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Trainee's reactions to logger training course characteristics: data from 300 courses held in Italy

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ABSTRACT

Reaction surveys were collected during over 300 logger training courses issued between 2007 and 2015 in Piemonte (north western Italy). In the reaction surveys, trainees were asked to rate several course attributes, which were grouped under the following items: utility, outcome, teaching, content, and amenities. Reaction scores were intersected with participant demographics and course type, and the relationships were tested through a general model and path analysis. Results indicated a general level of satisfaction, as well as stratification of results for different participant groups. In particular, employees seemed more interested in course outcome (qualification), while logging managers placed a stronger emphasis on utility (acquiring new skills). Managers and consultants were more critical about course content, compared with employees. Consultants – generally holding a university education – were especially appreciative of teaching quality. These findings pointed to opportunities for improving course design, which may be specifically adapted to participant group. Reaction surveys can offer a good proxy for training transfer, in the absence of dedicated pre- and post-training field evaluations. Future surveys should also include a clear description of participant expectations, for a more accurate interpretation of the reaction survey.

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Introduction

Logging work requires considerable skill, even when conducted with simple tools: otherwise there would have been no reason for Homer to use a logger as the epitome for skill in one of his many similes already 2800 years ago, when such a professional would have had nothing more than an ax and a saw at his disposal (Rood 2008). Verse 315 on the 23rd book of Iliad reads " … for skill a woodcutter is far better than for physical strength … " and continues " … with skill a helmsman steers straight his swift ship on the wine-dark sea … " (Fagles and Mugler 1998). Then, it is the father on western literature who first matched the competence of the logger with that of the plane pilot of the time, exactly as other authors have done far more recently (Gellerstedt 2002). Curiously enough, the similarity between these two occupations does not end with a high skill requirement: another important analogy is in the severe consequences of any eventual errors. In both cases, a momentary lapse in skillful performance may result in severe injury or death. That confirms the importance of careful training for both pilots and loggers. While pilot training has been a main focus of the aviation industry since its early days (Rostyskus et al. 1998), logger training has been largely disregarded until recently, with the result that the profession is now considered among the most dangerous in peacetime, with four times the fatality rates of other occupations in the agricultural sector (Klun and Medved 2007).

Realizing that, safety authorities worldwide have started a massive effort to improve safety in forestry, by enforcing the use of personal protective equipment, by supporting mechanization (Bell 2002) and especially by promoting aggressive training campaigns on safe working techniques (MacKay et al. 1996). Unfortunately, operators often perceive safety as conflicting with both comfort and productivity (Nieuwenhuis and Lyons 2002; Cavazza and Serpe 2009), and may deliberately choose to take risks (Williams and Geller 2000; Zohar 2008). What is more, operators with preexisting work experience usually believe they already possess all the necessary skills and may regard professional training as a waste of time and revenue (Montorselli et al. 2010). In response, safety authorities have made safety training a pre-requisite for operation, turning the issue from a technical to a regulatory one. Therefore, safety training has become a compliance issue, rather than an opportunity to improve performance and general efficiency – which should be among the main goals of professional training (Jokiluoma and Tapola 1993). This is a serious problem, because coercion tends to generate negative attitudes and a compliance-only approach is bound to miss the benefits of participatory training (Kazutaka 2012). Therefore, there is an interest in stimulating participation, and in making even mandated training as attractive as possible.

Furthermore, training organizations and sponsors have an interest in demonstrating that participants have acquired specific skills and/or are aware of their responsibilities regarding safety or environmental norms or regulations. However, actual training impacts often defy direct measurement, and the resulting behavior changes are difficult to detect. Even if such changes occur, the contribution of factors outside the scope

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of the training makes it difficult to assess the contribution of training. Gaps in training transfer may involve training quality, training effectiveness, or post-training barriers. Many studies have looked for evidence of training effectiveness in logging and forestry work. Following Kilpatrick's revised typologies (Arthur et al. 2003) examples include evaluation of i) participant reaction (Helmkamp et al. 2004), ii) learning (Goodwin et al. 1982), iii) behavior (training and job) (Väyrynen and Könönen 1991), or iv) results (Bell and Grushecky 2006). Post-training assessments may include participant reaction surveys to determine participants' impressions about the course. Those impressions include aspects about the value of the course to their work or functional aspects of how the course was managed. Learning can be assessed by verbal or written quizzes that confirm some level of knowledge gain. Learning can be assessed pre- and post-training or can be delayed to show retention. Behavior is assessed by observation of the participant during training or on the job. While the observer might complete the assessment, in some case electronic monitoring is possible. Results include the measurable outcome that is expected from the training and could include attributes like reduced number of safety incidents or increased productivity. In practice, evaluation techniques are limited to those that can be implemented during the course, due to limits in both budget and training program scope. Therefore, evidence about the impact of logger training programs is generally anecdotal, although occasionally quite persuasive. While the belief by stakeholders that training outcomes are positive is important, investment in logger training may be enhanced by evidence that training is transferred to the job and contributes to desired impacts.

