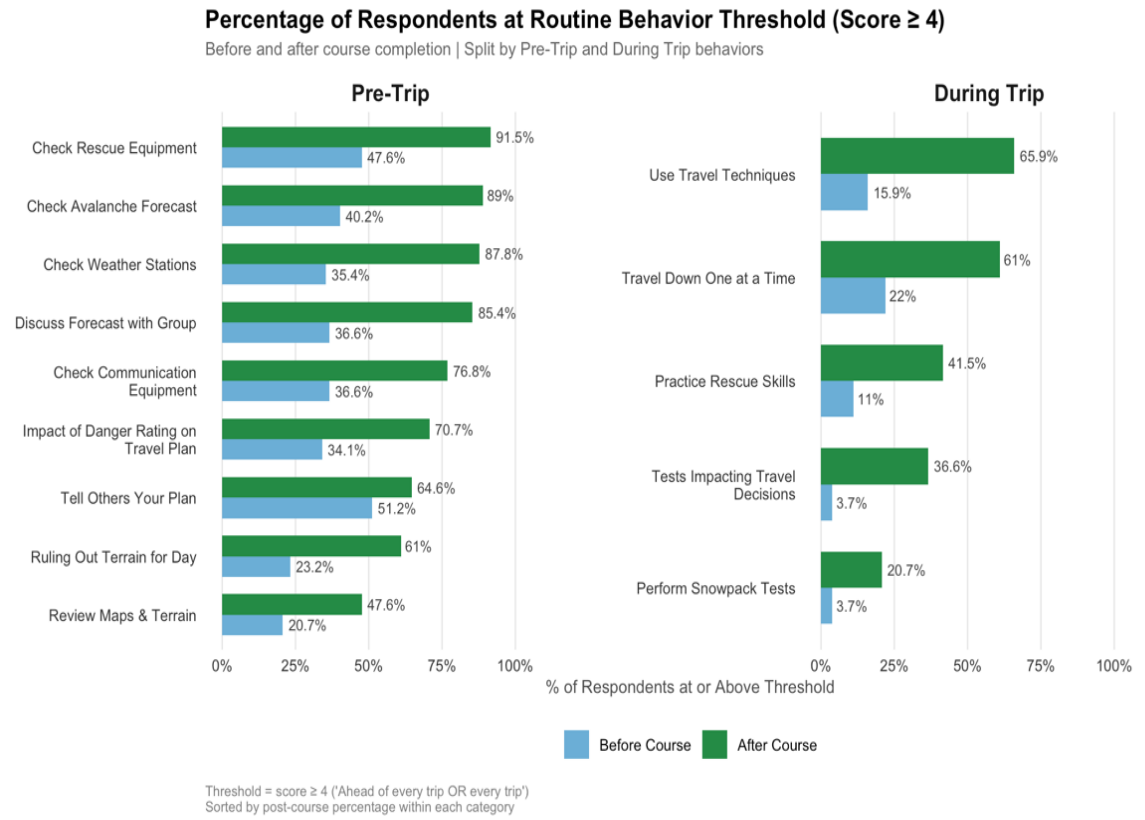



Figure 3: Threshold analysis on Pre-Trip and During Trip split

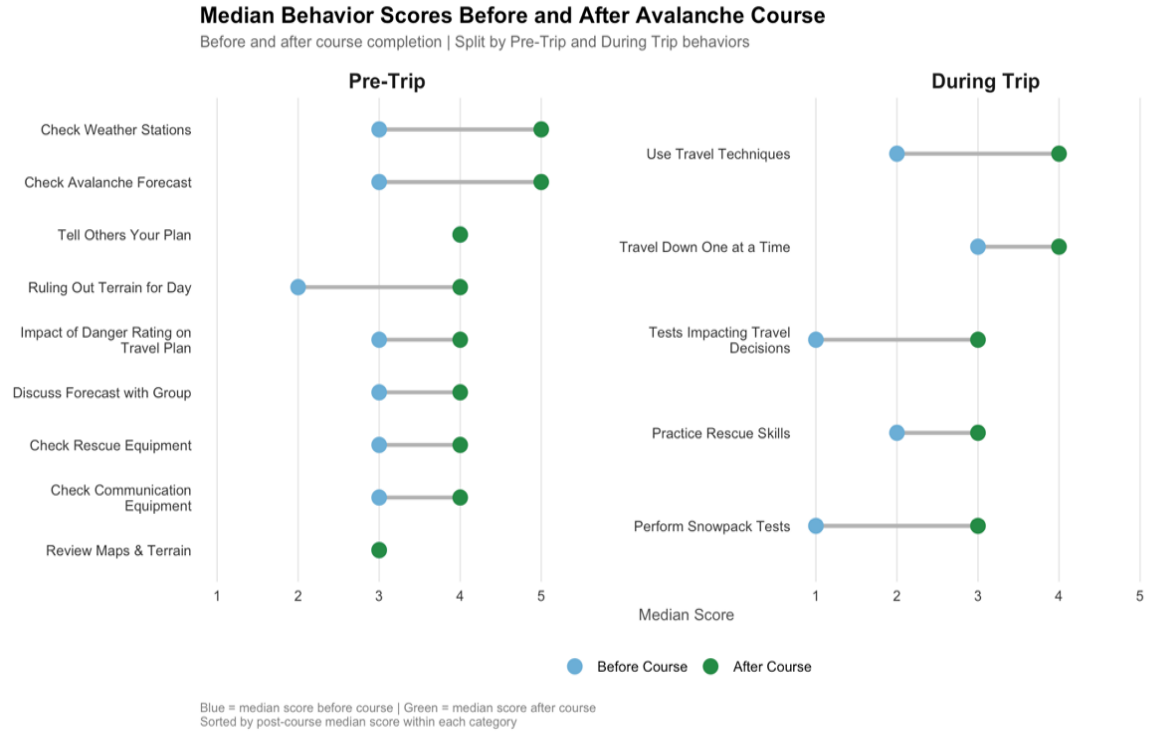



Figure 3: Median scores split on Pre-Trip and During Trip behaviors

### 3.5 *Instructor Survey Demographics*

Out of the 20 respondents for the instructor survey, the majority had been teaching for AAS for 2-5 years (40%), all instruct for Ski/Snowboard with three also teaching motorized courses. Most respondents teach up through the Level 2 course.

### 3.6 *Prioritized Level 1 Behavioral Learning Outcomes Based on Instructor Survey*

Table 2: Prioritized Behavioral learning outcomes rated by instructors

| ***Prioritized Learned Behaviors Rated by Instructors*** | ***Prioritized Behavioral Learning Outcomes in A3 Guidelines Rated by Instructors*** |
|---|---|
| Understanding Avalanche terrain, how to manage it, and use travel techniques | Choose terrain appropriate for the current avalanche forecast & safe travel |
| Be able to communicate well with a group about risk and have self-awareness | Apply risk management tools: safety equipment, trailhead checks, and communication |
| Regularly practicing companion rescue with friends | Access local avalanche bulletin and learn to understand & apply. |
| Able to recognize and apply field data to decision making processes | |
| Able to read and understand the local Avalanche Forecast | |

Between the prioritized learned behaviors according to instructors and instructors' three top priority A3 behavioral learning outcomes for a Level 1 course, by far the most important was knowledge and subsequent application of avalanche terrain identification and safe travel techniques. Additionally, it is emphasized that the ability to access and implement a local avalanche forecast is critical to instructors. Unfortunately, only one of the most popular winter backcountry recreation regions in Alaska have a daily avalanche bulletin, the Chugach National Forest. This means that many recreationists may be recreating in areas without a bulletin, making these prioritized behaviors not applicable for every trip.

