Submissions to Standing Committee on Finance and Economic Affairs

Bill 288, Building Opportunities in the Skilled Trades Act, 2021

May 25, 2021

DCLC
Durham Community Legal Clinic
& Access to Justice Hub

About

The **Durham Community Legal Clinic (DCLC)** is a Community Legal Clinic that provides legal services, information, education, and representation for historically marginalized and low-income residents of Durham Region. DCLC also engages in advocacy and law reform activities, in particular to ensure that our laws properly consider the perspectives of historically marginalized and low-income Ontarians. The main areas of services DCLC provides includes employment law, WSIB, human rights, housing and tenancy issues, and social benefits.

The **Durham Access to Justice Hub®** (the "Hub) was established by the clinic in 2019 with the assistance of LAO. This inter-agency and inter-disciplinary initiative intended to provide legal services beyond the income thresholds and subject matter of LAO, and other social, financial, and psychological services. These cooperative relationships seek to foster better client-centered services, reduce administrative barriers and silos, and improve efficiency of services that are funded or subsidized by taxpayer dollars. Some techniques used to achieve these goals include recruitment of volunteers to contribute towards improving access to justice, and by embedding students into workflows and innovative projects through experiential education. Through the Hub, DCLC provides even broader services to focus on the root causes of poverty and engages in deeper forms of poverty alleviation

Omar Ha-Redeye is a lawyer and the Executive Director of DCLC. He holds a JD from Western University, and an LLM from Osgoode Hall. He has received numerous awards for his efforts in law reform and advocacy on behalf of historically marginalized and low-income populations, including the Queen Elizabeth II Diamond Jubilee Medal, and the OBA Foundation Award.

Reid Jackson is a Community Legal Worker and Paralegal with the Durham Community Legal Clinic. He focuses primarily on human rights law, employment law, and workers' compensation law at the clinic. He was previously a Human Resources Specialist within the construction industry, with a focus in labour relations and workers' compensation.

Samantha Iantomasi is a Durham Region resident, a first-year law student at the University of Ottawa Faculty of Law, and a volunteer with DCLC. She holds a Bachelor of Science and Certificate in Law from Queen's University.

Contents

Introduction

1. Bill 288, *Building Opportunities in the Skilled Trades Act, 2021,* was enacted to regulate the practice of trades and apprenticeship programs in Ontario.

2. Ontario will be facing a dire and urgent shortage of skilled trades in the coming years. This pressure will be felt most keenly in the construction industry, with shortages of 100,000 workers predicted by 2029.[1]

3. Much of this shortage can be attributed to the large numbers of the baby boom generation who will be retiring in the coming years. Hon. Minister McNaughton has remarked that one in three journeypersons is now over the age of 55, and the average age of an apprentice is 30 years.[2] This government has taken action to combat these looming shortages by creating grants, disseminating media pieces extolling the virtues of the trades,[3] and planning to send recruiters into high schools to promote the trades to new graduates.[4]

4. However, these changes alone may not be enough to cover the shortage, which can also be traced to deeper systemic issues. These plans do not go far enough to address the barriers which discourage and exclude racialized Ontarians and newcomers from pursuing a career in the trades.

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[1] Christina Varga, "Construction industry fears a skilled-trades shortage," The Globe and Mail, February 23, 2021, available at: <https://www.theglobeandmail.com/business/industry-news/property-report/article-construction-industry-fears-a-skilled-trades-shortage/>.
[2] Don Wall, "New Skilled Trades Ontario to replace College of Trades," Daily Commercial News, May 6, 2021, available at: <https://canada.constructconnect.com/dcn/news/government/2021/05/new-skilled-trades-ontario-to-replace-college-of-trades>.
[3] Government of Ontario, "Ontario takes Action to Address Skilled Trades Shortage," January 10, 2020, available at: <https://news.ontario.ca/en/release/55286/ontario-takes-action-to-address-skilled-trades-shortage>.
[4] Ellwood Shreve, "Ontario vows to send recruiters to high schools to promote skilled trades," January 7, 2021, Postmedia News, available at: <https://torontosun.com/news/provincial/ontario-vows-to-send-recruiters-to-high-schools-to-promote-skilled-trades>.

5. These submissions are largely in support of changes to the skilled trades as set out in Bill 288, provided they are enacted with due consideration of the concerns raised in the Dean Report. DCLC will specifically highlight workplace safety with apprenticeship ratios, issues of equity in the skilled trades, and effective strategies for introducing skilled trades to young Ontarians.

Background

6. The Ontario College of Trades ("OCOT") was created under the *Ontario College of Trades and Apprenticeship Act, 2009* (OCTAA).[5] This was passed to elevate the industry socially and scientifically, improve its reputation and standing, and increase the completion rates of apprenticeships, which was at about 50% at the time.[6]

7. OCTAA addresses many deficiencies of Bill 55, *Apprenticeship and Certification Act, 1998*,[7] which deregulated and diluted apprenticeship standards on the assumption that private employers would ensure sufficient training and credentials for tradespeople. The private sector never delivered on its promises, and it took many years to attempt to rectify these changes through a system that would create and enforce standards. The presence of workers conducting trades work such as welding, while not voluntarily registered as an apprentice, created conditions

[5] SO 2009, c 22 [the "*OCTAA*"].
[6] Legislative Assembly of Ontario, "Official Report of Debates (Hansard)," First Session, 39th Parliament, June 2, 2009, at 7129-7131, available at: <https://www.ola.org/sites/default/files/node-files/hansard/document/pdf/2009/2009-06/house-document-hansard-transcript-1-EN-02-JUN-2009_L157.pdf>.
[7] SO 1998, c 22.

conductive to injury for at least some workers under this regime.[8] The previous regime was also susceptible to allegations of political influence and interference.[9]

8. However, OCOT was also plagued by its own criticisms since opening its doors in 2013. Many believed that its mandate was too sharply focused on enforcement, and that it did not devote enough effort to attracting new workers and promoting the rights of apprentices.[10] The OCOT system has also been criticized for being needlessly complex and difficult to navigate, discouraging new workers from entering or staying in the trades, and creating additional barriers for low-income individuals and others who could benefit most from a more accessible apprenticeship program.

9. In 2015 Tony Dean conducted an extensive report on the OCOT, "The Supporting a strong and sustainable Ontario College of Trades."[11] The Dean Report thoroughly examined the OCOT and the issues which have plagued it since its inception. It was conducted over several months, with numerous stakeholder consultations, and made a number of recommendations to improve the operations and transparency of OCOT.

10. The Dean Report highlighted the need for changes to apprenticeship ratios, changes to scopes of practice, and trade classifications and reclassifications. The

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[8] See *Decision No. 180/08*, 2008 ONWSIAT 295 (CanLII) (Appendix "A"), where the Tribunal notes at the time that the worker was not an apprentice, as it was not mandatory at the time to register, and was therefore denied compensation; aff'd 2008 ONWSIAT 1440 (CanLII) (Appendix "B").
[9] *Petersen v. Ontario (Minister of training, colleges & universities)*, 2002 CanLII 34294 (ON SCDC).
[10] Ontario Chamber of Commerce, "New Making Ontario Open for Business Act: Rapid Policy Update on the Bill 47, *Making Ontario Open for Business Act, 2018*," Oct. 23, 2018, available at: <https://occ.ca/rapidpolicy/new-making-ontario-open-for-business-act/>.
[11] Tony Dean, "Supporting a strong and sustainable Ontario College of Trades," 2015, Ministry of Colleges and Universities, [the "Dean Report"], available at: <https://www.ontario.ca/document/supporting-strong-and-sustainable-ontario-college-trades>.

report endorsed greater flexibility in a number of these areas, recognizing that the college would be required to modernize and do more to promote an accessible apprenticeship process if it were to truly serve the needs of its members and the public.

11. While the Dean report recognized the need for changes, it was equally concerned that these changes be conducted in an informed and measured way. The primary concern espoused by the report was that any changes to apprenticeship ratios and trades classifications should conducted in a way which mitigated risk, both to workers and members of the public.[12]

Apprenticeship Ratios and Workplace Safety

12. In the years following the Dean Report, many of the recommendations have been addressed through regulations under OCTAA, notably in the regulations that utilize a classification panel under s. 63.6, which explicitly look at the risk of harm to an individual performing the work, engaging in the practice of the trade, to other workers, or the public.[13] The emphasis on the risk of harm and any health and safety conditions is a prevailing theme under the current regime, which must be maintained in any revisions to the skilled trades. The regulations created under Bill 288 must maintain this emphasis and continue to employ the recommendations found in the Dean Report, with an explicit reference to reducing risk for workers.

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[12] *Ibid*.
[13] *Classification Roster Determinations Under Part XI.1 of the Act*, O Reg 315/18, s 7; OCTAA, *supra* note 5, s. 63.6(15).

13. This government previously proposed abolishing the Ontario College of Trades in 2018, as part of the omnibus *Making Ontario Open for Business Act.*[14] While this was supported by many stakeholders such as organizations in the construction industry, it also generated some alarm, notably from organized labour who were concerned with the proposed changes to the ratios of apprentices to journeymen. Concerns were raised that the proposal to set the ratio of journeymen to apprentices at 1:1 could lead to more workplace accidents and injuries, and could create unsafe working environments.[15] Bill 288 raises similar concerns, specifically in section 8, which sets the default apprenticeship to journeyperson ratio at 1:1, unless otherwise prescribed.

14. Many of the industries affected by these changes will still surpass the minimum ratios found in section 8, largely because they are exceeded in existing collective agreements. However, for non-unionized workplaces, and especially smaller employers, the failure to properly regulate apprenticeship ratios could give rise to an increased risk of injury. The relative proportion of these workplaces may not be large enough to statistically identify and demonstrate that the ratios themselves are responsible for the injury, which is why prescribing higher ratios should be carefully contemplated once Bill 288 is enacted.

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[14] Bill 47 - Making Ontario Open for Business Act, 2018, SO 2018, c 14, Schedule 3, available at: <https://www.ontario.ca/laws/statute/s18014#BK5>.
[15] CBC News, “Scrapping Ontario College of Trades 'a step backward,' says Unifor,” October 26, 2018, available at: <https://www.cbc.ca/news/canada/windsor/scrapping-ontario-college-of-trades-a-step-backward-1.4879544>.

15. There is some indication in the literature that apprenticeship ratios have some weak correlations to risk perceptions among workers.[16] Falls from heights by carpenter apprentices are relatively common, especially at residential construction sites, but comprehensive training and proper fall protection techniques can ideally ameliorate these risks.[17]

16. A survey of 1,025 apprentice carpenters found that despite participation in a formal apprenticeship program, including school-based and on-the-job training, carpenter apprentices in residential construction with less than 1 year of work were at the greatest risk of falls, with those performing a wider variety of work tasks at greatest risk. The authors conclude,[18]

> For every 10% increase in the percentage of apprentices at the worksite, there was a 27% increase in ladder falls. Safer crew behaviors were protective, with a 1 point improvement in crew behavior resulting in a 10% decreased likelihood of all falls from heights and ladder falls…
>
> Our research echoes findings from other industries that organizational factors and safety culture strongly influence worker behaviors (28, 29). Previous work by our team (5) and Lipscomb (16) suggests that inexperienced carpenters do not receive the type and amount of mentorship they would like from journeymen on their work crews. Limiting the number of apprentices working at residential construction sites will increase the opportunities for mentorship; however many contractors have increased the number of apprentices on their residential crews in order to remain competitive in the current home building market. In addition, journeymen may underestimate their role in providing supervision and training to inexperienced workers.
> [emphasis added]

17. Other jurisdictions in Canada without a mandatory ratio, such as British Columbia, have significantly higher injury rates for the skilled trades.[19] Injury rates in B.C.

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[16] Kaskutas et al., "Fall prevention among apprentice carpenters," *Scandinavian Journal of Work, Environment & Health* (May 2010): 258-65 at 262 ((Appendix "C").
[17] Kaskutas et al., "Changes in fall prevention training for apprentice carpenters based on a comprehensive needs assessment," *Journal of Safety Research* (June 2010): 221-227 (Appendix "D").
[18] Kastutas et al., *supra* note 16, at 262-263.
[19] Prism Economics and Analysis, "BC's (Not So) Great Apprenticeship Training Experiment: A Decade Reconsidered," BC Federation of Labour, November 2017, available at:

were steadily decreasing until 2004, when the province eliminated compulsory trades and adopted modularized trades training.[20] The injury rate for tradespeople in B.C. is nearly four times that of tradespeople in Ontario.[21] On this basis alone, regulations made under Bill 288 should refrain from readily adopting elements from the B.C. model.

18. Although some of these risks can be mitigated through adequate funding for the Workplace Safety and Insurance Board and Tribunal systems,[22] this is a reactive and inefficient means to promote health and safety, and one that will cost taxpayers more and result in greater injury. Therefore, apprenticeship ratios should be monitored closely to prevent workplace injury, and the Minister should be mandated to collect all information related to injuries in the skilled trades for the purposes of risk management and quality improvement under s. 62(4).

Equity Considerations in Skilled Trades

19. Improving the routes to skilled, stable, and well-paying jobs will be especially important during the economic recovery following the COVID-19 pandemic. The measures under Bill 288 that simplify the process of becoming a tradesperson should assist with the path to recovery by making trades jobs more accessible. However, broad inequities present in the labour market may unintentionally

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<https://bcfed.ca/sites/default/files/attachments/BCFED_apprenticeship_training_reprint_Feb_2018_web.pdf>.

[20] *Ibid* at 26, though the authors note this does not demonstrate causation.

[21] *Ibid* at 27.