In fact, reaction surveys upon course completion represent a valuable opportunity to gauge training transfer by matching training behavior with information about the participants. While participants' opinions about the program may only have a limited relationship to adoption of trained behavior (Colquitt et al. 2000), items that focus on program utility may have a better relationship to training results (Alliger et al. 1997). Training transfer may be impacted by cognitive ability, self-efficacy, valence, and personal and situational factors that affect learning motivation (Colquitt et al. 2000). This information could improve program design for current participants, and help to adapt programs to changes in participants and in work situations over time (Haworth et al. 2007).

Therefore, the goal of this study was to match participant demographics with participant reaction toward aspects of course amenities, content, outcomes, teaching, and utility, in order to determine if and how course design can be manipulated for maximum effect. The underlying assumption is that an optimized course will improve participant attitudes toward training, foster a shift from mandatory to participatory training and maximize learning outcomes.

Materials and methods

The database for this study consists of available demographic and reaction survey data from the logger training courses sponsored between 2007 and 2015 by the regional administration of Piemonte in western Italy. Piemonte is one of the 22 Regions of Italy, each with specific powers over a number of sectors, including forestry. Forest land represents 37% of the regional surface of Piemonte and covers 930 000 ha (30% Public and 70% private ownership, mostly non-industrial). There are over 400 registered logging companies in Piemonte, with a total workforce of over 1500 operators (Spinelli et al. 2013). Mechanization is still at the intermediate stage, based on the prevalent adaptation of general purpose machines, such as farm tractors and excavators. However, use of this equipment requires high technical skill, as does the operation of a relatively large cable yarder fleet, estimated at 60 yarders (Spinelli et al. 2014).

Piemonte is the confirmed leader in logger training in Italy and has invested over 8 million Euros between 2007 and 2015 in logger training. With this budget the regional administration has supported 329 courses attended by 4900 participants (representing over 2500 unique individuals).

To this purpose, the Piemonte forest office has developed a series of six sequential occupational training courses for individuals involved in logging in any capacity. Therefore, the logger training courses supported by Regione Piemonte do not target professional loggers only, but can be attended by part-time loggers, forestry consultants who support logging teams, self-employed forest owners and prospective loggers who plan to engage with logging tasks in the immediate future. Therefore, within this context of this study, the term "logger" does not define the specialist woodcutter only, but anyone actually or potentially engaged with logging as a main or a secondary occupation. The six courses span subject matter from basic chainsaw operation to crew safety management. The training course levels F1 and F2 are introductory courses that can be skipped if participants show sufficient competence at the admission test, while F3, F4, F5, and F6 result in a specific qualification for the participants (Table 1). Qualification from each of the last four-course levels provides specific benefits regarding timber harvesting in the region, because companies without formally qualified workers are not admitted to bid on public forest land timber sales. The training programs have learning outcomes that are specifically described, and the trainers test the participants to determine whether they have reached the expected skill levels before they are granted qualification. In the vast majority of the cases the participants achieve the qualification following the course.

Courses are managed by professional training agencies, based on the curricula and the evaluation criteria produced by the regional administration (Table 2). Certified logging technique instructors are active in the region, and they were eventually contracted by the training agencies for administering the courses. Each agency was supposed to collect a reaction survey at the end of the course, in order to gauge trainee satisfaction. Therefore, the available database consisted of the reaction surveys gathered upon course completion and of the participant information collected at the time of registration – both quite detailed, although occasionally heterogeneous.

The objective of the analysis was to determine whether the course data (reaction surveys and demographic data) could provide some understanding related to training transfer and future course optimization. While the programs do not know

Table 1. Course level descriptions.

Course	Topics	Duration	Outcome
F1	Introduction to chainsaw safety.	4 hrs theory, 12 hrs practice	Prerequisite
F2	Safe use of a chainsaw in processing operations.	4 hrs theory, 20 hrs practice	Prerequisite
F3	Safe use of a chainsaw in felling and processing operations.	8 hrs theory, 32 hrs practice	Qualification
F4	Safe use of a chainsaw in felling and processing operations: Advanced level.	4 hrs theory, 36 hrs practice	Qualification
F5	Work and safe application of equipment in forest operations.	4 hrs theory, 20 hrs practice	Qualification
F6	Work safety and health, injury prevention, emergency management, and enviromental and forestry rules.	16 hrs theory	Qualification

whether trained behaviors are adopted, there is evidence (Colquitt et al. 2000) that attitudes measured by aspects of reaction surveys are related to training transfer.

