UNDERSTANDING AND IMPROVING A PROFESSIONAL AVALANCHE TRAINING PROGRAM: INITIAL FINDINGS FROM THE AIARE PRO 1

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ABSTRACT: Professional avalanche training plays a central role in preparing workers for avalanche operations, yet little research has examined its effectiveness or the factors shaping its outcomes. As part of a phased evaluation of their Pro 1 program, the American Institute for Avalanche Research and Education (AIARE) analyzed records for 315 participants across 24 courses delivered during three operating seasons. To characterize performance across multiple assessments, we classified participants into four classes spanning the assessed proficiency range, from highest to lowest. We then used logistic regression and chi-square tests to examine factors associated with membership in the highest and lowest classes, including participant attributes, course structure and delivery, instructors, and terrain and hazard variables. Age, gender, race, prior training, and industry background were not associated with membership in the highest or lowest proficiency classes. However, associations emerged for participants' formal education and primary mode of travel, individual courses and instructors, and course size and course types, such as motorized and gender-affinity courses. Terrain and hazard variables were also associated with proficiency class membership. Overall, membership in the highest proficiency class was more common with more complex terrain and higher hazard, whereas membership in the lowest proficiency class was more common under lower hazard and in the absence of slab avalanche problems. Proficiency class membership also varied by venue and mountain region. These patterns raise the possibility that courses with simpler terrain, lower hazard, or no slab avalanche problems may constrain meaningful opportunities for participants to demonstrate proficiency and for instructors to assess it. Further work should test this explanation and determine how programs can support reliable assessment when key conditions do not occur. These questions, together with the other patterns identified, provide direction for further analysis, targeted data collection, and the development of a systematic evaluation program.

KEYWORDS: Avalanche education; professional training; program evaluation

1. INTRODUCTION

Following several years of pandemic-related disruptions, three seasons of routine course delivery provided the American Institute for Avalanche Research and Education (AIARE) with an opportunity to conduct a structured evaluation of their Pro 1 program. In the United States, the Pro 1 is a standardized, entry-level certification course recognized or required by many employers across ski-area, guiding, forecasting, transportation, and other avalanche operations (American Avalanche Association [A3], n.d.). It is intended to prepare participants to contribute to a risk management team, work as skilled observers, and manage a small team in avalanche terrain (A3, 2025). The A3 establishes national requirements for course structure, prerequisites, learning outcomes, and assessment, which recognized providers such as AIARE use to develop and deliver their courses (A3, n.d.). This evaluation focuses on AIARE's course design, delivery, assessment, and outcomes within these requirements.

To inform our approach, we first looked to avalanche research for insight into educational effectiveness and the factors that shape program outcomes. However, published research directly examining avalanche education remains limited. A recent scoping review identified four peer-reviewed studies of avalanche education, all focused on public recreationists (Hetland et al., 2025). While ISSW proceedings reflect growing interest in avalanche education effectiveness, with studies examining participant learning, instructor perspectives, and post-course behavior, this work also remains focused primarily on recreational avalanche education (e.g., Balent et al., 2016, 2018; McNeil et al., 2023, 2024; Riggs Meder and Walker, 2023). Research involving avalanche professionals has primarily examined the organizational and decision-making factors that shape operational practice in avalanche terrain (Johnson et al., 2016; Sterchi et al., 2019; Løland et al., 2023; Ahonen et al., 2025). However, the available literature provides little direct insight into the effectiveness of professional training or

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the factors shaping its outcomes. This gap is particularly notable given the Pro 1's central role in the U.S. avalanche profession. Against this backdrop, this paper presents an initial quantitative analysis of existing Pro 1 program data. We examine proficiency patterns and their associations with participant, course, instructor, terrain, and hazard variables to identify priorities for further study and inform the development of a systematic evaluation program.

2. PRO 1 PROGRAM AND EVALUATION APPROACH

2.1 Instruction and assessment context

The A3 standards provide a common structure for Pro 1 courses from enrollment through assessment. Enrollment requires completion of A3-recognized Recreational Level 1 and Avalanche Rescue courses, documented field experience, and submission of trip-planning and observation records. Recreational Level 2 training is recommended but not required. Once enrolled, participants complete a minimum of 45 contact hours, including at least 30 hours of field instruction, typically over five days (A3, 2025). The standards require a participant–instructor ratio of no more than 6:1 and recommend continuity of the instructor team throughout the course.