[22] See, for example, Ministry of Labour, Training and Skills Development, "Published plans and annual reports 2020-2021: Ministry of Labour, Training and Skills Development," Dec. 14, 2020, available at: <https://www.ontario.ca/page/published-plans-and-annual-reports-2020-2021-ministry-labour-training-and-skills-development>.

exclude many newcomer and racialized Ontarians from these jobs, and may decrease the amount of available opportunities for these marginalized communities.

20. The intent of this legislation to facilitate greater entry into the skilled trades is commendable, especially with measures that make it more client-focused and accessible. However, there are numerous systemic barriers and obstacles for many who try to enter the skilled trades, even with these changes in place.

21. The existing barriers faced by low-income Ontarians is easily exacerbated by the inherent challenges of immigrating to a new country. A client-focused process that is easy to access and clearly lays out the roles and responsibilities of all stakeholders in the process sends the message that newcomers are welcome here, their experience and talent is needed, and Ontario is working to eliminate the barriers and delays that keep newcomers from working. These changes to Bill 288 will assist newcomers in contributing to the economy, contributing to their community and supporting their family.

22. The changes to Bill 288 alone will not achieve these goals. A 2004 examination into the barriers faced by new Canadians by Dr. John Samuel highlights these difficulties. Many highly qualified immigrants, approximately 90% of whom are visible minorities, struggle to find meaningful work when they come to Canada, and many have their impressive qualifications overlooked and underutilized.[23]

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[23] John Samuel, “Are there racial barriers to access to professions and trades for the foreign-trained in Ontario?,” Ontario Human Rights Commission, December 2004, available at: <http://www.ohrc.on.ca/en/race-policy-dialogue-papers/are-there-racial-barriers-access-professions-and-trades-foreign-trained-ontario>.

23. Dr. Samuel points out that these struggles are exacerbated by the fact that interview boards and panels often lack racialized members, further putting these groups at a disadvantage.[24] These issues still persist, highlighted by the fact that while 40% of women make up the new Trades Panel, racialized persons, and especially newcomers, continue to be underrepresented in discussions about the skilled trades in Ontario.[25]

24. These challenges in the skilled trades are also reflected in the broader workplace in Ontario. Recent surveys show that 96% of Black Canadians believe racism is an issue in the workplace, while 56% of White Canadians believe it is a small problem, or not a problem at all.[26] These patterns of exclusion are replicated in the skilled trades in Ontario today, regardless of the presence of organized labour, and require governmental involvement to ensure the entirety of the potential workforce is properly engaged to provide new opportunities.

25. Meaningful jobs change lives, and it is our hope that this Bill will contribute to that change for many Ontarians. Being unemployed can fuel low self esteem, a lack of confidence, anxiety and stress – particularly for those who live pay cheque to pay cheque. For many youth, unemployment creates doubts about their future, and can lead to greater anti-social behaviour. Unemployment often creates confusion and uncertainty for newcomers. Although there are income supports available,

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[24] *Ibid.*
[25] Government of Ontario, "Skilled Trades Panel," available at: <https://www.pas.gov.on.ca/Home/Agency/634>.
[26] Angelyn Francis, "Survey shows most Canadians agree racism is a problem. And Black people are dealing with the worst of it," Toronto Star, May 21, 2021, available at: <https://www.thestar.com/news/gta/2021/05/21/survey-shows-most-canadians-agree-racism-is-a-problem-and-black-people-are-dealing-with-the-worst-of-it.html>.

accessing these supports deprives many people of hope that they will be employed. However, merely creating jobs will not be enough. We need to ensure the opportunities that are being created allow all members of society the chance to excel.

26. The Hon. Monte McNaughton has recently remarked on the news that truck production in Oshawa is set to begin again ahead of schedule, in the 4th quarter of this year.[27] This will result in the creation of nearly 1,700 jobs, including 1,500 production line workers, and over 150 electricians and millwrights. Minister McNaughton has also remarked that all of these jobs, like many opportunities in the trades, also provide robust benefits and pensions plans, and represent the kind of jobs which we need to see in our communities.[28] Bill 288 may indeed create more of these types of opportunities for our community.

27. Despite our noted concerns, our clinic is largely supportive of this proposed legislation. Located in Oshawa, we have seen firsthand the importance of accessible and empowering employment, and the terrible void that can be created when these opportunities disappear. The trades have long represented a pathway out of poverty for Ontarians, and making these opportunities more accessible has the potential to benefit the most vulnerable in our society. DCLC shares the Minister's excitement at the return of General Motors to Oshawa, and is hopeful

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[27] The Canadian Press, "Oshawa assembly plant restart ahead of schedule: GM Canada," BNN Bloomberg, May 5, 2021, available at: <https://www.bnnbloomberg.ca/oshawa-assembly-plant-restart-ahead-of-schedule-gm-canada-1.1599525>.

[28] Legislative Assembly of Ontario, "Official Report of Debates (Hansard), No. 260," 1st Session, 42nd Parliament, May 10, 2021, at 13429, available at: <https://www.ola.org/sites/default/files/node-files/hansard/document/pdf/2021/2021-05/10-MAY-2021_L260.pdf>.

that this Bill will further encourage the proliferation of highly skilled and highly paid trades jobs within Ontario.

Skilled Trades Cannot be Taught Online

28. While improving access to skilled trades jobs will be especially important for Ontario's recovery from the effects of the COVID-19 pandemic, it will also be made increasingly difficult by the continuation of remote learning after the pandemic. Much of the push towards remote learning has occurred within the last year, in response to COVID-19. However, there have been indications that the current government is contemplating making online education permanent.[29]

29. Many stakeholders have expressed their concerns with the proposal of continued online learning. Organized labour are concerned about the negative impact of remote learning on the quality of education for trades students, and fear that the shift towards remote learning is an attempt to further privatize the education system in Ontario.

30. These stakeholders have spoken out against privatization in Ontario numerous times in the past. Sweeping changes and cuts were made to the education system in the past, in Bill 104, *Fewer School Boards Act, 1997* and Bill 160, *Education Quality Improvement Act, 1997.* These changes were vigorously opposed by many in the education sector, including the TDSB Skilled Trades Council.[30] People in the

[29] Dan Karpencuk, "Teachers alarmed, as Ontario offers remote learning as permanent option,". WBFO NPR. May 6, 2021, available at: <https://news.wbfo.org/post/teachers-alarmed-ontario-offers-remote-learning-permanent-option>.
[30] Ontario Federation of Labour, "The Privatization of Ontario's Education System: 1995-2001," 2002, available at: <https://ofl.ca/wp-content/uploads/2002.01.01-Report-EducationPrivatization.pdf>.

education sector recognize the vital role that a robust education system plays in preparing students for the future, including a career in the trades.

31. Remote learning is especially ineffective for skilled trades, as the vocations by their very nature require applied and hands-on experience. Online courses cannot provide the same experience as practical training. For example, online courses cannot mimic the physical reality of a trades setting and students cannot practice using professional-grade equipment from the comfort of their homes.[31] A survey by the Association for Career and Technical Education shows that 74% of teachers and counselors find online learning less effective than hands-on learning.[32] The apprenticeship program is industry-driven, with only 10% to 20% of an apprentice's time spent in the classroom, and the remaining time spent in the workplace.[33] Therefore, the shift to online learning threatens the preparedness of trades students to enter the workforce, and when they do enter the workforce, they may not be properly prepared.

32. While we support efforts to mobilize trades recruiters into high schools, we caution that this can only be fully effective if schools are conducting in-person learning. Despite the efforts of recruiters, students may be deterred from pursuing a trades career if they will not receive hands-on training, and may pose a risk to themselves and others without proper in-person preparation.

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[31] Anne Dennon, "How Trade Schools are Weathering COVID-19", March 18, 2021, *Best Colleges,* available at: <bestcolleges.com/blog/how-trade-schools-are-adapting-to-covid-19/>.
[32] *Ibid.*
[33] "National Apprenticeship Survey: Canada Overview Report 2015", 2015, *Statistics Canada,* available at: <https://www150.statcan.gc.ca/n1/pub/81-598-x/2017001/sect01-eng.htm>.

33. The current education policies appear to intend to make remote learning mandatory, at least in part.[34] However, many stakeholders have expressed concerns that remote learning presents its own risks, especially for vulnerable youth,[35] and has the potential to increase marginalization. If the intent of this proposed legislation is to make the skilled trades more accessible to Ontario youth, then steps must be taken to ensure that vulnerable and marginalized youth are not left behind.

Conclusions

34. The introduction of new legislation for skilled trades is long overdue. Increasing the accessibility of the trades increases their appeal, especially among those who would benefit most from a career in this industry. However, all changes must be approached with caution, as the failures of the *Apprenticeship and Certification Act, 1998* and the *Ontario College of Trades and Apprenticeship Act, 2009* demonstrate. Past legislation has shown that a fine balance is required in this industry. This means carefully considering accessibility of entry and autonomy of the industry with compelling safety concerns and adequate enforcement, and ensuring that while apprentices are given the empowerment and abilities to succeed, this is paired with the sufficient oversight to ensure industry standards are met.

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[34] People for Education, “Major changes coming to online learning in Ontario,” March 28 2021, available at: <https://peopleforeducation.ca/our-work/major-changes-coming-to-online-learning-in-ontario/>.
[35] Katie Dangerfield, “Online learning has become a COVID-19 reality. But experts say kids aren’t thriving online,” Global News, April 15, 2021, available at: <https://globalnews.ca/news/7757076/remote-learning-covid-19-consequences/>.

35. DCLC recommends that this legislation protects the health and safety of workers through a proactive regime. Workplaces need to carefully monitor the effects of the prescribed 1:1 ratio to ensure that it is not contributing to workplace injury.

36. Further, DCLC recommends that this legislation recognizes the systemic barriers faced by marginalized groups entering the skilled trades. Skilled Trades legislation should ensure that the Trades Panel represents racialized persons and newcomers. Although Bill 288 may create increased opportunities for our community, the government must ensure that these opportunities are equally accessible to all members of the community.

37. Lastly, DCLC recommends that in-person learning is used for skilled trades. Online learning is ineffective for a predominately hands-on occupation and it risks excluding vulnerable and marginalized youth from pursuing a trades career.

38. This legislation will be successful if paired with regulations and policies that ensure the trades are accessible for all Ontarians, in particular racialized persons, newcomers, and those living in poverty. This means investing in a strong and sustainable education system that does not leave vulnerable students behind and ensuring adequate representation of all Ontarians on industry boards and panels.

39. Trades careers give Ontarians the tools and skills they need to build a better life and contribute to a better Ontario. This goal is commendable and worth supporting provided it can be achieved in a safe, accessible, and equitable manner.

WORKPLACE SAFETY AND INSURANCE APPEALS TRIBUNAL

DECISION NO. 180/08

BEFORE:	S. Ryan: Vice-Chair
HEARING:	January 15, 2008 in Hamilton Oral
DATE OF DECISION:	January 30, 2008
NEUTRAL CITATION:	2008 ONWSIAT 295
DECISION(S) UNDER APPEAL:	S. Sousa, Appeals Resolution Officer, June 9, 2006

APPEARANCES:

For the worker:	K. Channan, a lawyer
For the employer:	Did not participate
Interpreter:	M. Khan (Punjabi)

REASONS

(i) Introduction

[1] On August 24, 1998, the worker suffered an injury to his right eye. At that time, the worker was employed as a Die Opener/Torch Operator. He continued to work in regular duties and on September 23, 1998, he was hired by another employer as a Labourer.

[2] In *Decision No. 12/05* (October 6, 2005), a Panel of the Tribunal granted the worker initial entitlement for the injury to his right eye occurring on August 24, 1998. The worker was subsequently granted a 25% Non-Economic Loss (NEL) award for total vision loss in his right eye.

[3] The Board's Operating Branch denied the worker entitlement to LOE benefits on the grounds that his earnings with the new employer exceeded his pre-accident earnings. That determination was upheld in the decision of the Appeals Resolution Officer (ARO) dated June 9, 2006. That decision is now the subject of the worker's appeal to the Tribunal.

[4] In this appeal, the worker argues that, had it not been for the compensable injury, he would have pursued a career as a Welder for which he held certification and would have attracted earnings in excess of his pre-accident and his actual post-accident earnings. Accordingly, he argues, he should be granted Loss of Earnings (LOE) benefits.

(ii) Background

[5] The essential facts in this case are not disputed. The worker was born in India in 1971 and immigrated to Canada in 1993. In India, he completed 10 or 11 years of schooling and had no formal training in any skilled trade.

[6] In approximately 1994, he worked as a General Labourer on a full-time basis for a manufacturer of furniture. His duties included lifting and sanding planks. He earned about $8.00 per hour. After about six or seven months, he was laid off.

[7] In 1994 or 1995, he worked as a Labourer on a full-time basis for an automotive parts manufacturer and die caster. His duties including cutting and finishing parts. He earned between $10.00 and $12.00 per hour. He remained in that job for about 2 ½ years before being laid off.

[8] In 1997, the federal government sponsored the worker in a welding program at Advanced Welding Techniques Program Inc. The worker testified that the program lasted about five or six weeks and he attended eight-hour classes, five days per week. A certificate dated March 7, 1997, issued by the Advanced Welding Techniques Program Inc., indicates that the worker successfully completed Mig Weld, Stick Weld, Flux Cored Weld, Carbon Steel and Aluminium in flat, horizontal, vertical and overhead positions. The worker testified that he looked for work as a welder without success before being hired by the accident employer.