Six training agencies managed all the regional training, and each developed its own reaction survey (Table 2). For this reason, survey forms were quite heterogeneous, covering 9 to 22 items and providing responses in likert-like scales with 4, 5, 6, or 10 response levels. In all cases, higher scores reflected stronger agreement with positive statements. The surveys with the most items often had the same type of item repeated for each of several, similar course aspects or each of several trainers or training supervisors. The summary data for each course were a count of each response level for each item. To standardize response levels, researchers scaled them from 1 to 60, since 60 was the lowest common multiple. Standardizing items were a bit more difficult and required identifying identical items first, and then grouping similar items into five general subjects described in Table 3. These were:

Utility – the new usable knowledge obtained from the course

Outcome – the tangible outcome of the course, normally the qualification

Content – what was taught in the course

Teaching – how new knowledge was taught (teaching methods, trainer competence etc.)

Amenity – the amenities and materials available to the course (classroom, tools etc.)

Three Region staff and the researchers assigned the keywords, and the researchers assigned the subjects based on the majority or plurality. The variable for each subject was the average response level of all the items in the subject area.

The Region maintained the registration information for participants. For most of the participants the registration information included age, gender, address, education, occupation, and nativity (Italian or not). Anyone engaged or intending to engage with logging could request to attend a course and therefore the pool of attendees included a number of different professional figures, who were categorized as follows:

Logging manager: any professional logger who managed his/her own logging company, often an independent logging contractor;

Logging employee: any professional logger who was employed by a private logging company, often the employee of an independent logging contractor (Logging manager);

Employee PAF (Public Administration – Forestry): as above, but employed by the public administration. Generally a member of the regional logging crews that are tasked with noncommercial logging operations (thinning);

Table 2. The number of courses for each of the training agencies.

		Agencies*					
Subject	Keywords	A	B	C	D	E	F
Number of courses	F1/F2	1/1	4/9	4/4	3/7	4/8	1/7
	F3	2/2	10/24	5/8	5/17	2/2	10/32
	F4		5/10	2/3	0/2		2/12
	F5		10/10	3/4	1/1		3/15
	F6		5/11	2/4	0/2		0/10

*The top number indicates the number of surveys returned and the bottom number the number of courses organized. For example, 4/9 indicates that 4 questionnaires were returned from 9 courses delivered.

Table 3. The number of survey items (in the columns) by subject for each of the training agencies.

		Agencies					
Subject	Keywords	A	B	C	D	E	F
Amenities	Convenience, organization, order, availability	2	5	1	10	2	6
Content	Subjects, training material, program content	1	1	2	2	6	1
Outcome	General satisfaction, course objectives met (qualification)	1	2	2	1	2	2
Teaching	Teaching, instructors, course, methods and techniques, lessons, lectures	4	10	6	3	4	13
Utility	Useful, competence gain, professional, increase, knowledge gain	1	1	2	3	1	3
Survey response levels	Scale	1 to 10	1 to 4	1 to 6	1 to 4	1 to 10	1 to 5

Consultant: a certified forester who assists loggers and wishes to become more familiar with the technicalities of the job.

For a subset of the registrations the occupation and education information was missing since participants registered with the training organization and not the Region. The Region also maintained the list of participants who achieved qualifications (Qualified) and of those who eventually became Instructors (Instructor).

Researchers determined if occupation data were missing by comparing the number of participants in the course to the number of responses recorded in the survey. If the number of respondents with occupation identified exceeded 75% of the number of surveys (usually 12 to 15), one considered that the demographic information was usable. For the analyses, counts were standardized in demographic categories (gender, occupation, education, home province, nativity) to a total of 15 per course, the desired course maximum and most frequent course size. For example, if there were 6 participants who were logging firm owners in a class with 13 records, the standardized value would equal 6*(15/13) or 6.9, which was rounded down to the nearest integer or 7 logging firm owners.

Researchers performed a path analysis with the maximum likelihood estimation technique, using the average score from each subject and demographic variables as shown in Figure 1. Typically, path analysis is used to describe the direct dependencies among a set of variables, very much like multiple regression analysis. In path analysis, variables are categorized as exogenous or endogenous, respectively, corresponding to the independent and dependent variables of regression analysis.

The hypothesis tested here with path analysis was that aspects of the training setting (Amenities, Content, and Teaching) affected the participants' perception of the training results (Outcome or Utility). Logging Manager, Qualified, and Age were included in each path, together with other variables with significant ($p < 0.10$) correlations. Company VAT registration number was excluded, since it was intercorrelated with Logging Manager. Lagrange Multiplier tests were applied to each model for assessing if the eventual inclusion of additional variables in paths would lead to model improvement. The models were trimmed iteratively to remove variables with low significance, with the final goal of retaining no more than 8 variables. Trimming concerned variables with t values less than 0.25, 0.5, 1.0, and 1.5 in successive iterations. It was expected that all retained variables would have a p-value of less than 0.10 in the final model. The path analysis was performed with both Outcome and Utility as the dependent factor.