Instruction and assessment are integrated through demonstration, practice, coaching, formative feedback, and summative assessment. A3 establishes four proficiency categories: Avalanche Rescue Skills (Category 1), Observations and Recording (Category 2), Hazard and Risk Analysis (Category 3), and Written Exam and Knowledge (Category 4). Participants must earn at least 70% overall and meet category-specific requirements to pass, based on established marking standards and rubrics. Each participant must also be evaluated by at least two assessors (A3, 2025).

Within AIARE, Observations and Recording (Category 2) is assessed through a snow profile exam, avalanche occurrence observations, an avalanche path identification exercise, and field documentation. Hazard and Risk Analysis (Category 3) is assessed through pre- and post-operational forms, contributions to discussions, a field hazard and risk analysis exercise, and the interpretation, communication, and application of snow, weather, and avalanche observations during group travel. Written Exam and Knowledge (Category 4) is assessed through a written exam. The Hazard and Risk Analysis category cannot be retested. During the study period, Avalanche Rescue Skills (Category 1) were assessed on a pass/fail basis. The A3 is currently considering changes to professional rescue training and its relationship to Pro 1 and Pro 2 assessment requirements (A3, 2026). Changes in assessment components and scoring methods across seasons were accounted for in the analysis (Section 3.1).

2.2 Evaluation approach

These standards provide an essential starting point for evaluation by specifying course requirements, intended proficiencies, and assessment criteria. However, they do not establish whether those proficiencies reflect the needs of professional practice, explain how the program is intended to work, or identify indicators for evaluating implementation and outcomes. These elements form the foundation for systematic evaluation (Funnell & Rogers, 2011), and building this foundation is a central focus of the AIARE Pro 1 evaluation. The framework described by St. Clair et al. (2026) guides this work through empirical analysis and engagement with participants, instructors, employers, and other partners.

We began this groundwork by making systematic use of existing program data through two complementary analyses. The quantitative analysis presented here examines proficiency patterns and their associations with participant, course, instructor, terrain, and hazard variables. A subsequent thematic analysis will examine participant feedback, instructor-team course summaries, and written assessment feedback. The combined insights can identify patterns requiring explanation and questions to investigate through a purpose-built study with participants, instructors, employers, and other partners. The purpose at this stage is to build the empirical foundation needed to assess and clarify the program's intended outcomes, strengthen its design and delivery, and establish baselines and indicators for evaluation.

3. METHODS

3.1 Data and sample

The quantitative analysis draws on existing data from 24 AIARE Pro 1 courses delivered between December 1, 2023, and May 31, 2026. These courses span three operating seasons (2023–24 through 2025–26) and 13 venues across seven western U.S. states. The courses were attended by 318 participants and involved a total of 20 instructors. Three participants who began but did not complete their courses because of circumstances unrelated to the program were excluded, resulting in a sample of 315 participants.

Data sources included participant registration and assessment records; course administration records; operational InfoEx records documenting terrain use and avalanche conditions; and post-course records. Notable occurrence reports were also reviewed, although too few occurrences were documented to support statistical analysis. Records were linked using internal identifiers and checked for completeness and consistency before analysis. Participant records were de-identified before analysis, and courses and instructors were represented using coded identifiers.

The four assessment categories described in Section 2.1 remained consistent, but some components and point allocations changed. Beginning in 2024–25, the manual weather-station observation was no longer scored, and its five points were redistributed within Observation and Recording (Category 2). The Written Exam and Knowledge assessment (Category 4) increased from 25 to 30 points. To support comparisons across seasons, the analysis used category-level percentages and proficiency ratings rather than raw component scores. Written exam and overall scores were calculated as percentages of the points available in each season.

3.2 Proficiency classifications

We examined whether participants' placement at the upper or lower end of the assessed proficiency range was associated with participant, course, instructor, terrain, and hazard variables. This required a measure of overall assessed proficiency that reflected performance across multiple assessments. A score from any one assessment exercise was insufficient because small point differences may not represent meaningful differences in a participant's broader proficiency pattern. We created proficiency classes to distinguish participants at the upper and lower ends of assessed proficiency.

We first calculated each participant's scores for Category 2 (Observations and Recording), Category 3 (Hazard and Risk Analysis), and Category 4 (Written Exam and Knowledge). Category 1 (Avalanche Rescue Skills) was excluded because its pass/fail result added little information and had a negligible effect on participants' proficiency classifications. We also incorporated the proficiency ratings assigned within Categories 2–4, which classified performance as Exceeds Standard, At Standard, or Below Standard. The analysis included four ratings: one each for Categories 2 and 4 and two for Category 3.