[9] On July 21, 1997, the worker was hired by the accident employer, a manufacturer of concrete poles. He was employed as a Die Opener/Torch Operator. The worker described his duties which involved using a propane oxygen torch to cut various materials. He also opened

and filled dies. In answer to my questioning, the worker testified that, while working with the accident employer, he did not perform any of the welding duties he learned at the Advanced Welding Techniques Program Inc.

[10] On August 24, 1998, the worker suffered an injury to his right eye when a piece of hot metal penetrated his safety goggles. He was subsequently diagnosed with focal chorioretinal atrophy of the macula and lost all vision in the right eye. At the time of the compensable injury, he earned $14.30 per hour over a 40 hour work week or $572.00 gross per week. He was 26 years old. Despite the injury, the worker continued to work in regular duties.

[11] On September 23, 1998, he began employment with a new employer as a Labourer. He testified that he decided to change jobs because he was afraid of injuring his left eye in his pre-accident employment. In an interview with a Board Claims Investigator (CI) on August 7, 2001, the worker advised that he earned "$1.00 more per hour" with the new employer compared to his hourly rate with the accident employer. With the new employer, his duties included grinding and sanding parts in the manufacturing of farm equipment. The worker testified that he continues to be employed in the capacity of a Labourer with the new company. Information in the Case Record indicates that in 2000, the worker earned approximately $700 gross per week ($17.50 per hour in a 40 hour week or $36,400 per annum). His earnings have increased since that time.

(iii) Submissions

[12] Mr. Channan does not dispute the fact that the worker did not meet the Board policy definition of an apprentice in that the worker was not registered under the *Trades Qualification and Apprenticeship Act* or the *Apprenticeship and Certification Act* with a signed contact for training and instruction in a trade through an employer.

[13] Put succinctly, Mr. Channan argued that, but for the compensable accident, the worker would have pursued a career as a Welder and would have attracted earnings in excess of his pre-accident earnings and the earnings in his present job as a Labourer. He submitted that the WSIA requires that this case be considered on its real merits and justice. He submitted that pursuant to the *Charter of Rights* the worker is entitled to equal treatment under the law and that the worker ought to be granted Loss of Earnings (LOE) benefits to reflect his loss of future earnings as a Welder.

[14] Mr. Channan emphasised evidence from "Ontario Job Futures" that sets out general educational and training requirements of Welders:

> Some secondary school education is usually required with Grade 12 being the norm for hiring skilled welders. Workers and job applicants must have a good knowledge of the basic settings on welding machines, polarity, blue-print reading etc. They must also have "hands-on" experience. Some employers, especially machinery manufacturers and pressure vessel manufacturers, require highly skilled welder-fitters for precision and very sophisticated work.
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> For more highly skilled welding occupations, completion of an apprenticeship program or in combination of over three years of work experience in the trade and some college or industry courses in welding is usually required to be eligible for trade certification. Trade certification is available, through Canadian Welding Bureau, for this occupation in

> Ontario but certification is not a compulsory work requirement for the occupation in the province, Inter-provincial (Red Seal) trade certification, which allows qualified welders to work in other provinces and territories, is available for this trade.
>
> Entry to apprenticeship requires a job and usually the completion of Grade 12. The apprentice applies directly to the employer, union or joint industry committee for an apprenticeship opening. Students who have completed Grade 10 have an opportunity to become registered apprentices while finishing high school under the Ontario Youth Apprenticeship Program. Alternatively, entry into apprenticeship can be pursued through pre-apprenticeship training.

[15] Mr. Channan reviewed in detail the documents in the Case Record. He cited sections of the WSIA, Board policies and Tribunal decisions (discussed below). He cited Lord Blackburn in *Dixon v. Caledonian & Rly. Co.* (1880), 5 App. Cas. 820, p. 838 and submitted that laws are adapted to cases which more frequently occur and do not cover every case that may arise. He submitted that where there is a *casus omissus* in a statute the case is governed under Common Law.

[16] Mr. Channan submitted that the worker's LOE benefits should be calculated on the hypothesis that as of March 7, 2000—three years since the receipt of his welding certificate—he would have been a qualified Welder earning the industry average of $41,391 per year.

(iv) Analysis

[17] I have carefully considered all of the available evidence before me, testimony of the worker and submissions of Mr. Channan.

[18] Mr. Channan made general comments about the applicability of the *Charter of Rights*[1] to these proceedings. However, he did not file notice of a specific *Charter of Rights* argument in accordance with the Tribunal's Practice Directions. Mr. Channan submitted, and I agree, that neither the WSIA nor Board policy should be interpreted in a manner that conflicts with the provisions of the *Charter of Rights*.

[19] In this case, I can find no conflict or inconsistency with the values set out in the *Charter of Rights* and no specific argument has been filed in compliance with the Tribunal Practice Direction entitled, "Procedure When Raising a Human rights or Charter Question". Section 4.1 of that practice direction states:

> Where a party to an appeal intends to raise a question under the *Canadian Charter of Rights and Freedoms* with respect to the legislation or WSIB Policy applicable to the Tribunal, the party must comply with section 109 of the *Courts of Justice Act*. One of the requirements under section 109 is to serve a notice of constitutional question on the Attorney General of Canada and the Attorney General of Ontario. The notice must be served as soon as the circumstances requiring it become known. A copy of the notice of constitutional question must also be provided to the Tribunal and all parties to the appeal

[20] Mr. Channan confirmed his agreement with the history as it is described above. However, even though the worker testified that he did not perform any of the welding duties that he was taught at the Advanced Welding Techniques Program Inc. while working for the accident

[1] *Canadian Charter of Rights and Freedoms*

employer, Mr. Channan submitted that the worker was nevertheless performing some welding duties at the time of the compensable accident because he used a torch. Mr. Channan also submitted that the worker's compensable injury, which resulted in total vision loss in the right eye, precluded any opportunity to pursue a career as a Welder.

[21] I note that there is no supporting evidence to indicate that using a torch is sufficient to be considered a Welder. I note that there is no supporting evidence in the available materials to indicate that loss of vision in one eye precludes employment as a Welder. Mr. Channan submitted that the worker would likely have earned more as a Welder than as a Labourer in his present occupation. I note that according to the Ontario Wage Survey, submitted by Mr. Channan, the average "most frequently paid" rate for full-time and part-time Welders is $16.99 per hour and $17.04 per hour for full-time Welders. As noted above, information in the Case Record indicates that in 2000, the worker earned approximately $700 gross per week ($17.50 per hour in a 40 hour week or $36,400 per annum). Thus, it is not clear at all that the worker, as of 2000, was suffering a wage loss because of his inability to pursue a career as a Welder.

[22] Even if I accept that the worker was performing some welding duties with the accident employer, that the compensable injury prevented him from pursuing a career as a Welder and that he has suffered a wage loss due to an inability to pursue a career as a Welder, I am satisfied that the Board was nevertheless correct in determining that the worker is not entitled to LOE benefits.

[23] In reaching this conclusion, I am satisfied that the decision to deny entitlement to LOE benefits is consistent with a reasonable interpretation of the applicable legislation and Board policy. It is also consistent with Tribunal case law as well as the real merits and justice of this particular case.

[24] I note that the accident date in this case is August 24, 1998. Accordingly, entitlement to benefits is governed under the *Workplace Safety and Insurance Act* (WSIA). As noted by Mr. Channan, the purpose of the WSIA is set out in section 1:

> Purpose
>
> 1. The purpose of this Act is to accomplish the following in a financially responsible and accountable manner:
>
> 1. To promote health and safety in workplaces and to prevent and reduce the occurrence of workplace injuries and occupational diseases.
>
> 2. To facilitate the return to work and recovery of workers who sustain personal injury arising out of and in the course of employment or who suffer from an occupational disease.
>
> 3. To facilitate the re-entry into the labour market of workers and spouses of deceased workers.
>
> 4. To provide compensation and other benefits to workers and to the survivors of deceased workers. 1997, c. 16, Sched. A, s. 1; 1999, c. 6, s. 67 (1); 2005, c. 5, s. 73 (1).

[25] Payment for loss of earnings is governed under section 43 of the WSIA:

43. (1) A worker who has a loss of earnings as a result of the injury is entitled to payments under this section beginning when the loss of earnings begins. The payments continue until the earliest of,

(a) the day on which the worker's loss of earnings ceases;

(b) the day on which the worker reaches 65 years of age, if the worker was less than 63 years of age on the date of the injury;

(c) two years after the date of the injury, if the worker was 63 years of age or older on the date of the injury;

(d) the day on which the worker is no longer impaired as a result of the injury. 1997, c. 16, Sched. A, s. 43 (1).

Amount

(2) Subject to subsections (3) and (4), the amount of the payments is 85 per cent of the difference between,

(a) the worker's net average earnings before the injury; and

(b) the net average earnings that he or she earns or is able to earn in suitable and available employment or business after the injury.

However, the minimum amount of the payments for full loss of earnings is the lesser of $15,312.51 or the worker's net average earnings before the injury. 1997, c. 16, Sched. A, s. 43 (2); 2000, c. 26, Sched. I, s. 1 (5); 2007, c. 7, Sched. 41, s. 2 (1).

Payments where co-operating

(3) The amount of the payment is 85 per cent of the difference between his or her net average earnings before the injury and any net average earnings the worker earns after the injury, if the worker is co-operating in health care measures and,

(a) his or her early and safe return to work; or

(b) all aspects of a labour market re-entry assessment or plan. 1997, c. 16, Sched. A, s. 43 (3); 2000, c. 26, Sched. I, s. 1 (6).

Earnings after injury

(4) The Board shall determine the worker's earnings after the injury to be the earnings that the worker is able to earn from the employment or business that is suitable for the worker under section 42 and is available and,

(a) if the worker is provided with a labour market re-entry plan, the earnings shall be determined as of the date the worker completes the plan; or

(b) if the Board decides that the worker does not require a labour market re-entry plan, the earnings shall be determined as of the date the Board makes the decision. 2007, c. 7, Sched. 41, s. 2 (2).

Calculation of amount

(5) The calculation of the amount of the payments is subject to the following rules:

1. The amount of the net average earnings before the injury must be adjusted by the alternate indexing factor for each January 1 since the date of the injury.

2. The amount described by clause (2) (b) must reflect any disability payments paid to the worker under the *Canada Pension Plan* or the *Quebec Pension Plan* in respect of the injury.

3. If the amount described by clause (2) (b) is not zero and does not consist solely of disability payments in respect of the injury paid to the worker under the *Canada Pension Plan* or the *Quebec Pension Plan*, the amount of the payment must be adjusted,

i. by multiplying, for each January 1 since the date of the injury, the amount of the payment by the sum of one plus the general indexing factor expressed as a fraction, and

ii. by dividing, for each January 1 since the date of the injury, the amount of the payment by the sum of one plus the alternate indexing factor expressed as a fraction. 1997, c. 16, Sched. A, s. 43 (5).

Annual adjustment

(6) Every year on January 1, the Board shall adjust the amount of the payments otherwise payable to a worker using,

(a) the alternate indexing factor, if the amount described by clause (2) (b) is zero or consists solely of disability payments in respect of the injury paid to the worker under the *Canada Pension Plan* or the *Quebec Pension Plan*; or

(b) the general indexing factor in any other case. 1997, c. 16, Sched. A, s. 43 (6).

[26] Mr. Channan also cited section 119 of the WSIA which states:

Principle of decisions

119. (1) The Board shall make its decision based upon the merits and justice of a case and it is not bound by legal precedent.

Same

(2) If, in connection with a claim for benefits under the insurance plan, it is not practicable to decide an issue because the evidence for or against it is approximately equal in weight, the issue shall be resolved in favour of the person claiming benefits.

[27] Pursuant to section 126 of the WSIA, the Board has identified a number of policies that apply to this case. *Operational Policy Manual* (OPM) Document #18-03-02, "Loss of Earnings (LOE) (Accidents from 1998) – Payment of LOE Benefits" states, in part:

LOE benefits are based on 85% of the worker's pre-injury net average earnings (NAE) subject to the legislated minimum and maximum amounts of compensation…

A full LOE benefit is 85% of the worker's pre-injury NAE. A partial LOE benefit is some portion of 85% of the worker's pre-injury NAE.

. . .

If a worker does not require an LMR plan, the post-injury earnings are deemed (i.e. the amount is determined in the absence of actual employment earnings).

. . .

For the purposes of LOE benefits, earnings may be determined when it is confirmed that a worker is not entitled to an LMR plan, or a worker completes an LMR plan.

To determine earnings, the WSIB identifies a suitable and available employment or business (SEB) for the worker using information gathered in an LMR assessment and the National Occupational Classification (NOC). The earnings for the identified SEB are determined using current wage and labour market information. The LOE benefit is based on 85% of the difference between the worker's pre-injury NAE and the determined post-injury NAE.

[28] OPM Document #12-04-13, "Special Cases (Worker Coverage) – Apprentices" states:

> An apprentice is a person registered under the *Trades Qualification and Apprenticeship Act* (specified construction trades) or the *Apprenticeship and Certification Act* (all other trades), who has signed a contract of apprenticeship for training and instruction in a trade, through or from an employer.

[29] Mr. Channan does not dispute that the worker was not an apprentice within the meaning of Board policy at the time of the compensable accident. However, Mr. Channan argued that the principle of compensating an apprentice with deemed earnings above actual earnings at the time of injury should also apply to the worker in this case.