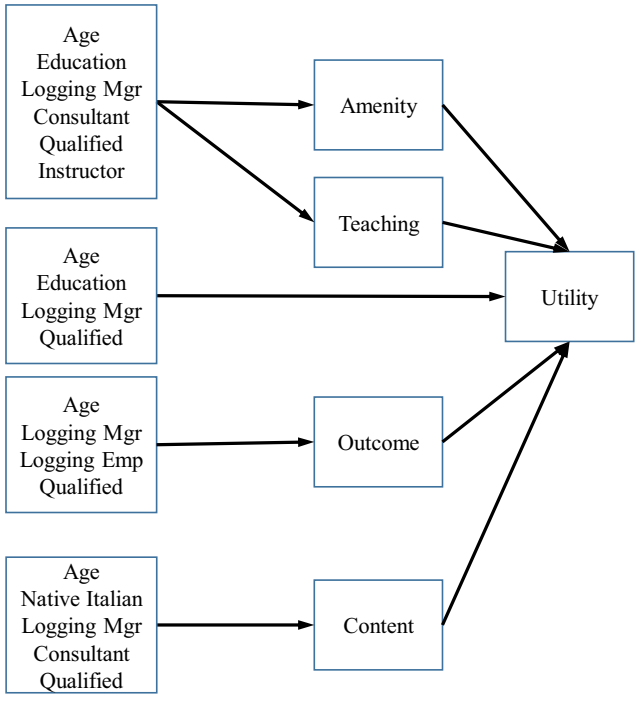

Figure 1. Relationships used in the path analysis. Only relationships with $p < 0.1$ were illustrated in the analysis.

Results

Course level evaluations

The statistics for the different course levels are presented in Table 4, where the results of the general model estimate for each dependent variable is indicated in the cells with class variables for course level and organization. Since there was only one F1 course, these data were combined with those for the F2 courses. For the courses the proportion of participants with demographic information was consistent and ranged from 67% to 79%. For lower course levels F1, F2 and F3 there were few registrants from the provinces where the courses were offered. As expected there were progressively more qualified operators and instructors in the higher level courses. The summary data for all training agencies with more than 100 registrants are presented in Table 5. The proportion of registrants without demographic data varied more among training agencies (41% to 92%) than among courses, since some participants registered with the agencies only, and the agencies did not provide the full data to the Region. All demographic variables except for nativity, gender and age showed significant variation among the training agencies.

The database offered overall mean scores for whole courses, since individual responses by students in a class were averaged by training agencies before sending their reports to the regional

Table 4. Summary of various factors from demographic data (by course level).

Course type	F1/F2	F3	F4	F5	F6
Registrants (number)	540	1816	593	749	545
Demographic data	79%	72%	67%	70%	69%
Province match	5%[3]	0%[3]	70%[2]	77%[3]	66%
Male	96%[3]	99%	98%	99%	99%
Logging employee	24%[3]	21%	22%	21%	20%
Logging manager	59%	63%	67%[1]	66%	60%
Consultant	5%	3%	3%	3%	4%
Employee PAF	8%	10%	7%	7%	11%
Native Italian	94%[2]	95%[2]	97%	97%	97%
Age (mean)	38.6	38.3	38.1	37.8	38.7
Instructor	0%[3]	1%[3]	2%[3]	2%[3]	12%
Qualified	8%[3]	23%[3]	69%[3]	55%[3]	80%
Education	40%[3]	29%	27%	30%	32%

The percentages represent the proportion of participants for each characteristic within each course level, while the superscript letters indicate the significance of these correlations as follows $p \leq 0.1^1$, 0.05^2, and 0.01^3. Education is High School diploma or higher.

Table 5. Summary of various factors from demographic data (by training organization).

Training organization	B	C	D	E	F	G	H	I	J
Registrants (#)	1072	360	409	105	1566	105	171	176	168
Demographic data	88%	90%	92%	41%	52%	62%	52%	95%	89%
Province match	30%[3]	46%	9%[3]	8%[3]	48%	5%[3]	15%[3]	17%[3]	5%[3]
Male	98%	96%[3]	98%	100%	99%	98%	98%	98%	96%[2]
Logging employee	19%[3]	11%[3]	21%[3]	12%[3]	28%	12%[3]	17%[3]	26%	24%[1]
Logging manager	60%	81%[3]	69%[3]	72%[2]	60%	37%[3]	66%[2]	67%[2]	48%[3]
Consultant	5%	3%	2%	2%	2%	11%	3%	2%	5%
Employee PAF	15%	3%	6%	12%	5%	25%	10%	4%	16%
Native Italian	97%	98%	94%	99%[2]	96%	94%	94%	94%[1]	93%[1]
Age (mean)	38.3	40.1[3]	39.3[3]	39.1	38.0	35.9[2]	36.5	38.5	36.9[1]
Instructor	4%[3]	3%	3%[3]	0%	2%	3%[3]	0%	0%	2%
Qualified	46%[3]	35%[3]	13%[3]	27%[3]	56%	31%	10%[3]	15%[3]	36%[3]
Education	38%[3]	32%[3]	39%[3]	12%[3]	22%	39%[3]	24%	43%[3]	40%[3]

The numbers represent correlations, while the superscript letters indicate the significance of these correlations as follows $p \leq 0.1^1$, 0.05^2, and 0.01^3. Education is High School diploma or higher.