Categories 2 and 3 assess proficiency demonstrated through field and operational activities. Together, they formed the *field-based proficiency classification*. Adding Category 4 created the *comprehensive proficiency classification*, which represented performance across both field-based assessments and foundational knowledge assessed through the written exam. For both classifications, we summed participants' points across the included categories and expressed each total as a percentage of the points available. We used the distribution of these scores to identify four ranges, each containing approximately one-quarter of participants. Both classifications produced the same score ranges: 94% or higher, 91–93%, 86–90%, and 85% or lower. Within each range, we also used participants' proficiency ratings to reflect the consistency of their performance across categories. The same rules were applied to the field-based and comprehensive classifications (Table 1).

Table 1: Proficiency class criteria

Proficiency Class	***Criteria: Combined Score (%) and Ratings***
Class 1 (highest)	≥94% and a mix of Exceeds Standard and At Standard ratings
	≥91% and all Exceeds Standard ratings
Class 2	≥94% and all At Standard ratings
	91–93% and a mix of Exceeds Standard and At Standard ratings
	86–90% and all Exceeds Standard ratings
Class 3	91–93% and all At Standard ratings
	86–90% and a mix of Exceeds Standard and At Standard ratings
	≤85% and all Exceeds Standard ratings
Class 4 (lowest)	≤90% and all At Standard ratings
	≤85% and a mix of Exceeds Standard and At Standard ratings
	Any score and at least one Below Standard rating

The field-based classification included 88 participants (27.9%) in the highest class and 90 (28.6%) in the lowest. The comprehensive classification included 89 participants (28.3%) in the highest class and 80 (25.4%) in the lowest. These groups represented the upper and lower ends of assessed proficiency within the sample. Membership in the highest and lowest classes served as separate response variables in the subsequent analyses. Because the proficiency classes represent relative performance within a generally high-performing sample, membership in the lowest class does not necessarily indicate performance below the required standard.

3.3 Statistical methods

We summarized the sample and proficiency outcomes using descriptive statistics. We used logistic regression to examine associations between proficiency outcomes and predictors covering participant attributes; course structure and delivery; instructors; and course setting, terrain, and hazard conditions. We examined instructor associations separately using Pearson chi-square tests. In all analyses, membership in the highest and lowest proficiency classes served as separate binary response variables. For each response, participants in that class were compared with all other participants.

We selected the proficiency classification for each analysis based on the assessments most directly related to the factors being examined. We used the comprehensive proficiency classification to examine participant attributes because it reflected overall performance across both field-based assessments and the written exam. We used the field-based proficiency classification to examine course structure and delivery, course setting, terrain, and hazard conditions, and instructor associations because these factors were most directly related to proficiency demonstrated through field and operational activities. Table 2 summarizes the predictors examined within these three groups and the separate instructor analysis.

Table 2: Predictor variables analyzed

Variable Category	***Predictor Variable***
Participant attributes	Age
	Gender
	Race
	Education
	Industry background
	Primary travel mode
	Prerequisite course
	Prerequisite course recency
Course structure and delivery	Seasonal timing
	Course size
	Participant–instructor ratio
	Course type
	Instructor-team gender
Course setting and risk context	Course ID
	Mountain region
	Venue
	Highest ATES classification
	Highest forecast avalanche hazard
	Slab avalanche problem presence
	Persistent slab problem presence
Instructor	Individual instructor presence

For several predictor variables, response categories were combined to ensure enough observations for stable and interpretable comparisons. For example, the registration form included seven racial identity categories and allowed participants to select more than one. Because the sample was predominantly White and each of the other categories contained few observations, race was grouped into White only and any non-White identity, whether selected alone or in combination with White. Gender was grouped into men and participants of other genders, and education into graduate degree, bachelor's degree, and less than a bachelor's degree. Industry background was categorized as aspiring, guide, patroller, or other; primary travel mode as ski/alpine, splitboard, or snowmobile; and prerequisite course as Recreational Level 1, Recreational Level 2, or another approved pathway.

Seasonal timing was categorized as early season for courses held in December or January and late season for courses held from February through April. Course type was categorized as general enrollment, gender-affinity, or motorized, and instructor-team gender as men, mixed gender, or women. Mountain regions were the Pacific Northwest (WA), Northwest Interior (WY, ID), Southwest Interior (CO, UT), and the Sierras (CA, NV). For each course, we identified the highest Avalanche Terrain Exposure Scale (ATES) classification entered (Statham and Campbell, 2025), the highest operational avalanche hazard rating across all course days (Statham et al., 2010), and whether slab or persistent slab avalanche problems were present on any day (Statham et al., 2018).