[30] OPM Document #11-01-03, "Adjudication Principles – Merits and Justice", also cited by Mr. Channan, states, in part:

> **Merits and justice**
>
> Every decision made by the WSIB must be based on the merits and justice of the case, which means decision-makers must take into account
>
> - all facts and circumstances relating to the case
> - the relevant WSIB policy or policies, and
> - the relevant provision or provisions of the *Workplace Safety and Insurance Act* or the *Workers' Compensation Act* (the Act).
>
> By applying relevant legislative and policy provisions to similar situations, decision-makers ensure that
>
> - similar cases are adjudicated in a similar manner
> - each participant in the system is treated fairly, and
> - the decision-making process is consistent and reliable.
>
> **Scope of authority**
>
> The obligation to decide each case on the basis of merits and justice does **not** authorize a decision-maker to disregard the relevant provisions of the Act or WSIB policies. The Act and the policies must be taken into consideration, and cannot be ignored if they apply to a particular case.
>
> . . .
>
> If a decision-maker finds that the facts of the case are not covered by existing policy, the case must be decided on its particular facts, in accordance with the general provisions of the Act. The decision-maker cannot disregard the relevant provisions of the Act.

[31] The calculation of average earnings under the WSIA is based upon the worker's net average earnings before the injury and net average earnings that he or she earns or is able to earn in suitable and available employment or business after the injury. Under the WSIA, the Board is required to determine the worker's earnings after the injury to be the earnings that the worker is able to earn from the employment or business that is suitable for the worker. There is no requirement under the WSIA to consider anything other than the worker's net average earnings before the injury and net average earnings that he or she earns or is able to earn in suitable and available employment or business after the injury.

[32] Section 119 of the WSIA stipulates that the Board shall make its decision based upon the merits and justice of a case and it is not bound by legal precedent. The Board has created policy to consider the circumstances of special cases, namely apprentices. An apprentice is a person registered under the *Trades Qualification and Apprenticeship Act* (specified construction trades) or the *Apprenticeship and Certification Act* (all other trades), who has signed a contract of apprenticeship for training and instruction in a trade, through or from an employer. Apprentices have a clear and probable opportunity to earn more upon the completion of the apprenticeship than the amount earned during the apprenticeship. The same cannot be said of the worker in this case. Although he possessed a welding certificate, he was not a registered apprentice under the *Trades Qualification and Apprenticeship Act* (specified construction trades) or the *Apprenticeship and Certification Act* (all other trades) and did not have a signed contract of apprenticeship for training and instruction in a trade, through or from an employer.

[33] Numerous Tribunal decisions have discussed the concept of fairness in the calculation of a worker's average earnings and the worker's actual loss. In *Decision No. 1157/02*, the Vice-Chair noted:

> In interpreting section 53(3), in my view, "fairness" as contemplated by that provision is not simply fairness as perceived by the worker, but rather is reflected by the degree to which the worker's average earnings as determined by the Board are likely to have approximated his reasonably anticipated future earnings had an accident not occurred (i.e., his actual loss). Accordingly, average earnings calculated pursuant to section 43 of the Act will be "unfair" if they do not reflect reasonably anticipated future earnings *whether they are lower or higher* than such reasonably anticipated earnings.

[34] In determining a fair earnings basis upon which wage loss benefits are calculated, Tribunal decisions have considered anticipated future earnings and have generally determined that a worker is not entitled to compensation based upon potential earnings unless, at the time of the injury, the worker was a learner, apprentice or student. In these circumstances, Tribunal decisions have found that it was more likely than not that the worker's potential earnings would exceed his or her pre-accident escalated earnings.

[35] In other specific circumstances, Tribunal decisions have held that some consideration of anticipated earnings should be considered in calculating a worker's wage loss benefits. However, in those cases there is clear evidence that a salary increase was pending at the time of the compensable accident (See *Decisions Nos. 317/93* and *1594/01*). In theses cases, it was more likely than not that the worker's potential earnings would exceed his or her pre-accident escalated earnings.

[36] In the instant case, the worker obtained a certificate in welding prior to his compensable injury. This alone does not constitute sufficient evidence that the calculation of his earnings basis (and LOE benefits) should be based upon the earnings of a qualified Welder. At the time of his injury, he was not registered under the *Trades Qualification and Apprenticeship Act* or the *Apprenticeship and Certification Act* with a signed contact for training and instruction in a trade through an employer. He was not a student or learner. He was not working during a probationary period following which his remuneration would be increased and he was not promised a promotion.

[37] There are no exceptional circumstances in this case to warrant a departure from either the provisions of the WSIA or Board policy.

DISPOSITION

[38] The appeal is denied.

DATED: January 30, 2008

SIGNED: S. Ryan

COURT FILE NO.: 295/02
DATE: 20021025

SUPERIOR COURT OF JUSTICE - ONTARIO
(Divisional Court)

RE: RONALD DONALD PETERSEN

Applicant

- and -

MINISTER OF TRAINING, COLLEGES & UNIVERSITIES

Respondent

BEFORE: BLAIR, R.S.J, CARNWATH & McNEELY JJ.

COUNSEL: *Morris Cooper*, for the Applicant

Luba Kowal & *Daniel Guttman*, for the Respondent

HEARD: October 2, 2002

E N D O R S E M E N T

CARNWATH J.

[1] The application is dismissed with costs to the respondent fixed at $5,000, inclusive of GST.

[2] One of the purposes of the Industry Committee was to advise the Minister: *Apprenticeship and Certification Act, 1998* secs. 5(a).

[3] The Minister had the power to appoint the required number of committee members. [sec. 5(2)] By virtue of s. 28(1) of the *Interpretation Act*, the Minister had the discretionary power to revoke an appointment.

[4] In determining the standard of review for the exercise of the Minister's discretion a pragmatic and functional approach must be employed: *Baker* v. *Canada*, [1999] 2 S.C.R. 817, para. 53.

Applying the factors enumerated in *Pushpanathan* v. *Canada (Min. of Citizenship and Immigration)*, [1998] 1 S.C.R. 982, paragraph 27, we conclude the standard of review to be, at the least, reasonableness *simpliciter*, if not patently unreasonable.

[5] Members of the public have been exposed to widely disseminated information tending to show that the Hell's Angels Club is closely connected to organized crime and that many of its members have been convicted of serious criminal offences: Criminal Intelligence Services Canada, 2002 Annual Report; *Brown* v. *Durham Regional Police Force* (1996), 134 D.L.R. (4th) 177 (Gen. Div.), aff'd (1998), 167 D.L.R. (4th) 672 (C.A.).

[6] Counsel for the applicant submits that freedom of association under s. 2(d) of the *Charter* means the freedom from being found guilty by association. We do not accept this submission. "Guilt by association" is a notion relating to the criminal law principles of reasonable doubt and the presumption of innocence. It is not an aspect of the basic right to freedom of association that is guaranteed by the *Charter*, namely "the freedom to establish, belong to and maintain an association": *Professional Institute* v. *N.W.T.*, [1990] 2 S.C.R. 367 at 402.

[7] The Minister, in the exercise of her discretion to revoke did not act unreasonably when she removed from the Committee an admitted member of the Hell's Angels. She was not required to retain an advisor in whose judgment she no longer had confidence, given his membership in the Hell's Angels.

[8] There was no violation of Mr. Petersen's *Charter* rights of freedom of association. He is free to associate with the Hell's Angels. We reject the argument he is coerced to resign from the Hell's, in order to remain on the committee. This argument was rejected the Court of Appeal in *Nunziata* v. *Toronto (City) (Clerk)* (2000), 50 O.R. (3d) 295 (C.A.) para. [13].

[9] The applicant is not assisted by the decisions in *Re Dewar et al.* and *Re Hewat et al.* The Boards in question had different purposes and powers. They were quasi-judicial in nature whose members were appointed by Orders-in-Council, not by a Minister. The issue here is not whether Mr. Petersen was appointed at pleasure, but rather his appropriateness as an advisor to the Minister: See *Re Dewar et al.* v. *The Queen in Right of Ontario* (1996), 30 O.R. (3d) 334, aff'd on appeal to the Court of Appeal, 37 O.R. (3d) 170, *Re Hewat et al* v. *The Queen in Right of Ontario* (1998), 37 O.R. (3d) 161, on appeal from (1997), 32 O.R. (3d) 622.

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BLAIR R.S.J.

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CARNWATH J.

DATE: 20021025

McNEELY, J. (Dissenting):

[1] I would quash the decision of the Minister. I agree that her decision does not breach the applicant's charter right to freedom of association and that her discretion to revoke an appointment is wide. It is not, however, an absolute discretion and must be exercised having regard to the purpose for which it was granted.

[2] In the present case that purpose is to ensure that appointees are qualified to carry out the role of a member of the Motorcycle Marine Engine and Small Engine Technician Committee. This committee is one of 21 industry committees under the *Apprenticeship and Certification Act* 1998 and the evidence is that it meets about once a year.

[3] It is acknowledged by counsel for the Minister that Mr. Peterson is a person of good character and integrity, that he possesses exceptional qualifications to contribute to the work of the committee, and that he has in fact so contributed.

[4] The appointment of Mr. Peterson was pursuant to Section 11 of Ont. Reg. 573/99 under the *Apprenticeship and Certificate Act* 1998 which requires that appointments be for "terms of not less than three or more than five years". Mr. Peterson was appointed on February 23, 2000 for a three-year term ending February 23, 2003.

[5] Given the fixed term of the appointment, the admitted good character and qualifications of Mr. Peterson, the limited role of the committee and the fact that it only meets once a year, I find the Minister's action in dismissing Mr. Peterson in the middle of his term of office on the sole ground of his membership in Hells Angels to be an unreasonable exercise of her discretion.

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E.G. McNeely J.

Released: 20021025

Original article

Scand J Work Environ Health 2010;36(3):258–265

Fall prevention among apprentice carpenters

by Vicki Kaskutas, OTD,[1] Ann Marie Dale, PhD,[2] Hester Lipscomb, PhD,[3] John Gaal, EdD,[4] Mark Fuchs, BSc,[5] Bradley Evanoff, MD [2]

Kaskutas V, Dale AM, Lipscomb H, Gaal J, Fuchs M, Evanoff B. Fall prevention among apprentice carpenters. *Scand J Work Environ Health.* 2010;36(3):258–265.

Objective Falls from heights are a leading cause of mortality and morbidity in the construction industry, especially among inexperienced workers. We surveyed apprentice carpenters to identify individual and organizational factors associated with falls from heights.

Methods We developed a 72-item survey on fall prevention with multiple domains including fall experience, fall-prevention knowledge, risk perceptions, confidence in ability to prevent falls, training experience, and perceptions of the safety climate and crew safety behaviors. We administered the questionnaire to apprentice carpenters in this cross-sectional study.

Results Of the 1025 respondents, 51% knew someone who had fallen from a height at work and 16% had personally fallen in the past year, with ladders accounting for most of the falls. Despite participation in school-based and on-the-job training, fall-prevention knowledge was poor. Ladders were perceived as low risk and ladder training was rare. Apprentices reported high levels of unsafe, fall-related behaviors on their work crews. Apprentices in residential construction were more likely to fall than those in commercial construction, as were apprentices working on crews with fewer senior carpenters to provide mentorship, and those reporting more unsafe behaviors among fellow workers.

Conclusions Despite participation in a formal apprenticeship program, many apprentices work at heights without adequate preparation and subsequently experience falls. Apprenticeship programs can improve the timing and content of fall-prevention training. This study suggests that organizational changes in building practices, mentorship, and safety practices are also necessary to decrease worker falls from heights.

Key terms construction; construction safety; injury prevention; ladder; safety and health.

In 2007, the US construction industry experienced more fatalities than any other industry (1), with falls accounting for 37% of these fatalities (2). Falls accounted for an even larger proportion of the fatalities in residential construction, causing 42% of fatalities in new single-family home construction, and 55% in residential framing (2). Deaths due to falls in construction have risen in the past decade contrary to national trends of declining mortality from other occupational fatalities (3, 4).

In a three-year active surveillance project with over 5000 unionized residential carpenters, falls from height accounted for 20% of all the US Occupational Safety and Health Administration's (OSHA's) recordable injuries (4). These falls occurred most often from ladders, scaffolding, roofs, unsecured surfaces, and unprotected openings (5). Fall protection strategies mandated by OSHA construction standards (6) and alternative strategies described in the OSHA residential guidelines (7), (such as guardrails, toe boards, tying off to appropriate anchors, and guarding openings) would have prevented many of these falls; unfortunately, these practices were not the norm at these sites (5). Many of these non-fatal events (5) bear striking similarity to the fatal falls described in the fatality assessment and control evaluation program at the US National Institute of Occupational Safety and Health (8).

1 Program in Occupational Therapy, Washington University School of Medicine, St Louis, MO, United States.
2 Division of General Medical Sciences, Department of Internal Medicine, Washington University School of Medicine, St Louis, MO, United States.
3 Division of Occupational and Environmental Medicine, Duke University, Durham, NC, United States.
4 Carpenters' District Council, St Louis, MO, United States.
5 Carpenters' Joint Apprenticeship Program, St Louis, MO, United States.

Correspondence: V Kaskutas, Washington University School of Medicine, Program in Occupational Therapy, Campus Box 8505, 4444 Forest Park Avenue, Saint Louis, MO 63110, USA. [E-mail: kaskutasv@wustl.edu]

Construction worker safety when working on elevated surfaces depends upon a multitude of factors, including: (i) individual or intrinsic factors, such as physical agility, vigilance, knowledge, attitudes, and beliefs; (ii) organizational factors at the contractor level, such as equipment, safety climate, access, and management practices; and (iii) societal factors, such as federal inspections, safety standards, and economic conditions and resulting pressures. Individual skills necessary to succeed in construction are developed through school-based instruction and on-the-job mentorship. Organizational factors [such as the size of the firm (9) and observed safety environment or climate (5, 10)] influence worker safety and vary greatly among contracting companies. Societal factors drive the pace of the construction trade and strongly affect both the organization and the individual.