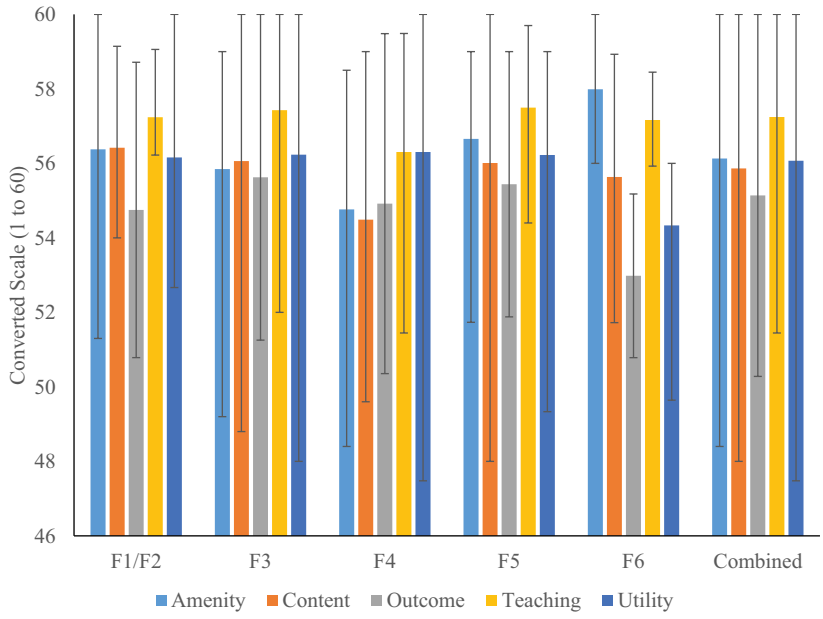

Figure 2. Average scores and ranges of variation (bars – min to max) for the subject areas using the converted 1 to 60 point scale, for each course level (F1 to F6).

administration. Evaluation scores were quite high across all subjects (Figure 2). For all but one of the course levels, Teaching received the highest average rating and had the narrowest range. Consistently across all levels. Utility had a slightly higher score than Outcome, whereby Utility could be described as the actual gain in skills, while Outcome as the achievement of more tangible course objectives, such as receipt of the qualification as explicitly or implicitly defined in the course objectives. For most of the data, the range in score was typically less than 8 points with a few more than 10. Most of the widest ranges (>10) occurred in Outcome and Utility subjects.

General correlations

The correlation matrix of course totals had a number of significant correlations, but only few of these correlations could account for more than 50% of the variability in the dataset (Table 6). Less frequent occupations (Forest Owner and Consultant) were negatively correlated with Logging Manager and Logging Employee since those were the majority of participants in each class. Courses with more Logging Managers had more company VAT number holders, were more likely native Italian, were older and had more formal education. Courses with more Region employees also had more instructors and the Region employees comprised a higher proportion of the participants in the higher level classes. Courses with more Consultants were younger and were more often lower level courses, since the category "Consultant" included a large proportion of young graduates freshly out of the University and building their career as freelance forestry consultants. Among the evaluations, the company VAT holders category was most strongly correlated with 4 of the 5 evaluation subjects. Higher education was correlated with 3 of the 5 subjects. None of the demographic variables were correlated with Content. Amenities were significantly correlated with more demographic variables (six total) than the other subjects.

Table 6. Correlation matrix (Pearson R) for course evaluation and demographic variables. Significance of class levels (H_0: value equals 0) are given for $p \leq 0.1^1$, 0.05^2, and 0.01^3.

Variable	Logging Mgr (LMgr)	Logging Emp (LEmp)	Region Emp (REmp)	Consultant (Cons)	VAT	Native Italian (NI)	Age	Qualified (Qual)	Instructor (Instr)	Education (Ed)	Course level (CL)	Province match (PM)
LMgr	1.000	−0.056	−0.155	−0.118	0.788^3	0.253^2	0.259^2	−0.053	−0.034	0.385^3	−0.091	0.051
LEmp		1.000	0.106	-0.229^2	0.308^3	0.085	0.035	−0.012	−0.099	0.206^1	−0.022	−0.033
REmp			1.000	0.051	0.257^2	0.158	0.098	0.148	0.453^3	0.253^2	0.192^1	0.125
Cons				1.000	0.107	−0.085	-0.220^2	0.040	0.115	0.343^3	−0.073	−0.086
VAT					1.000	0.225^2	0.246^2	−0.024	0.097	0.606^3	−0.103	0.073
NI						1.000	0.348^3	0.021	0.073	0.084	0.150	0.217^1
Age							1.000	−0.057	0.102	−0.041	−0.080	0.077
Qual								1.000	0.359^3	−0.002	0.559^3	0.601^3
Instr									1.000	0.165	0.280^2	0.251^2
Ed										1.000	−0.059	−0.089
CL											1.000	0.508^3
PM												1.000