### 3.7 *Is indoor or outdoor learning environment better for learning?*

AAS Level 1 courses are three days long with each day split into morning classroom lectures, afternoon field instruction, then evening classroom lectures. Instructors were asked if they found the Indoor or Outdoor environment better for learning and why. Three survey respondents said Indoor was better and 17 respondents said Outdoor.

Indoor: "*The indoors provide a learning environment with less distractions and is necessary to be sure all questions are covered where everyone can get on the same page*"

Outdoor: "*The outdoors is better for learning though the variability of snow cover/quality and weather challenges can take away from the learning experience greatly. The small groups and hands on learning of the field segments better engages the student and provides a more effective learning experience*"

## 4. DISCUSSION

Taking Alaska Avalanche School recreational avalanche courses improved students' targeted backcountry skills and behaviors. All behaviors and skills assessed in this study require consistent use and practice to mitigate the impacts of uncertainty and heuristics in avalanche hazard identification and management. Respondents practice most behaviors, which makes them safer and more prepared backcountry recreationists. Pre-trip behaviors and During Trip behaviors related to terrain and travel are the most improved behaviors that had developed into a routine. Few behaviors are still not part of respondents' trip-by-trip routine, for example *Perform Snowpack Tests* falling short with only 22% of respondents meeting the routine threshold. Often, students are first learning about snowpack tests in their Level 1 course. As other behaviors, like *Check Avalanche Forecast*, may already be part of their routine, snowpack assessment is new, complicated, and difficult to effectively put into practice as a beginner backcountry recreationist.