The goals of this study were to describe the distribution of individual and organizational factors related to fall prevention in a large cross-sectional study of apprentice carpenters and examine associations between these factors and reported falls from height. Our study focused on residential construction workers, a high-risk population that has not been widely studied. The results from this project will help researchers, union leaders, apprenticeship trainers, and residential contractors identify and design interventions to improve fall prevention in the residential construction industry at both the individual level, through apprenticeship training experiences, and at the organizational level, through worksite assessment, mentorship, supervision, and the modification of building practices.

Methods

Population

The study population for our survey comprised apprentice carpenters who were attending regularly scheduled training at the Carpenters' Joint Apprenticeship Program (CJAP) in St Louis, Missouri, USA during a six-month period between December 2005 and May 2006. We initially sampled all apprentices to reach a goal of covering 200 apprentices in each year of the four-year, union-based training program; then we oversampled second- and third-year apprentices to provide a comparison group for future intervention studies. The CJAP is supported by the Carpenters' District Council of Greater St Louis and Vicinity and the Home Builder's Association of Greater St Louis. At the time of the study, there were 2400 apprentice carpenters in the four-year apprenticeship program. Of these, 90% performed residential construction.

Questionnaire development and administration

We identified domains of interest relevant to fall prevention by reviewing US construction safety standards (6, 7, 11–13), fall statistics, and literature exploring fall causation, consultation with subject matter experts, and focus groups with apprentice carpenters at various stages of their training (14). We reviewed existing measurement tools in the process of constructing questionnaire items, including some that were specific to construction (4, 15–18) and others used in different occupational groups that explored relevant concepts (19). We administered a preliminary version of the questionnaire to the CJAP trainers and several apprentices, facilitating feedback in focus group format. Our final questionnaire had 72 items with 11 domains including: demographic data, employment data, fall history, task performance and equipment use history and training, risk perceptions, knowledge, confidence, work-crew behaviors, workplace safety climate, barriers to fall protection, and training effectiveness.

The employment data section identified the amount of time worked in residential construction in the last year, employer size, and the average number of journeymen (skilled craftsmen) and apprentices in a work crew. In exploring fall history, we defined a fall from height as "falling from one height to another, like falling from a ladder or down several steps, but not a fall to the floor on which you are standing". If apprentices reported a fall from a height in the past year, they identified: (i) the type of surface from which they fell, (ii) the distance fallen, (iii) medical treatment and work status after the fall, (iv) factors that contributed to the fall, and (v) what could be done to prevent others from experiencing this type of fall.

Apprentices reported if they received school-based and on-the-job training prior to performing 11 designated work tasks or using specific equipment. Eight multiple-choice questions assessed fall-prevention knowledge of OSHA construction standards. Apprentices rated the degree of fall risk for 12 common work tasks and rated confidence in their ability to use safety equipment (2 items) and prevent falls (2 items). The frequency of 5 crew behaviors while working at heights was rated on a 5-point scale. Also using a 5-point scale, 5 items measured the apprentices' perceptions of their workplace safety climate. These items represented various levels of organizational factors described by Bolman & Deal (20).

Instructors distributed the survey and informed consent forms to apprentices attending regularly scheduled school-based training at CJAP and explained the project and its voluntary nature. The apprentices placed all surveys, completed or not, in sealed envelopes and deposited them in a box in the classroom, from which a university researcher retrieved them. The Institutional Review Board at Washington University approved all procedures.

The questionnaire was distributed to 1037 apprentices in all stages of training, of which 1025 responded (98.9% response rate). Respondents comprised 43% of the 2400 apprentices in the Carpenters' District Council at the time. The mean age was 26 years [standard deviation (SD) 5.8, range 18–49]. The majority of apprentices were white males. Twenty-one percent (21%) of respondents were first-year apprentices, 30% second-year, 31% third-year, and 19% fourth-year apprentices. The majority of the apprentice respondents framed single-family homes for large-sized contractors.

Data management and analysis

We generated initial descriptive statistics for all variables including frequencies of categorical responses and distributions of continuous variables. Employer size was categorized into small (<25 carpenters), medium (26–75 carpenters), and large (>75 carpenters). We calculated the percentage of knowledge questions answered correctly for each participant. In order to calculate the scores for the safety climate, crew behavior, risk perception, and confidence domains, we added the score for each item within the domain (item scores ranged from 1–4 or 5), equally weighting each item, and divided by the number of items in the domain. For domains with missing items, we computed the mean score for that domain and imputed this mean value for the missing value(s) if at least 75% of the items were completed. Scale reliability was assessed using Cronbach's alpha to assess the internal consistency of items within the scales in our apprentice sample.

We expected that falls would be more common: (i) among apprentices with less carpentry experience, (ii) among residential compared to commercial carpenters, (iii) at sites where the ratio of apprentices to journeymen was high, (iii) and at sites with high rates of unsafe worker behavior when working at heights. Since our scales were internally consistent based on Cronbach's alpha (0.92 risk perception, 0.78 safety climate, 0.67 confidence, and 0.60 crew behavior), we used domain scores to combine individual variables for analysis. We explored the relationships between fall experience and the individual and organizational domains of the survey using standard parametric and non-parametric statistics. We computed crude odds ratios for each domain/variable and for the employer size categories for all falls from heights and ladder falls, and entered all variables/scales into multivariate logistic regression models using forward stepwise and backward selection methods. Variables with P-values ≤0.05 were considered to be statistically significant. We assessed the model fit using the Hosmer & Lemeshow goodness-of-fit test. Analyses were pre-specified and performed using SAS version 9.2 (SAS Institute, Cary, NC, USA).

Results

Over half of the apprentices reported knowing a colleague who experienced a serious work-related fall from a height. In the past year, 16% had personally fallen from a height. Of those who fell (N=164), 17 (10.4%) lost work time, 9 (5.6%) returned to restricted work, 26 (15.9%) received medical care, and 13 (7.9%) received prescription medication. The average distance fallen was 3 meters, with a range from 0.6–9 meters. The largest percentage (30%) of the falls occurred from ladders (figure 1). Loss of balance, slipping/tripping, and weather conditions were the most common contributing factors (figure 2). When asked what could be done to prevent someone else from experiencing the same type of fall, respondents mentioned two organizational factors (increased availability of proper working equipment and avoid working in bad weather) and one individual factor (working extra carefully). Other factors could be attributed to both the organizational and individual level, such as proper installation of equipment, slowing the work pace, and consistently using fall-protection methods.

We asked about common work tasks and equipment use related to falls or fall prevention. While most apprentices were trained prior to performing these tasks, their training was not aligned with the required work tasks (table 1). Use of step and extension ladders were the two most common work tasks reported (97% and 96%, respectively) yet the least common tasks in which apprentices were trained prior to performance on the job (53% and 56%, respectively). Only two thirds of apprentices reported that they were trained before performing other common tasks at a height, including roof sheathing and setting trusses, joists, and outside walls. Conversely, 87% of apprentices were trained to use personal fall arrest systems (a body harness and lanyard used to arrest

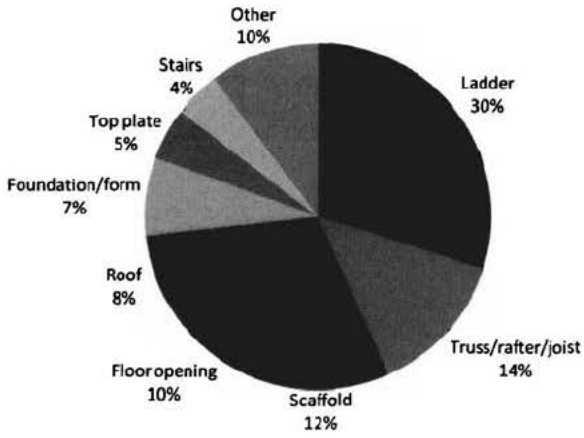

Figure 1. Surfaces apprentices fell from or through (N=164 apprentices who fell from a height).

a fall), although apprentices reported that these systems were commonly used at only 13% of worksites.

Respondents to the questionnaire had a mean knowledge score (percentage correct) of 56%, ranging from 72% for the height requirements for fall protection to 35% for the size of a hole in the floor that must be covered. Most apprentices believed the size of a floor opening that required covering was 12 inches (30 cm) or larger in diameter, rather than 2 inches (4.4 cm) as defined by OSHA. Approximately half of the apprentices knew that standing on the external top plate (top of the outside house wall) was never permitted, although 27% believed it was allowed to install roof trusses or floor joists or lay out rafters. Correct extension ladder setting methods were known by less than two thirds of apprentices surveyed.

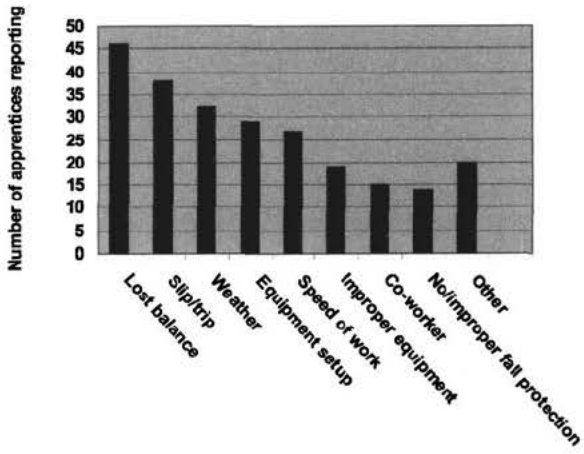

Figure 2. Factors reported to contribute to falls from height (N=164 apprentice falls).

Respondents rated step ladders as the work task or equipment which posed the least risk of causing a fall, while truss setting and working on the top plate were rated as having a high fall risk (table 2). Confidence ratings were high among apprentices surveyed, even among those who reported falling in the previous year; most believed they could use the personal fall arrest system correctly and prevent a fall from heights.

When asked about work-crew behaviors, apprentices reported that they always or often observed crew members performing unsafe acts, such as standing on the exterior top plate (40%), walking on floor joists (36%), and using unopened step-ladders leaned against a wall (39%). Forty eight percent (48%) of the apprentices reported that personal fall arrest systems were not used at the worksite; only 13% of those surveyed responded that they were used often or always. However, more siding installers and roofers reported using the personal fall arrest systems often or always (28% and 22%, respectively). Despite OSHA's residential guidelines' requirement for controlled access zones to be monitored by a designated worker or foreman, 21% of apprentices reported that unprotected floor openings were never monitored.

Regarding the workplace safety climate, most respondents agreed that (i) journeymen teach them how to do the job safely, (ii) safety is a priority with management/foremen, (iii) there is adequate time to work safely and meet production deadlines, and (iv) they feel free to report safety violations. However, 16% reported that they had been asked to "sign off" on safety training that they did not attend. Respondents reported a mean number of four members in each work crew, including two journeymen and two apprentices, resulting in a mean journeyman to apprentice ratio of 1 : 1.

Table 1. Apprentices who reported performing tasks on the job and percent who received training prior to performing task on the job.

Task	Performed task on the job (%)	Trained prior to task performance (%)
Use personal fall arrest	81.4	87.1
Use pump jack scaffold	66.2	76.4
Use ladder jack scaffold	78.9	68.0
Work near unprotected openings/edges	82.1	67.7
Set outside walls	86.5	67.6
Set trusses	85.0	65.8
Set joists	84.3	65.6
Sheath roof	78.8	61.8
Use extension ladder	96.1	56.5
Use step ladder	96.7	53.0

Table 2. Apprentices' perception of fall risk for different work tasks. Ratings on 1–10 Scale (1=no risk, 10=extreme risk). [SD = standard deviation; 1 inch = 2.54 cm]

	Mean	SD
Work on roof >9 inch 12 pitch	7.2	2.5
Set trusses	6.4	2.5
Work on top plate	6.3	2.7
Work at unprotected opening/edge	5.6	2.7
Work on roof between 5–9 inch 12 pitch	5.4	2.5
Frame roof structure	5.2	2.6
Work near unprotected stair opening	5.2	2.8
Use extension ladder	4.8	2.4
Use scaffolding	4.3	2.4
Work near unprotected window	3.9	2.7
Work on roof <4 inch 12 pitch	3.2	2.3
Use step ladder	3.2	2.2

Factors associated with crew behaviors and falls

Safer work climate ratings demonstrated a moderate correlation (0.43) with safer crew behavior ratings (table 3). Variables which demonstrated weak correlations with safer crew behaviors included: (i) receiving training in a greater number of tasks, (ii) higher confidence ratings, and (iii) working for a large-sized employer (versus a small- or medium-sized one). Weak, negative correlations were noted between higher percentage of apprentices at the worksite, higher risk perception ratings, and a greater amount of residential work (versus commercial). Knowledge and age were not correlated with crew behaviors.

Crude odds ratios for all falls from a height and ladders are described in table 4. Apprentices working in residential construction experienced more falls than those in commercial construction (17.7% versus 9.3%), and apprentices with <1 year in the carpentry trade experienced more falls than those with >5 years experience (18% versus 6.8%). Apprentices working on crews with safer work behaviors and climates were less likely to experience falls, as were those on crews with fewer apprentices. Knowledge was not associated with falls from heights. There was no difference in the number of falls at contractors of different size.

Among apprentices working in residential construction, the strongest independent risk factor predicting falls was having <1 year of work experience (table 5). Apprentices who performed a wider variety of work tasks were 52% more likely to experience ladder falls. For every 10% increase in the percentage of apprentices at the worksite, there was a 27% increase in ladder falls. Safer crew behaviors were protective, with a 1-point improvement in crew behavior resulting in a 10% decreased likelihood of all falls from a height and ladder falls.