All analyses were conducted using SAS Education® statistical software, version 9.4 (SAS Institute Inc., 2013), with statistical significance assessed at $p<.05$. Separate logistic regression models were fitted for each predictor and binary proficiency response using the LOGISTIC procedure. Age, prerequisite course recency, course size, and participant–instructor ratio were analyzed as continuous predictors using the Reg procedure, and all others were analyzed as fixed-effect categorical factors using the GLM procedure. For categorical predictors with more than two levels, post hoc Tukey–Kramer tests were used to compare mean response scores between all pairs of categories and determine which differed significantly. Each logistic regression model used the available observations, excluding records with a missing value for the predictor included in that model.

Because instructors worked in teams of two or three and taught in different combinations, each instructor was represented by a binary variable indicating their presence on a participant's course. Pearson chi-square tests examined the relationship between each instructor's presence and membership in the highest and lowest proficiency classes. For each proficiency outcome, the resulting *p*-values were adjusted across the 20 instructor comparisons using a false-discovery-rate procedure.

4. 4. RESULTS

4.1 Participants, courses, and performance

Across the three operating seasons, the 315 Pro 1 participants ranged from 20 to 69 years old, with a mean age of 32. Seventy-two percent identified as men, 27% as women, and 1% as nonbinary. Eighty-seven percent identified solely as White, and 76% held a bachelor's degree or higher. Participants' primary modes of backcountry travel were skiing or alpine travel (77%), splitboarding (15%), and snowmobiling (8%). The sample included participants aspiring to enter the avalanche industry (30%), as well as ski patrollers (24%), guides (20%), and avalanche educators (7%). For prerequisite training, 76% had completed a Recreational Level 1 course, 20% had completed a Recreational Level 2 course, and 4% qualified through a Prior Learning Assessment or another approved pathway.

Course size ranged from 10 to 18 participants, and participant–instructor ratios spanned 5:1 to 6:1. The sample included three gender-affinity courses attended by 34 participants and three motorized courses attended by 31 participants. The highest avalanche hazard rating recorded during each course was Low for three courses, Moderate for nine, Considerable for nine, and High for three. Seven courses remained in Simple terrain, 14 traveled in Challenging terrain, and two entered Complex terrain. The highest ATES terrain class was unavailable for one course. Slab avalanche problems were present during 20 of the 24 courses, including persistent slab problems during 12 courses.

Participant performance in this sample was high. The pass rate was 94%. Participants' overall scores ranged from 57% to 99%, with a mean of 89% and a median of 90%. Nineteen participants (6%) did not meet the required standard in at least one of the four assessment categories.

4.2 Participant attributes

Age, gender, race, prerequisite course and its recency, and industry background were not associated with membership in either the highest or lowest proficiency class.

A participant's level of formal education was associated with membership in the highest proficiency class (p=.0043). Compared with participants with less than a bachelor's degree (13.2%), membership in the highest proficiency class was greater among participants with a bachelor's (31.8%; Tukey–Kramer-adjusted p=.0078) or graduate degree (36.5%; adjusted p=.0053). Education was not associated with membership in the lowest proficiency class.

Primary travel mode was associated with membership in both the highest (p=.0113) and lowest (p=.0127) proficiency classes. Membership in the lowest proficiency class was more common among splitboarders (39.6%) than among ski/alpine participants (21.4%; adjusted p=.0233). No pairwise comparison for the highest proficiency class remained significant after adjustment. Snowmobile participants did not differ significantly from either group.

4.3 Course structure and delivery

A course's seasonal timing and participant–instructor ratio were not associated with membership in either analyzed proficiency class.

Course size was associated with membership in the highest proficiency class. Each additional participant was associated with 11.5% greater odds of membership in the highest proficiency class (OR 1.115, 95% CI 1.023–1.215; p=.0130). Course size was not associated with membership in the lowest proficiency class.

Course type was associated with membership in both the highest (p=.0412) and lowest (p=.0165) proficiency classes. Compared with general enrollment course participants (34.0%), membership in the highest proficiency class was lower among motorized course participants (9.7%; adjusted p=.0311). No participants in gender-affinity courses were classified in the highest proficiency class. Because this zero cell prevented stable model estimation, comparisons involving gender-affinity courses could not be interpreted reliably. Compared with general enrollment course participants (25.6%), membership in the lowest proficiency class was greater among those in gender-affinity courses (50.0%; adjusted p=.0116). For the lowest proficiency class, motorized course participants did not differ significantly from either general enrollment or gender-affinity participants.