In the AAS curriculum, there is an hour lecture and afternoon field day that focuses on snowpack tests and assessment skills. Snowpack tests are taught as an important tool but one that must be understood within the context of the weather, terrain, and other conditions and information, like the Five Red Flags.

Instructors involved in this study prioritized avalanche terrain-related behaviors, like *Use Travel Techniques* and *Ruling Out Terrain for Day*. Generally, in recreational avalanche education, terrain choice and management is taught as the answer to all avalanche risk management. If the snowpack, weather, and/or the group is dangerous, choosing the appropriate terrain and travel techniques is the answer to make the trip safer. After taking the AAS Level 1 course, most respondents are practicing these terrain management behaviors every trip. Yet these behaviors were reported as habitual for every trip for 60% -

65% of respondents. Instructors would like to prioritize that all the students nail this down. Travel technique and terrain identification skills are hard to effectively practice and implement after a short, three-day course where you often are very limited by time, weather and snowpack conditions, and student travel abilities. If conservative terrain identification and safe travel habits are the answer to all our problems in the backcountry, we should see these behaviors in all the students.

Additionally, while regularly practicing companion avalanche rescue is the third highest priority behavior amongst instructors, only 21% of respondents are practicing rescue twice or more a season. Practicing avalanche rescue may be less fun for some than skiing with friends, though it is a critical skill to have as muscle memory. This behavior happens too rarely for most respondents. Companion avalanche rescue is an elaborate skill that is a backcountry user's last wall of defense in preventing a fatality in an avalanche incident. To make rescue an automated skill requires constant and regular practice. Connecting these two critical points shows a potentially serious skill gap of less-than-ideal terrain identification and travel skills and infrequent companion rescue practice.

On the bright side, the post-course change in pre-trip planning behaviors, namely *Check Avalanche Forecast* and *Impact of Danger Rating on Travel Plan* show that the classes set learners up for successful trip planning that meet the instructors' ideal standards.

As it currently stands, there is a lot of information to be covered in the short Level 1 course. As an introductory course, much of the information covered is new for the students and is often delivered in challenging environments both indoor and outdoor. Curriculum developers need to know how courses are impacting their students, consider what learning priorities are, and adjust the educational experience as necessary to try and meet those priorities. Instructors prioritized avalanche terrain choice and management, risk management skills, and companion rescue skills. This study shows the majority of those points are not being met in the respondent pool. Centering a curriculum around these priorities and embodying a less-is-more mindset could be solutions in providing an impactful, useful, and important education to students.

The insights from this study can support informed curriculum development and help instructors to understand how their courses may be impacting their students. Instructors and recreational course developers need to continue to ask themselves, what do we need recreational users to learn in a Level 1? What behaviors should be the highest priority and does this match with the impacts of our courses? How much should be in the Level 2 course instead of in the Level 1? How much is too much for a Level 1?

## 5. LIMITATIONS

This entire data set relies on respondent self-reporting. This introduces potential limitations on the accuracy of the data through any biases, unreliable memory, and individual interpretations of the questions. The response quality is limited by the respondent's ability to accurately recall the frequency of the 14 surveyed behaviors in the backcountry in their past days in the field before taking their course. The later season (2023-2024 and/or 2024-2025) course graduates, which account for 44% of respondents may have a more accurate understanding of their behaviors after taking the course, though may fall short in the accuracy of remembering their pre-course behaviors. This is expected to be conversely true for the 56% of respondents who took their course more recently. Surveys typically have low response rates, so this data set may not represent well the greater recreational backcountry community. Additionally, with a low response rate, the students who did respond were likely the most committed and interested in the quality of their education. More extensive research is necessary to gain generalizable understanding on how avalanche courses impact students.

## 6. CONCLUSIONS

This study investigated the impact of the Alaska Avalanche School Level 1 avalanche course on students' behaviors in the backcountry. Through two surveys and subsequent analysis we learned that these courses are significantly increasing the frequency of 13 out of 14 surveyed behaviors in the research participants. Most behaviors met a threshold of frequency for the behavior to be called routine in a respondents' backcountry trips. Only 60-65% of students regularly practiced terrain management skills / behaviors, and only 21% of respondents practiced companion rescue up to two times a season following their course. Student respondents are not meeting the instructor's instructional priorities of being well practiced in terrain identification and travel behaviors and are also falling short on frequency of rescue practice. This highlights some of the major challenges in effectively delivering the A3 learning objectives for a Level 1 course. A three-day course in a variable and challenging environment with students who are often new to the backcountry are likely factors why these behaviors are not matching instructor priorities. Critically considering the curriculum, guidelines, and delivery styles of a Level 1 course is important and leaves us with questions:

What does the Level 1 user need to know and practice and how does that get accomplished?

## 7. ACKNOWLEDGMENTS

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