Table 3. Scale and item correlations to safer crew behavior score. (OSHA = Occupational Safety and Health Administration)

Variable/scale[a]	Correlation coefficient	Median crew behavior score[b]	P-value
Safer work climate score	0.43	·	<0.0001
Percent of task trained prior to performance	0.22	·	<0.0001
Higher confidence levels	0.23	·	<0.0001
Percent apprentices on crew	-0.10	·	0.003
Higher risk perception score	-0.11	·	0.0002
Greater residential work in past year	-0.12	·	0.004
Higher OSHA knowledge score	0.05	·	0.146
Age in years	0.001	·	0.976
Employer size[c]			
Small (<25 carpenters)	·	2.3	<0.0001
Medium (26–75 carpenters)	·	2.3	
Large (>75 carpenters)	·	2.7	

[a] Spearman's rho.
[b] Higher scores denote safer behaviors on a 1–5 scale.
[c] Wilcoxon non-parametric test.

Discussion

We surveyed 1025 apprentice carpenters to measure their fall-prevention knowledge, beliefs, fall experiences and views on crew behaviors, safety climate, and other factors associated with falls from a height. Despite participation in a formal apprenticeship program that

Table 4. Associations between falls from heights for all apprentices surveyed (logistic regression). Only variables/scales significant at P≤0.05 are reported. (OR = odds ratio, 95% CI = 95% confidence interval)

Variables	All falls (N=938)		Ladder falls[a] (N=871)	
	Crude OR	95% CI	Crude OR	95% CI
Length worked in trade versus >5 years				
<1 year	3.11	1.42–6.80	2.26	0.69–7.39
2–5 years	2.80	1.39–5.66	1.79	0.63–5.14
Percent apprentice, per 10% increase	1.12	1.02–1.23	1.25	1.08–1.45
Number of tasks performed	1.08	1.00–1.16	1.25	1.06–1.48
Safer crew behaviors score	0.92	0.88–0.97	0.90	0.83–0.98
Safer work climate score	0.92	0.86–0.97	0.90	1.06–1.48
Worked residential construction past year	2.10	1.27–3.48	3.13	1.13–8.83

[a] Excludes those who fell from a surface other than a ladder.

Table 5. Predictors of all falls from height for residential apprentices surveyed. All variables/scales were entered into the multiple logistic regression models, only significant variables/scales are reported. (OR= odds ratio, 95% CI = 95% confidence interval, NS not statistically significant at P≤0.05)

Variables	All falls (N=815)		Ladder falls[a] (N=722)	
	Adjusted OR	95% CI	Adjusted OR	95% CI
Length worked in trade versus >5 years				
<1 year	3.50	1.54–7.95	4.75	1.33–16.95
2–5 years	2.43	1.18–4.50	1.85	0.63–5.42
Percent apprentice, per 10% increase	1.13	1.02–1.24	1.27	1.08–1.49
Number of tasks performed	NS	·	1.52	1.16–1.98
Safer crew behaviors score	0.91	0.86–0.96	0.91	0.83–0.99

[a] Excludes those who fell from a surface other than a ladder.

included both school-based and on-the-job training, apprentices performed tasks on the job prior to training, and many lacked essential fall-prevention knowledge, suggesting that the timing and content of carpenter apprenticeship training could be improved.

Ladders accounted for most of the falls in our sample, which is similar to findings of previously published studies (21–23). Worker training prior to ladder use on the job was rare. Apprentices reported unsafe ladder climbing behaviors by other crew members, which was confirmed by worksite observations at sites employing these apprentices where extension ladders were secured only 22% of the time and step ladders were used inappropriately at 49% of the sites audited (24). Our finding of the apprentices' perceived low risk of falling from ladders is an example of inexperienced workers mistakenly perceiving that routinely used equipment does not require special knowledge or skills (25). The low rates of ladder training suggest that contractors and apprenticeship trainers may also underestimate these risks.

Our results confirm that carpenters working in residential construction and apprentices with <1 year of experience are at greater risk of falling from heights. Apprentices on work crews characterized by a high number of apprentices are also more likely to fall from heights, suggesting that adequate on the job mentorship is essential. Apprentices working on crews that practice safe behaviors when working at heights are less likely to fall than those working with unsafe crew members, stressing the role of safe peer behavior in fall prevention.

This study had a number of strengths and limitations. We used surveillance data, fall prevention safety standards, previous instruments, and subject matter expert feedback to improve the content and construct the validity of our survey, while the scales demonstrated reasonable reliability. We surveyed 43% of the total apprentice population in our region and had very high response rates, suggesting that the internal and external validity of this work were good. The majority of our sample worked in residential construction, which gave us the opportunity to identify the fall-prevention needs of this high-risk, but infrequently studied, worker population. Although we used self-report to measure crew behaviors, results from this survey closely parallelled behaviors which we observed during the same time interval when auditing residential worksites (24). This study was not able to examine the conditions at the worksite at the time of the fall; however, Lipscomb and colleagues (5) found that fall protection strategies were not in place when they visited worksites soon after falls from heights. Although our population of small contractors was too small to detect a difference in falls by contractor size, we did see a trend towards a greater number of falls in smaller-sized contractors, as suggested by Kines (9), and safer crew behaviors in larger-sized contractors. Since this study surveyed only union carpenters, most of whom were young, white males, our findings may not be generalized to the non-union environment or older and more experienced carpenters, women, or minorities. Because of the cross-sectional design of our study, the survey occurred after the apprentices had fallen, and their responses on the survey may have changed as a result of the fall.

Our findings add to the growing literature on the unacceptably high rate of falls in residential construction. Since falls account for most of the construction worker deaths in residential framing and the highest costs per injury claim (21), interventions to address the personal and organizational factors associated with falls from heights are needed. Our research points to several factors that could improve worker safety at home-building sites. Use of the construction methods outlined in the OSHA residential guidelines (7) can decrease worker falls from heights; however, these methods are practiced inconsistently at best. Increasing contractor and carpenter awareness and understanding of the methods described in these guidelines, and increasing the use of available technologies at residential worksites is recommended. Personal fall arrest systems prevent worker falls to lower surfaces, yet they are not widely used during residential framing (24).

Our research echoes findings from other industries that organizational factors and the workplace safety climate influence worker behavior (26, 27). Previous work by our team (5) and Lipscomb et al (14) suggested that inexperienced carpenters do not receive the type or amount of mentorship they would like from journeymen on their work crews. Limiting the number of apprentices working at residential construction sites will increase the opportunities for mentorship; however many contractors have increased the number of apprentices on their residential crews in order to remain competitive in the current home building market. In addition, journeymen may underestimate their role in providing supervision and training to inexperienced workers.

It is apparent that there are many opportunities to improve the fall safety of residential carpenters, especially inexperienced workers. Carpenters can assume a more active role in ensuring fall prevention. Apprenticeship training programs can improve the timing and content of fall-prevention training. Contractors can ensure that their work crews are optimally staffed and there is adequate time, training, supervision, and resources to maintain the safety of the workers during all phases of the construction process. Researchers can partner with contractors to improve the safety culture, provide optimal supervision and mentorship, and infuse safe construction methods and technologies into the residential construction process. Policy-makers can increase the levels of enforcement of standards designed to protect workers from falls.

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Changes in fall prevention training for apprentice carpenters based on a comprehensive needs assessment ☆

Vicki Kaskutas [a,*], Ann Marie Dale [b], Hester Lipscomb [c], John Gaal [d], Mark Fuchs [e], Bradley Evanoff [b] and the Carpenters' Joint Apprenticeship Program Instructor Team [e]

[a] Program in Occupational Therapy, Washington University School of Medicine, 4444 Forest Park Avenue, Campus Box 8505, St. Louis, MO, USA, 63108
[b] Division of General Medical Sciences, Department of Internal Medicine, Washington University School of Medicine, 660 Euclid Avenue, Campus Box 8005, St. Louis, MO, USA, 63110
[c] Division of Occupational and Environmental Medicine, Duke University Medical Center, Box 3834, Durham, N.C., USA, 27710
[d] Carpenters' District Council of Greater St. Louis and Vicinity, 1401 Hampton Avenue, St. Louis, MO, USA, 63139
[e] St. Louis Carpenters' Joint Apprenticeship Program, Nelson-Mulligan Carpenters' Training Center, 8300 Valcour, St. Louis, MO, USA, 63123

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ABSTRACT

Problem: Falls from heights in residential construction are common, especially among inexperienced workers. *Methods:* We conducted a comprehensive needs assessment to determine gaps in the school-based apprentice carpenters' fall prevention training. A team of carpenter instructors and researchers revised the fall prevention training to fill these gaps. Apprentice evaluation and feedback guided ongoing curricular improvements. *Results:* Most apprentice carpenters performed work tasks at heights prior to training and fall protection techniques were not commonly used at residential construction sites. Priorities of the revised school-based training included safe ladder habits, truss setting, scaffold use, guarding floor openings, and using personal fall arrest systems. New apprentices were targeted to ensure training prior to exposure at the workplace. We used adult learning principles to emphasize hands-on experiences. A framed portion of a residential construction site was fabricated to practice fall protection behaviors in a realistic setting. The revised curriculum has been delivered consistently and apprentice feedback has been very favorable. *Conclusions:* Integration of needs assessment results was invaluable in revising the school-based carpenters apprentice fall prevention curriculum. Working closely with the instructors to tailor learning experiences has provided preliminary positive results. *Impact on Industry:* The fall safety of the residential construction industry continues to lag behind commercial construction and industrial settings. The National Occupational Research Agenda includes a Strategic Goal to strengthen and extend the reach of quality training and education in the construction industry via mechanisms such as construction safety and health training needs assessments. This study demonstrates how a structured process can be used to identify and remedy gaps and improve training effectiveness. We encourage others to take steps to assess and increase the impact of training efforts directed at all residential construction professionals; including both union and non-union workers. The implications are even greater in the non-union sector where most U.S. residential work is done.

1. Introduction and background

Construction is one of the nation's largest industries, employing about 8 million workers in 2007 (U.S. Bureau of Labor Statistics [BLS], 2010). Approximately 56% of construction work is performed in residential settings; including 13% residential building, 8% residential finishing, and 31% specialty trades (BLS, 2010). In 2007, falls from heights accounted for 43% of the fatalities in residential building, which is higher than in the overall construction sector (BLS, 2007). Residential construction workers are frequently exposed to working conditions that place them at risk of falling from heights, which can be especially hazardous to inexperienced workers.

Residential construction workers face unique hazards and safety considerations. The primary consideration in home construction planning is the aesthetic goal of the homeowner, not the safety of the construction workers. Steeply pitched roofs challenge workers sheathing and shingling the roof, and large vaulted ceilings limit workers' ability to use stepladders to reach work surfaces. Work crews are generally dispersed and small, therefore, workers perform a wide

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* Corresponding author. Washington University School of Medicine, Program in Occupational Therapy, Campus Box 8505, 4444 Forest Park Avenue, Saint Louis, MO 63110. Tel.: +1 314 286 1672; fax: +1 314 286 1601.
E-mail addresses: kaskutasv@wustl.edu (V. Kaskutas), adale@dom.wustl.edu (A.M. Dale), lipsc005@mc.duke.edu (H. Lipscomb), jgaal@carpdc.org (J. Gaal), mfuchs@cjtf.org (M. Fuchs), bevanoff@dom.wustl.edu (B. Evanoff).

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variety of tasks. The work environment and associated safety hazards change quickly, making it difficult to use environmental controls at home construction sites. Personal fall arrest systems can protect workers during some phases of the construction process, however, securing anchorage sites while setting roof trusses poses unique challenges. Residential construction in the United States has suffered in the recent economic downturn, creating increased anxiety about profit margins in an already fast-paced sector of the industry. These factors can foster practices and timelines that favor work speed over worker safety.

Residential construction workers must be skilled and vigilant in order to safely perform work tasks at heights. Apprenticeship programs are expected to help inexperienced workers develop the skills necessary to work in this hazardous environment. These programs require both formal classroom instruction and on-the-job training under the mentorship of journeymen during the three- to four-year training program (U.S. Department of Labor, 2009). Apprenticeship programs must conform to specific standards in order to obtain and maintain accreditation, although methods of delivery and proficiency testing vary among apprenticeship programs. The National Guidelines for Apprenticeship Standards describe the standard carpentry skills training and on-the-job experience (5,200–8,000 hours) required to develop skilled and productive workers for the unionized carpentry trade (United Brotherhood of Carpenters and Joiners of America, 2005).

Since the required formal educational attainment of construction workers is lower than required for employees in other industries (The Center to Protect Workers' Rights [CPWR], 2003), it is especially important for apprenticeship programs to design their training to meet the specific learning needs of their population. As a unique group of learners, construction workers do not enjoy "book learning." Albers and colleagues (1997) found that apprentice carpenters consistently preferred participatory teaching methods over traditional classroom instruction, with only 43% reporting lectures as useful. Adult learners want timely, well-organized training by experts that builds on their skills, is practical, and can easily be applied to their situation (Fogarty & Pete, 2004). This paper describes the process implemented to redesign the fall prevention training of apprentice carpenters in order to better prepare them to safely work at heights at residential construction sites. This process began with a needs assessment to identify the limitations of the existing training. This multilevel needs assessment included data on apprentice carpenters' knowledge and beliefs, as well as observation of safety behaviors at home-building sites. Based upon data from the needs assessment, we prioritized training needs and designed learning experiences to address existing gaps in the training experiences of apprentice carpenters. The revised training model is being tested through a variety of process and outcome measures.