Instructor-team gender was associated with membership in the lowest proficiency class (p=.0159), but not the highest. Membership in the lowest proficiency class was greater among participants taught by all-women instructor teams (50.0%) than among those taught by all-men teams (27.5%; adjusted p=.0404) or mixed-gender teams (24.9%; adjusted p=.0122). All-men and mixed-gender teams did not differ significantly. The three gender-affinity courses were also the only courses taught by all-women instructor teams, so the associations with course type and instructor-team gender cannot be interpreted separately.

4.4 Course and instructor variation

Membership in both the highest and lowest proficiency classes varied significantly across the 24 courses ($p<.0001$ and $p=.0010$, respectively). Only one pair of courses differed significantly in membership in the highest proficiency class after adjustment ($p=.0330$), and no comparison remained significant for membership in the lowest proficiency class after adjustment. Because each course reflects a particular combination of participants, instructors, setting, terrain exposure, hazard conditions, and other circumstances, these results demonstrate overall variation among courses without identifying the factors responsible for it.

After accounting for the number of instructor comparisons using a false-discovery-rate adjustment, 10 of the 20 instructors were associated with participants' membership in the highest proficiency class, and five were associated with membership in the lowest proficiency class. Five instructors were associated with both outcomes. Two were associated with greater membership in the highest proficiency class and lower membership in the lowest proficiency class, while three showed the opposite pattern. These relationships do not isolate the influence of individual instructors because instructors worked in teams and were associated with particular courses, participants, settings, and risk conditions.

4.5 Course setting and risk context

Membership in both the highest and lowest proficiency classes varied by mountain region ($p<.0001$ and $p=.0215$, respectively) and venue ($p=.0005$ and $p=.0171$, respectively).

Membership in the highest proficiency class was greatest in the Southwest Interior (41.3%), exceeding that of the Northwest Interior (14.3%; adjusted $p=.0119$), Pacific Northwest (12.5%; adjusted $p=.0006$), and Sierras (20.3%; adjusted $p=.0268$). Membership in the lowest proficiency class was greater in the Sierras (40.7%) than in the Southwest Interior (21.3%; adjusted $p=.0265$). After adjustment, two venue comparisons remained significant for highest-class membership and one for lowest-class membership.

The highest ATES classification experienced during a course was associated with membership in the highest proficiency class ($p=.0001$), but not the lowest proficiency class. Compared with courses that remained in Simple terrain (8.6%), membership in the highest proficiency class was greater on courses that traveled in Challenging terrain (35.9%; adjusted $p=.0002$) or Complex terrain (36.7%; adjusted $p=.0052$).

The highest avalanche hazard rating during a course was associated with membership in both the highest ($p=.0205$) and lowest ($p=.0012$) proficiency classes. Compared with Low hazard (10.7%), membership in the highest proficiency class was greater under Considerable hazard (34.3%; adjusted $p=.0329$) and High hazard (36.5%; adjusted $p=.0394$). Compared with Considerable hazard (15.8%), membership in the lowest proficiency class was greater under Low hazard (43.9%; adjusted $p=.0022$) and Moderate hazard (34.6%; adjusted $p=.0074$).

The presence of slab avalanche problems was not associated with membership in the highest proficiency class, but it was associated with membership in the lowest proficiency class ($p=.0004$). Membership in the lowest proficiency class was greater on courses without slab avalanche problems (49.1%) than on courses with slab problems (24.4%; adjusted $p=.0004$). The presence of a persistent slab problem was not associated with membership in either the highest or lowest proficiency class.

5. DISCUSSION

5.1 Interpretation and implications

This study identified several factors associated with membership in the highest and lowest proficiency classes. Age, gender, and race were not associated with either outcome, although the small number of participants in some groups and the combined categories used for analysis limit conclusions about equity. The absence of associations with prerequisite course type, its recency, or industry background is notable given the value placed on prior experience, though it may partly reflect the common baseline established by the course prerequisites. Formal education was associated only with the highest proficiency class, possibly reflecting greater familiarity with complex technical material and formal assessments. The finding that splitboarders were more likely than ski/alpine participants to be classified in the lowest proficiency class warrants further examination.