Path analysis

Results of the path analyses are presented in Table 7. The statistics for the Utility model indicate a better fit of the data than the statistics for the Outcome model (Hancock and Mueller 2004). Both models had high comparative fit indices and low-standardized root-mean-square residual (SRMR). The higher Chi-square and higher root mean square error or approximation (RMSEA) indicated a poorer fit for the Outcome model. In addition, residual plots from the Outcome model had a non-normal and right skewed distribution. For both models the ratio of variable to sample size did not exceed that suggested for path analysis (1:20). In that regard, readers should be warned that path analysis is an exploratory method to analyze relationships, and the results should not be considered a best-fit model.

Table 7. Statistics for the converged full models and the reduced models.

Model	Chi-square statistic (p value)	CFI	SRMR	RMSEA	Variables	Parameters
Utility	13.37(0.2693)	0.9905	0.0408	0.0523	9	34
Outcome	9.85(0.0430)	0.9747	0.0427	0.1361	7	24

CFI = Comparative fit index; SRMR = Standardized root mean square residual; RMSEA = Root mean square error or approximation.

The non-standardized parameter estimates are shown in the path diagram for the Utility model (Figure 3). For the non-standardized estimate, a parameter estimate of 1.0 would indicate that a 1.0 unit rise in the variable at the tail of an arrow would relate to a 1.0 unit rise in next variable in the path, placed at the head of an arrow. Only three of the five evaluation subjects had a significant ($p < 0.10$) contribution to Utility, and namely: Outcome, Amenity, and Education. The largest influence – Outcome – had one negative demographic influence (Education) and two positive (Consultants and Logging Employees). Consultant also had positive influence on Amenity and Teaching and a smaller and negative influence on Content. Amenity scores were influenced also by Education

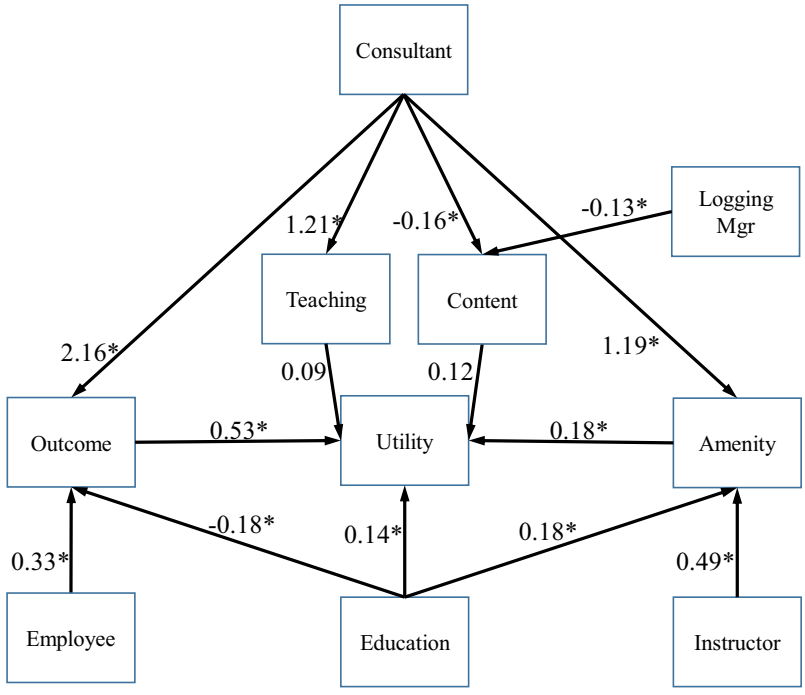

Figure 3. Path analysis results for the utility model with non-standardized parameter estimates. The reported numbers are the path parameter estimates. Significance at $p < 0.10$ is indicated by "*." The parameter sign indicates whether the relationship between attributes or scores is positive or negative (-).