2. Materials and methods

2.1. Setting and research team

Our project was a joint venture between the St. Louis Carpenters' Joint Apprenticeship Program (CJAP) and occupational health researchers at Washington University in St. Louis and Duke University. The CJAP is supported by the Carpenters' District Council of Greater St. Louis (CDC) and homebuilding contractors who employ union carpenter members. The team included university researchers, leaders of the carpenters' union, construction contractors, and the faculty of the apprenticeship training program.

Apprentice carpenters attend an initial one-week training session at CJAP prior to beginning work for a construction company. They return for additional two-week training courses at CJAP every six months throughout their four-year apprenticeship program, for a total of nine courses. CJAP instructors are journeymen carpenters with construction experience and an interest in teaching carpentry skills and safety; instructors have or are pursuing a bachelor's degree in workforce training, education, or a related area. The CJAP Board, made up of leadership from the CDC and representatives of construction contractors, meets regularly to approve the training curriculum and monitor the apprenticeship program.

2.2. Needs assessment

The overall goal of the needs assessment was to assess the current state of fall prevention training received by apprentice carpenters through school-based training and on-the-job experiences, measure apprentices' knowledge, attitudes, beliefs, and behaviors, and to use this information to identify gaps in fall prevention training. We employed a variety of data collection methods, allowing input from apprentice carpenters through focus groups, surveys, and direct observation of their work on residential jobsites, as well as from the apprenticeship instructors. Each element is described below.

2.2.1. Focus groups

We conducted focus groups with apprentices (n = 36) representing all levels of training in order to understand factors influencing the effectiveness of their fall prevention training. Topics explored included common fall hazards encountered, usual worksite practices, timing and adequacy of school-based training and on-the-job mentoring, barriers to using fall prevention practices at residential sites, and recommendations to improve training. We have previously described the focus group methodology and results (Lipscomb, Dale, Kaskutas, Sherman-Voellinger, & Evanoff, 2008).

2.2.2. Apprentice surveys

A 72-item survey was completed by a large (n = 1,025) and representative sample of apprentices during regularly scheduled training at CJAP. This survey measured fall prevention knowledge, risk perception ratings, training prior to task performance, preferred teaching methods, confidence in fall prevention abilities, reported crew behaviors, and workplace safety climate, as well as demographic construction-specific data and history of recent falls from height.

2.2.3. Worksite audit

An observational audit, entitled the St. Louis Audit of Fall Risks (SAFR; Kaskutas et al., 2009), was performed by trained journeymen carpenters on the research team at residential worksites (n = 197) to measure the fall prevention behaviors of residential work crews. This audit of 52 dichotomously scored items covered nine domains: general safety climate and housekeeping, floor joist and sub-floor installation, walking surfaces and edges, wall openings, truss setting, roof sheathing, ladders, scaffolds, and personal fall arrest equipment. A brief interview of each carpenter logged carpentry experience, frequency of on-the-job safety and fall prevention training, familiarity with the contractor's fall prevention plan, and availability of personal fall arrest equipment at the worksite. The audit, interview, and manual describing administration procedures are available at the Electronic Library of Construction Safety and Health website (Kaskutas, Evanoff, Dale, & Lipscomb, 2008), developed by the Center for Construction Research and Training. Details of the audit development process and pilot results have been previously described (Kaskutas, Dale, Lipscomb, & Evanoff, 2008), as well as the audit results at 197 residential worksites (Kaskutas et al., 2009).

2.2.4. Documentation of existing curriculum

Instructors for all of the apprenticeship training courses logged existing fall prevention training delivered in their courses, including a description of the content, training method, and time allotted.

2.3. Identifying gaps in the curriculum

A core group of CJAP instructors worked closely with the research team to analyze results from the focus groups, surveys, and worksite audits and compare to the existing fall prevention training. We constructed a matrix to compare the frequency of fall experience and training, and the scores on the knowledge, risk perceptions, confidence, and behaviors scales across the various phases of the home construction process (floor joist and sub-floor installation, walking surfaces and edges, wall openings, truss setting, roof sheathing, ladders, scaffolds, and personal fall arrest equipment). The team identified the phases of construction and specific items with the poorest performing areas as targets for the revised curriculum.

2.4. Designing the new curriculum

The instructor team designed curricular changes to address each of the gaps identified; these became the training priorities of the new curriculum. Specific objectives for each priority described the level of cognition expected on Bloom's taxonomy (knowledge, comprehension, application, analysis, synthesis, or evaluation), which was driven by the nature of the gap that had been identified. The team chose educational methods and teaching techniques that matched the preferences identified by the apprentices and were supported by adult learning theory. We identified equipment and supplies needed to support the educational methods and training priorities. In order to ensure consistency of curriculum delivery, detailed lesson plans were written to describe training sequence, equipment, tools, and methods. Feedback from all instructors at the program was solicited for some of the training modules. Portions of the training were piloted and adjustments made in order to best meet the gaps identified and deliver the necessary training in a feasible manner within the limits of the curricular schedule.

2.5. Curriculum delivery and monitoring

After instructor training was complete, the new fall prevention training was initiated on April 15, 2007. Instructors followed the lesson plans and modified them appropriately to best meet the students' needs. We logged the number of revised training sessions delivered and the number of apprentices participating in the revised courses. Curriculum delivery was closely monitored to ensure consistency and quality. In order to evaluate the feasibility and student response to the revised curriculum, process evaluation was performed at three levels: (a) achievement of the learning objectives for each class was logged and monitored, (b) process evaluations were completed by 80-150 apprentices in each of the courses that involved revised training in order to obtain immediate feedback about the effectiveness of training, and (c) focus groups were held with apprentices participating in at least one course to discuss training effectiveness and methods to improve training. After reviewing this feedback, the instructor team adjusted the training when it was apparent that it would improve student performance in the target areas. The team continued to monitor the process evaluation results and adjust the training based on feedback in an iterative process, logging all changes to monitor response to the revisions.

3. Results

3.1. Needs assessment

3.1.1. Existing training

Apprentices participating in focus groups reported that they worked on elevated surfaces early in their careers and usually prior to training, noting that journeymen at the worksite often assumed that they know how to do tasks that they do not know how to do. Furthermore, less than one third (<33%) of the apprentices reported that they received school-based training in home-building tasks that involve working at heights, such as: roof sheathing, working near unprotected openings, working on ladders, and setting floor joists, trusses, and outside walls. Apprentices reported that the school-based training they received was safety-focused, but that the methods taught in school did not correspond to methods actually employed on their worksites.

Consistent with these reports, the review of the existing curriculum found that the primary fall prevention teaching performed with brand new apprentices was to show a 20-minute fall prevention videotape. Apprentices were not required to demonstrate competency in fall prevention behaviors or knowledge. After this brief orientation to fall prevention, apprentices work at construction sites for 5-6 months before returning for additional school-based training. Fall prevention training was addressed in five of the other eight courses over the 4-year apprenticeship including an orientation to personal fall arrest systems and scaffold erection. The focus of the fall prevention training was mainly on commercial applications, with residential methods covered only briefly. Apprentices participating in focus groups suggested more training early in the apprenticeship so that inexperienced workers could function more competently. Interestingly, they felt that this could decrease some of the dissatisfaction that led to program dropouts.

Training typically occurred in the classroom setting, except for ladder jack and pump jack scaffolding training, which was performed in the shop with the actual equipment. The primary teaching method used was for the instructor to read the federal safety regulation out loud from the OSHA 1926 book while the apprentices highlighted the sentences the instructor read, a common method for OSHA training. However, our surveys showed that this was the least preferred teaching method; apprentices strongly preferred hands-on practice through real-world experiences and disliked classroom activities and lectures. This was confirmed by apprentices in focus groups, who clearly articulated their preferences for demonstration through hands-on training and reality-based training, which prepared them for what really happens in the field (Lipscomb et al., 2008).

3.1.2. Apprentice fall experience

Of the 1,025 apprentices surveyed, 16% reported falling from a height at work in the past year and 51% knew someone who had fallen at work. The majority of these falls occurred from ladders (30%), trusses/top plate/joists (18%), floor openings (17%), and scaffolds (12%). The average distance fallen was 3 meters, with a range from 0.6 to 9 meters. Loss of balance, slip/trip, and weather conditions were the most common contributing factors. Fortunately most of these falls did not result in serious injury, lost or restricted time, medical care, or prescription medication. Many apprentices participating in our focus groups noted dangerous work is frequently assigned to new apprentices as a "rite of passage" to "break" them.

3.1.3. Knowledge and attitudes

The average knowledge score on the eight questions on the survey about fall prevention standards was 58%, supporting the focus group findings that apprentices do not know how to safely perform many work tasks. The knowledge score ranged from 35% for the correct size of a hole that must be covered, to 80% for the height that fall prevention is required. Most apprentices believed the size of a floor opening that required covering was 12" (30 cm) or larger in diameter, rather than correct diameter of 2" (4.4 cm). Ladders were perceived as the lowest risk task on the survey (mean of 3.2 on a 1-10 scale); steep roofs were perceived as posing the most risk (7.2 on a 1-10 scale). Apprentices in focus groups reported they must "get over their fear"

so they can perform these risky tasks since they cannot tell journeymen that they are unwilling to do something they feel is unsafe.

3.1.4. Self-reported and observed fall prevention behaviors

Apprentices rated how often their crew used fall protection methods on the job, and our auditors visited worksites to measure fall prevention compliance on-the-job. Apprentices' surveyed reported many unsafe crew behaviors such as: always or often walking floor joists (36%), using an unopened stepladder leaned against a wall (39%), and standing on the top of exterior walls (40%). Working on the top of walls was also described as a common practice by apprentices participating in focus groups. Despite OSHA's residential guidelines' requirement for controlled access zones to be monitored by a designated worker or foreman, 21% of apprentices reported that unprotected floor openings were never monitored. Personal Fall Arrest Systems (PFAS) were reported as not used at the worksite by 48% of the apprentices and used often or always by only 13% of all apprentices surveyed. This was confirmed by the worksite audits, with PFAS in use at only 5% of the worksites visited.

We identified a high prevalence of fall hazards at the 197 residential sites audited; the overall mean safe behavior observation rate was 60% (Kaskutas et al., 2009). Truss setting met the safety criteria least consistently (28%), followed by work at unprotected floor openings and edges (43%), and floor joist and subfloor installation (48%). Marking and monitoring of unguarded floor openings was rare (18% and 2%, respectively). The first two trusses were never set from ladders or hanging scaffolding at any of the homes audited, and layout work in preparation for trusses was performed safely only 17% of the time. The brief interviews demonstrated that apprentice carpenters were less familiar with their employers' fall prevention plan than experienced workers (79% apprentices vs. 90% journeymen). Despite the widespread use of unsafe work practices reported above, 90% of apprentices surveyed agreed that safety is a priority with management.

3.2. Gaps identified in the existing curriculum

Upon review of the existing curriculum, it was apparent that inexperienced apprentices were not adequately prepared in fall protection by the existing apprenticeship training program and that there was a need for a unified approach to fall prevention training. In order to identify the specific gaps of the existing curriculum, the core group of CJAP instructors and the research team compared the knowledge, risk perception, beliefs, and behavior results from the focus groups, surveys, and worksite audits for the phases of home construction. This team targeted phases of the construction process with consistently poor scores, as well as deficit areas identified in the needs assessment. Specific gaps identified in the existing curriculum are described in Fig. 1. For example, stepladders accounted for most of the apprentices' falls and were used by nearly all apprentices surveyed; however, stepladders were rated as the least risky task performed, training was rare, and unsafe ladder behaviors were commonly reported and observed by auditors. Similarly, apprentices lacked knowledge about walking surfaces and edges, unprotected floor openings were rarely marked and monitored, and guardrails were often not in place; therefore a gap in training for walking surfaces and edges existed. Despite accounting for the second highest number of falls and being rated as the riskiest work task, truss setting was rarely performed safely at worksites (27% of the time), apprentices lacked truss setting knowledge, and training was low in this area. Several findings intrigued the team, including the high apprentice safety climate ratings despite a high prevalence of unsafe fall prevention and the high degree of apprentice confidence in their ability to prevent a fall. Although these areas were not identified as gaps in the curriculum, they were interpreted as opportunities for intervention.

3.3. New curriculum

3.3.1. New training content

Fig. 1 also describes the training priorities and training methods. A total of 39 objectives were integrated into four of the nine apprenticeship training courses, for a total of 17 hours of fall prevention training. Most of the training was designed for the inexperienced apprentices, with 2 hours performed with brand new apprentices, 5.5 hours with apprentices with 6 months of experience, 1 hour with apprentices with 1 year in the union, and 6.5 hours with apprentices in their final year of training. This represents a significant increase in time devoted to fall prevention; for example new apprentices receive six times more training in the revised curriculum as compared to the baseline curriculum. Detailed lesson plans describe the learning activities and teaching methods for each of the targeted topic areas. We set four objectives and devoted 35 minutes in the pre-apprentice course in order to raise awareness about falls from heights, increase their feelings of susceptibility, and help apprentices understand that tasks that do not appear risky account for most of the falls.

Ladder training was one of the priorities of the revised curriculum. Despite widespread use of ladders and the well-documented associated risk in this population, apprentices did not appreciate the fall hazards posed by ladders. Unsafe ladder setting and climbing behaviors were common. A total of eight objectives (110 minutes total) were integrated into three of the courses to address ladder risks, ladder setting, and ladder climbing behaviors. When ladders were being taught in a new context, such as in reference to scaffolds, ladder setting and climbing was reviewed in the new context. The level of cognition expected of each ladder objective matched the gap identified, hence a change in belief was the goal when attempting to increase risk perception of ladders, knowledge change was the goal of knowing when and how to stabilize the top of an extension ladder, and behavior was the outcome expected of ladder climbing objectives.