Seasonal timing and participant–instructor ratio had no apparent relationship with membership in either proficiency class. Although larger courses had greater membership in the highest proficiency class, the analysis cannot explain this association, which may reflect other differences among courses. Fewer motorized-course participants were in the highest proficiency class, while more gender-affinity-course participants were in the lowest. These findings point to the need to better understand how the delivery and assessment contexts of motorized and gender-affinity courses differ from those of general enrollment courses.

The particular course that a participant attended was associated with membership in both the highest and lowest proficiency classes, as was the presence of individual instructors. In both cases, the analysis cannot separate the overlapping features of each course, including the participant cohort, instructor team, venue logistics, avalanche conditions, and other circumstances. Additional inquiry is needed to identify which course-level circumstances may account for the observed variation. The instructor associations raise a separate set of questions about the consistency of instructional and assessment practices, including instructor-team processes, application of assessment criteria, and calibration among instructors.

The hazard and terrain conditions present during courses reveal a pattern with potentially important implications for assessment. Membership in the highest proficiency class was greater on courses that traveled in Challenging or Complex terrain than on those that remained in Simple terrain, and under Considerable or High hazard than under Low hazard. Membership in the lowest proficiency class was greater under Low or Moderate hazard than under Considerable hazard and on courses without slab avalanche problems than on those with them. The parallel associations with venue and mountain region may reflect geographic differences in the availability of these conditions, although both also encompass other course characteristics. One possible interpretation is that relevant terrain and avalanche conditions give participants more opportunities to demonstrate how they interpret and manage risk in field settings, providing instructors with more evidence for distinguishing levels of proficiency. When those conditions are absent, some skills may be more difficult for instructors to observe and assess directly. This could create challenges for consistent and reliable assessment across courses. The findings do not confirm this interpretation, and further work should examine how field conditions shape assessment and identify reliable ways to assess key proficiencies when naturally occurring opportunities are limited.

5.2 Limitations

This exploratory analysis has several limitations. It relied on records collected for program administration rather than research, which limited the analysis to the variables collected and left other potential influences unmeasured. The proficiency classes represent relative performance within a generally high-performing sample rather than externally validated proficiency levels. Their interpretation assumes that instructor assessments provide reasonably accurate and consistent evidence of proficiency and that the differences between the upper and lower classes are meaningful. Participants within each of the 24 courses shared instructors, venues, terrain, avalanche conditions, and other circumstances, so observations were not fully independent and associations among overlapping course-level factors could not be separated. The analysis also tested many possible relationships. With statistical significance set at $p<.05$, some associations can appear significant by chance when many tests are conducted. Adjustments reduced this risk for comparisons within multi-category variables and across instructors, but the possibility of chance findings remains across the analysis as a whole. The associations should be treated as patterns requiring further investigation rather than evidence of causal effects.

5.3 Next steps

The remaining analysis will code participant feedback, instructor-team course summaries, and written assessment feedback for themes and examine whether those themes help explain the quantitative findings reported here and how they relate to findings from the A3 needs assessment (A3, 2024). The combined quantitative and qualitative findings can then inform the design of a purpose-built study with participants, instructors, employers, and other relevant groups. The purpose-built study can clarify these groups' needs, priorities, and desired outcomes, and it can examine when training and assessment work more or less effectively and what shapes those circumstances. The resulting evidence can clarify what the program needs to influence, guide the development of its program logic and improvements to design and delivery, and establish baselines and indicators for evaluating implementation and immediate and longer-term outcomes (St. Clair et al., 2026).

6. CONCLUSION

Professional avalanche training plays a central role in preparing workers for avalanche operations, yet little evidence is available about its outcomes or the factors shaping them. This study used existing records from 315 participants across 24 AIARE Pro 1 courses to examine patterns at the upper and lower ends of assessed proficiency. Findings related to participants, course delivery, and instructors raise questions for further study, including patterns involving individual instructors, course size, splitboarding, and motorized and gender-affinity courses. Notable findings also involved field context. Membership in the highest proficiency class was more common with more complex terrain and higher hazard, whereas membership in the lowest proficiency class was more common under lower hazard and in the absence of slab avalanche problems. Proficiency class membership also varied by venue and mountain region. These patterns raise the possibility that courses with simpler terrain, lower hazard, or no slab avalanche problems may constrain meaningful opportunities for participants to demonstrate proficiency and for instructors to assess it. Further work should determine how programs can support reliable assessment under such conditions. Themes identified in participant feedback, instructor-team course summaries, and written assessment feedback may help explain these and other patterns. These findings identify priorities for further study and provide an empirical basis for purpose-built data collection to strengthen training and assessment and inform the development of a systematic evaluation program.

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