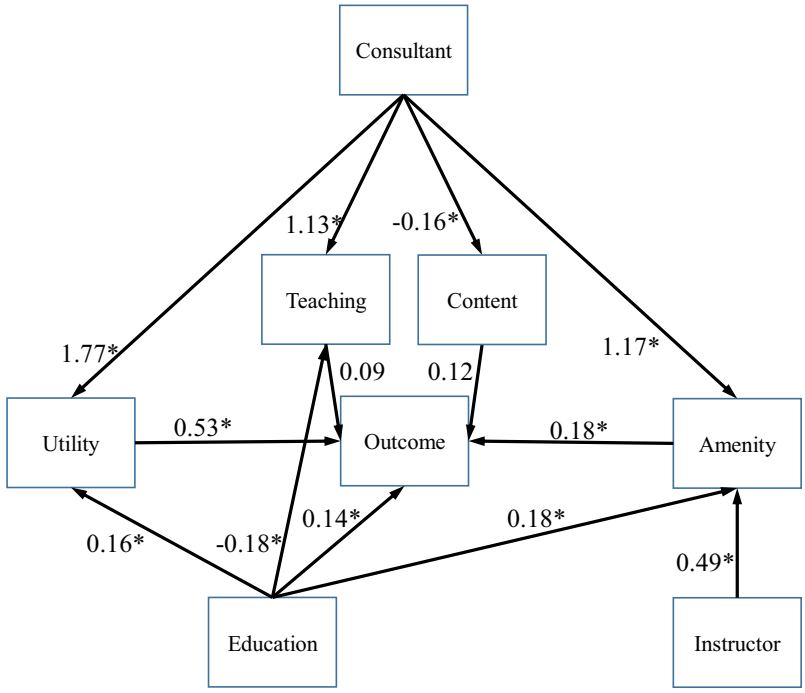

Figure 4. Path analysis results for the outcome model with non-standardized parameter estimates. The reported numbers are the path parameter estimates. Significance at $p < 0.10$ is indicated by "*." The parameter sign indicates whether the relationship between attributes or scores is positive or negative (-).

and Instructor. Logging manager only influenced Content, which in turn had no significant influence on Utility.

The Outcome model had similar relationships (Figure 4), but relationships for Employee and Logging Manager were non-significant ($p < 0.10$) and were trimmed. Content and Utility had significant positive influences on Outcome, while Amenity had a significant negative influence. For the most part, the magnitudes of the contributions to the Outcome model were similar to the Utility model, but the number of significant relationships declined. The largest change was the effect of Amenity, which was negative on Outcome while positive on Utility.

The subjects, Outcome and Utility, were strongly related and they might both be considered areas that generally captured participants' attitudes toward the program. A possible interpretation of the significance of Consultant in the model is that it represents total registration minus logging managers and logging employees. Since there were from 0 to 3 consultants in each course, recording the positive increment due to Consultants was more statistically significant than a negative increment across 10 to 12 Logging Managers and Employees. Participants, other than consultants, were then slightly more critical of the major inputs to Utility, Outcome and Amenity. The positive input of Logging Employees to Outcome indicated some small differentiation with Logging Managers, possibly describing a stronger interest from the part of employees to obtain license to operate, rather than new skills.

Amenity describes the situational and convenience aspects of the course location and organization, and the analysis shows it contributed to the perceived Utility. Amenity tended to be valued more highly by those with more experience in formal education (Education, Instructor and Consultant).

Teaching was the most evaluated subject area, since course providers were concerned about the quality of the instructors and the teaching methods. Variations in Teaching and Content were either unrelated to Utility, or Teaching and Content scores may have been uniform enough that they were not related to Utility. For Teaching the scores were fairly uniform.

Discussion

Attitudes toward training

Skills evaluation at the conclusion of the training indicated participants' success in training behavior or skills acquisition, at least from a formal viewpoint. Participants' reaction surveys confirmed the results of the formal evaluation tests, while adding a subjective perspective about how training had been assimilated by the trainees. That was especially important, because training objectives were partly affective in nature, as they encouraged those changes in behavior or attitude that were necessary to promote a safety culture (Wirth and Sigurdsson 2008). Since there were no job behavior assessments, the only evidence of intended adoption was the reaction surveys (Colquitt et al. 2000).

The Outcome survey items measured whether the course met the objectives that were stated in communications about the program (written and oral) or perceived by the participants. The vast majority indicated that the courses satisfied those objectives. If in participants' perceptions, the principle outcome was to gain the Qualification or progress to the next course, the participants were successful nearly all of the time.

The disposition of course participants toward logger training has been generally positive as reflected by these surveys and the literature (Reeb 1996; Egan et al. 1997) and adoption of

techniques has been self-reported (Wightman and Shaffer 2000; Helmkamp et al. 2004; Egan 2005; Mujuru et al. 2009; Barrett et al. 2012). As expected with the variety of programs documented, the results regarding impacts (Bell and Grushecky 2006; Mujuru et al. 2009) and job behavior (APA 1990; Väyrynen and Könönen 1991; Shaffer and Meade 1997; Haynes and Visser 2001; Davis and Clatterbuck 2003; Hammond et al. 2011) are more variable.