Since both knowledge and behaviors were lacking in the area of unprotected walking surfaces and edges, the objectives focused on these levels of cognition. The definition, requirements, and proper use of controlled access zones was explained and demonstrated to the apprentices, as were guardrail construction and installation, and methods to cover holes. Six objectives (45 minutes) in three of the courses were integrated into the revised curriculum.

Truss setting was also identified as a priority area, and eight objectives were set to increase apprentice awareness of the OSHA standards regarding truss setting and demonstrate safe alternatives to walking the exterior walls to perform truss setting. The majority of time spent on truss setting (4.5 hours) is in a truss and rigging specific course with upper term apprentices, however 40 minutes is spent early in the curriculum on this topic. It was not feasible to have apprentices set the trusses on the tops of the house walls due to inadequate roof height in the training facility; therefore we settled on a lower level of cognition according to Bloom's taxonomy and used alternative methods described below. Scaffolds, personal fall arrest systems, and roof sheathing were the other priority areas of training.

3.3.2. New training methods

Adult learning principles were integrated into the training, including hands-on practice, problem-solving activities, increasing feelings of susceptibility through story-telling, and role-playing to empower apprentices to confront experienced carpenters about unsafe work methods. For example, in order to change risk perceptions associated with ladder climbing, apprentices arranged pictures of various work tasks from lowest to highest risk of falling. This task forced apprentices to discuss their risk perceptions in a small group and troubleshoot methods to decrease the risks. When knowledge was the expected outcome, classroom lecture may be an appropriate method of information transfer; however, when behavior

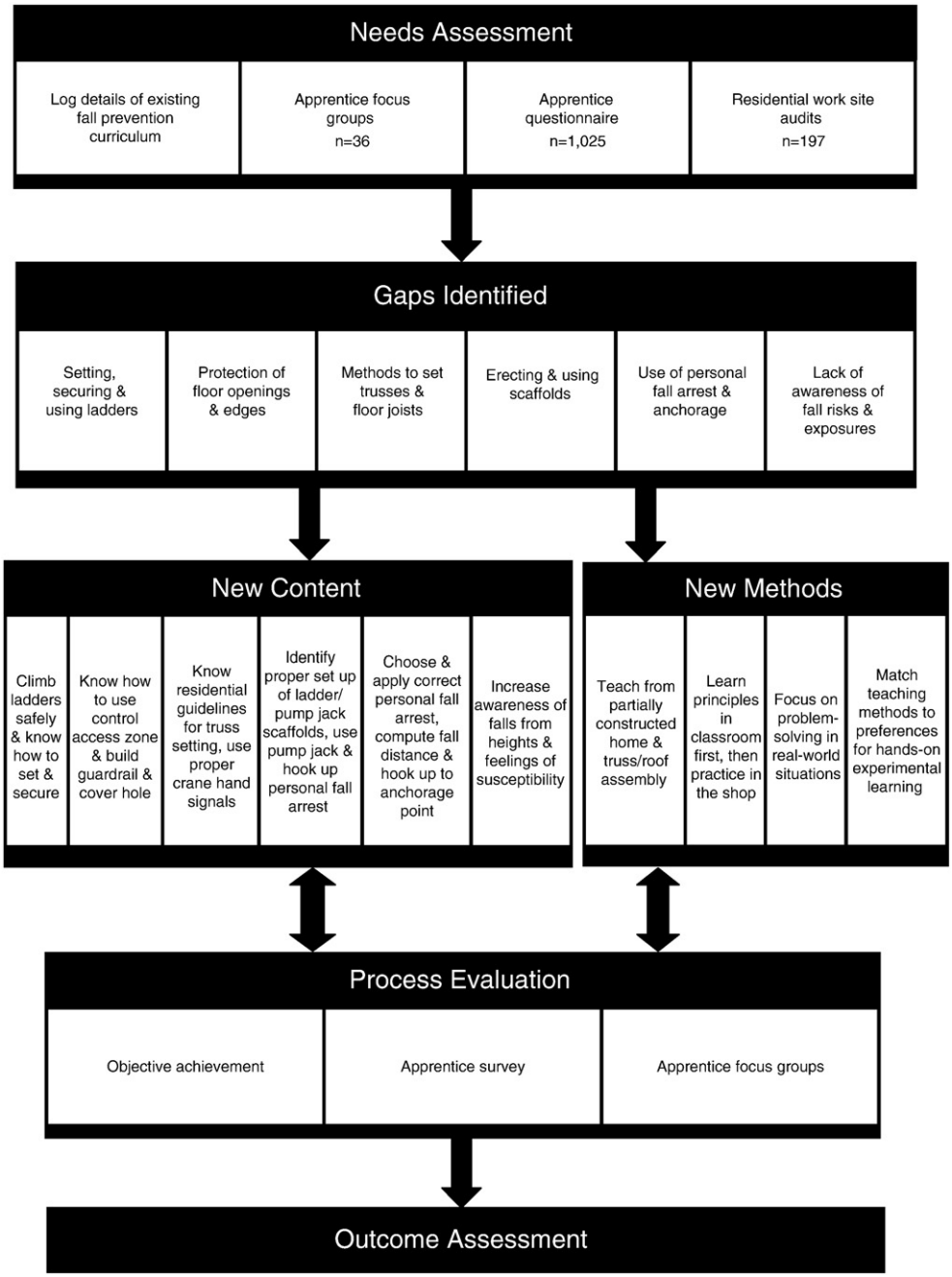

Fig. 1. Curriculum revision process.

was the goal, actual performance was expected in the shop setting. Experiential exercises in the shop setting were included as much as possible in order to match the apprentices' preference for 'hands-on,' 'real-world' training. Since the shop area is through a door off of each classroom at the CJAP, apprentices can learn the knowledge in the classroom setting and then immediately apply it and practice safe behaviors in the shop setting. Since the ceiling height in the shop limited our ability to demonstrate how to set trusses and work on roofs, we had to identify alternative methods for these tasks that would still allow them to see and experience the task. The team identified and obtained equipment and supplies used at residential worksites, including commercially available equipment to prevent falls. Several vendors donated equipment to the CJAP.

A mock home was constructed in the shop to allow apprentices to observe and practice using fall prevention methods and equipment in a context that mimics a residential construction site (Fig. 2). This full-scale home includes many of the fall hazards present in a home construction site, including floor openings, leading edges, exposed floor joists, window openings, holes, top plates, and trusses. The instructors demonstrated how to protect these openings with hole covers, guardrails, warning lines, and talked through how to install the floor joists and roof trusses from ladders and hanging scaffold systems. In a later course, apprentices stand on the ground while trusses are set nearby on the ground in order to experience trusses 'flying' overhead and practice using hand signals to communicate with the crane operator. A truss/roof assembly next to the mock home allows apprentices to observe and experience working from roof brackets, slide guards, and anchorage devices for personal fall arrest systems while safely positioned near the floor. Apprentices choose, inspect, apply, and utilize personal fall arrest systems. They learn how to assemble pump jack systems and ladder jack systems, practice climbing these scaffolds, and hook up their personal fall arrest

Fig. 2. Mock home demonstrates fall safety hazards and fall protection methods.

systems to vertical life lines. At least one apprentice per class steps off of a scaffold to experience suspension from a life line by the harness, explaining to classmates the uncomfortable sensations associated with this. Lectures and movies continue to be used, however, they are always followed up with practice in the shop to apply what was discussed. We continue to provide apprentices with the OSHA regulation book and orient them to the fall prevention sections, however, highlighting the book is rarely used.

3.4. Evaluation of revised training

The team measured the consistency of the revised training by monitoring achievement of learning objectives each time a course was taught; the effectiveness of the curriculum was assessed through post-course apprentice survey and focus groups. Objective achievement was continually monitored and adjustments in teaching plans made to ensure the curriculum was consistently delivered. The major variance in delivering the revised curriculum has occurred around holidays, when shortened work weeks gave inadequate time to cover all of the material. Objective achievement rates were analyzed after eight months of teaching the revised curriculum. Since achievement of objectives was lower than expected in the six-month class, the lesson plans were revised to a more realistic level for the time allotted. Since revision of the objectives, 78 revised training courses have been delivered to 974 total participants. The rate of objective achievement was 97% to 99% for all sessions besides the new apprentice course, which was 80%; the overall achievement rate was 89%. We are exploring methods to increase objective achievement in the new apprentice course.

We have also surveyed approximately 83 to 176 apprentices per training class at the completion of each revised training class for apprentice feedback. Apprentices ($n = 150$) participating in the new apprentice training reported that the residential prop was an effective training tool (96%) and 81% stated that they will change their stepladder work habits as a result of training. Six-month apprentices ($n = 176$) stated that they feel that they will use the safety behaviors learned in class (83%) and will be able to compute free fall distance for personal fall arrest devices (85%). Last year apprentices ($n = 83$) stated that they will change their scaffold behaviors (83%) and they can use proper rigging methods (92%). We also ran two focus groups with new apprentices to generate feedback regarding the training materials and methods. The training appeared to impact many of the apprentices as evidenced by feedback such as, "I will use these safety tactics daily, I had no knowledge of them before," and "I learned a lot about my own interpretation of risks…risk perception is different than it seems at first."

4. Discussion and conclusions

A comprehensive needs assessment that combined quantitative and qualitative methods was a useful method for identifying gaps in existing apprenticeship fall prevention training and preferred learning methods of apprentices. Importantly, we assessed real-world safety behaviors at residential worksites employing apprentice carpenters, in addition to utilizing self-reported measures. Documentation of the existing training allowed us to understand the breadth and depth of the current training and served as a starting point for revisions. Use of various assessment methods at multiple levels (including small group discussions, survey of a large sample of apprentices, and worksite observations using a standardized instrument) ensured that the needs assessment results were reliable and representative of the population of apprentices we were targeting. Actual observation of worksite behaviors was a powerful method for understanding the effectiveness of the existing safety training as well as for providing "real world" examples of what apprentices face on jobsites. By comparing the results across these different measures, we increased our confidence that we were able to identify important gaps in knowledge, attitudes, and behaviors. Understanding the learning preferences of our apprentice population helped the team design learning objectives and teaching methods to match the apprentices' learning styles and meet the identified training needs.

This project involved collaboration among university researchers, leaders of the carpenters' union, construction contractors, and faculty of an apprenticeship training program. Our backgrounds and strengths as well as work schedules and styles were quite different, and we continue to become accustomed to working together. However, we are linked by a common purpose and commitment that continues to sustain our efforts. Identification of the content areas and concerns that we needed to address in this collaborative effort including underestimation of the risks of common behaviors such as ladder use, lack of knowledge of methods to work at unprotected openings, and improper truss setting methods was made easy by the

use of a gap analysis matrix. However, the solutions were less apparent. By seeking input from learners and working collaboratively, the team was able to design a fall prevention curriculum that provides new apprentices with basic information needed to protect themselves from falls from heights early in their training, and extends this training to more detailed construction processes later in the apprenticeship. We have developed an integrated fall prevention curriculum that demonstrates the importance of fall prevention throughout the 4-year apprenticeship. Despite streamlining processes to continually monitor delivery of the curriculum and drive the iterative process of curriculum revision, formal methods of documenting quality assurance and quality improvement continue to challenge the team members. We hope that long-term monitoring of this project will continue to ensure that the revised curriculum is maintained and improved.

The research team is currently measuring the outcomes of this project through apprentice survey and residential worksite audits, with encouraging initial results. We expect to see improvements in those areas targeted in the revised curriculum, such as perception of risks for tasks where falls commonly occur, knowledge of methods to work around unprotected openings, and truss installation behaviors at the worksite, to name a few. This project has led to identification of other areas of intervention that our team has pursued for future projects, such as mentorship at the worksite, crew supervision, and greater use of available fall-prevention technologies.

Our work confirms the high risk of falls among residential apprentice carpenters and the fact that many apprentice carpenters do not have the knowledge, skills, and support from journeymen to ensure that they work safely at heights required throughout the home construction process. These apprentices lacked knowledge of basic federal safety standards and they did not use basic fall prevention techniques at residential worksites. When they had received training at school, they found actual experiences in the field to be quite different from what they were taught.

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Vicki Kaskutas, OTD, MHS, OT/L, is an Assistant Professor in Occupational Therapy at Washington University School of Medicine. She is an occupational therapist with research interests in work injury prevention and management, upper extremity rehabilitation, and work assessment.

Ann Marie Dale, PhD, MS, OTR/L, is an Occupational Therapist at Washington University School of Medicine. Dr. Dale is actively involved with prevention and intervention research of work-related injuries with a special focus in the construction industry.

Hester Lipscomb, PhD is a Professor in the Division of Occupational and Environmental Medicine at Duke University Medical Center. She is an injury epidemiologist with a longstanding history of work focused on improving safety in the construction trades.

John Gaal, EdD, is the Director of Training & Workforce Development for the Carpenters' District Council of Greater St. Louis & Vicinity. His areas of research include organizational leadership and labor-management relations at the international, national, state, and local levels.

Mark Fuchs, BS, is the Coordinator for the St. Louis Carpenters Joint Apprenticeship Program. His areas of research include technical workforce education, policy and planning, and occupational safety at the international, national, state, and local levels.

Bradley Evanoff, MD, MPH, is the Richard A. and Elizabeth Henby Sutter Professor of Occupational, Industrial and Environmental Medicine at Washington University School of Medicine in St. Louis. He is an occupational physician with research interests in workplace intervention studies and work injury prevention.