Different reactions of different groups

Typically, opinions about usefulness or utility of the trained skills or knowledge is a better indicator that participants intend to adopt the training on the job (Alliger et al. 1997). One can see that the participants differentiated between Outcome and Utility to some degree and more factors were related to Utility. Unfortunately, most surveys had few items exploring Utility or Outcome and there were differences in the construction of those items in the individual surveys. The effect of logging work (indirectly through Consultant) on most of the evaluation subjects demonstrated that loggers were slightly more critical in program evaluation concerning Utility (Figure 3 – high indirect path estimate of 1.21 between Consultant and Utility, through Teaching). In addition, Logging Managers were more critical of Content, reflecting some evaluation of its application in work settings (Figure 3 – negative path estimate of −0.13 between Logging manager and Content). Logging Employees were more positive about Outcome and perhaps more positive about the tangible course results (Qualification or achievement) versus the less tangible skills or knowledge gain (Figure 3 – positive path estimate of 0.33 between employee and Outcome). This may also constitute indirect evidence that logging employees perceive there are more barriers to training transfer or the utility of the training, compared with the release of a certificate. A significant effect of education on Utility may represent a positive influence of cognitive ability on training, or describe that those with more educational experience are more likely to perceive a positive result (Figure 3 – positive path estimate of 0.14 between Education and Utility; Figure 4 – positive path estimate of 0.16 between Education and Utility). In turn, that may indicate that this class of participants is more likely to implement suggested changes and contribute to building a safety culture.

In short, one may state that different groups had indeed different reactions to training characteristics. Consultants were the least critical, but also the least trained and experienced, since they generally represented fresh university graduates who tried to get a better understanding about the practicalities of the logging business. Employees seemed most eager to obtain the qualification that was necessary to carry on with their jobs, and less interested in gaining new skills – which they likely thought they already possessed to a sufficient degree. Since this group was also the least educated, the relatively lower interest for utility determined the negative association between utility and education. Finally, logging managers – generally owners of a contracting firm – were more interested than the rest in Utility, i.e. in obtaining new skills that could be used for their business. Being relatively experienced, they were also most critical of course content – which could be taken as a genuine interest in course attendance, beyond pure compliance. Therefore, it is possible that at least this group may freely join carefully designed courses, if these courses were deemed capable of increasing firm efficiency. In fact, logging company owners often have a positive attitude toward compliance training, which they regard as an effective way to curb unfair competition by irregular operators (MacKay et al. 1996; Spinelli et al. 2017).

Limitations of the study and suggestions for future research

Analyses of training suggest that a wide array of individual factors together with training design (Burke et al. 2006) determine training effectiveness. The role for training surveys may be to describe the relationship between participants and the training program, and provide evidence for program effectiveness. Pre- or post-training surveys can provide information on a number of factors related to training effectiveness. Given the characteristic of logger training, it is very likely that items regarding self-assessment, self-efficacy, barriers to training transfer, the desirability of training outcomes, and the usefulness of training may provide important information about training effectiveness. Unfortunately, available surveys only contained items related to outcomes and usefulness, but no specific questions about self-assessment, desirability of training outcomes, or barriers to training transfer.

Self-assessments are the program participants' measure of their own capability in applying the program outcomes. Self-assessments of current level of skill rather than gain attributed to training may be more accurate (Sitzmann et al. 2010). Self-assessments have been shown to have some validity in measuring skill, cognitive, and affective outcomes. Even though the instructor assessments of the participants were largely positive, a self-assessment could provide information on whether participants had confidence in skill application or whether over-training could be beneficial. Self-efficacy is the belief that one can complete a task following the training, and may be important in motivation to learn and to training effectiveness (Colquitt et al. 2000). Cognitive ability or trainee preparation may also be represented in self-efficacy.

Barriers to training transfer could be related to climate and job involvement. However, the public training programs observed in this study could not establish a close link between training and job demand, due to the variation among firms and the different roles of the participants (Smidt and Blinn 1994; Barrett et al. 2012). Aspects of job climate could describe the support the trainee would have to apply the training and receive positive feedback. In this context, it would be likely that Logging Employees would have the least certainty or control regarding job climate.

Finally, while the surveys had several items about the achievement of outcomes, there were no items that assessed the desirability of those outcomes. Some of the observed differences might be indicators of the desirability of specific outcomes for trainees with a specific occupation and education. Expressing those differences more specifically relative to

cognitive, skill, or affective outcomes would provide more information relative to training transfer. The items about training usefulness or utility helped to describe training effectiveness but were general in nature and did not refer to specific training elements.

Conclusions

It is important for training organizations to gauge customer satisfaction with regard to the training conditions, as poor conditions can contribute to less than ideal knowledge transfer and behavioral change. Logger training is confronted with difficult tasks: it must provide new skills to a group of learners which vary in motivation, cognitive ability, and pre-training skills, and it must favor training transfer among individuals that vary in confidence and operate within organizations which vary in support for trained skills. Developing better trainee and course evaluations will help determine which of these aspects need attention in an on-going effort to improve logger training. This study shows that different demographic groups have different reactions to standardized training courses and may provide a useful indication for the design of customized courses specifically addressing individual user groups.

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