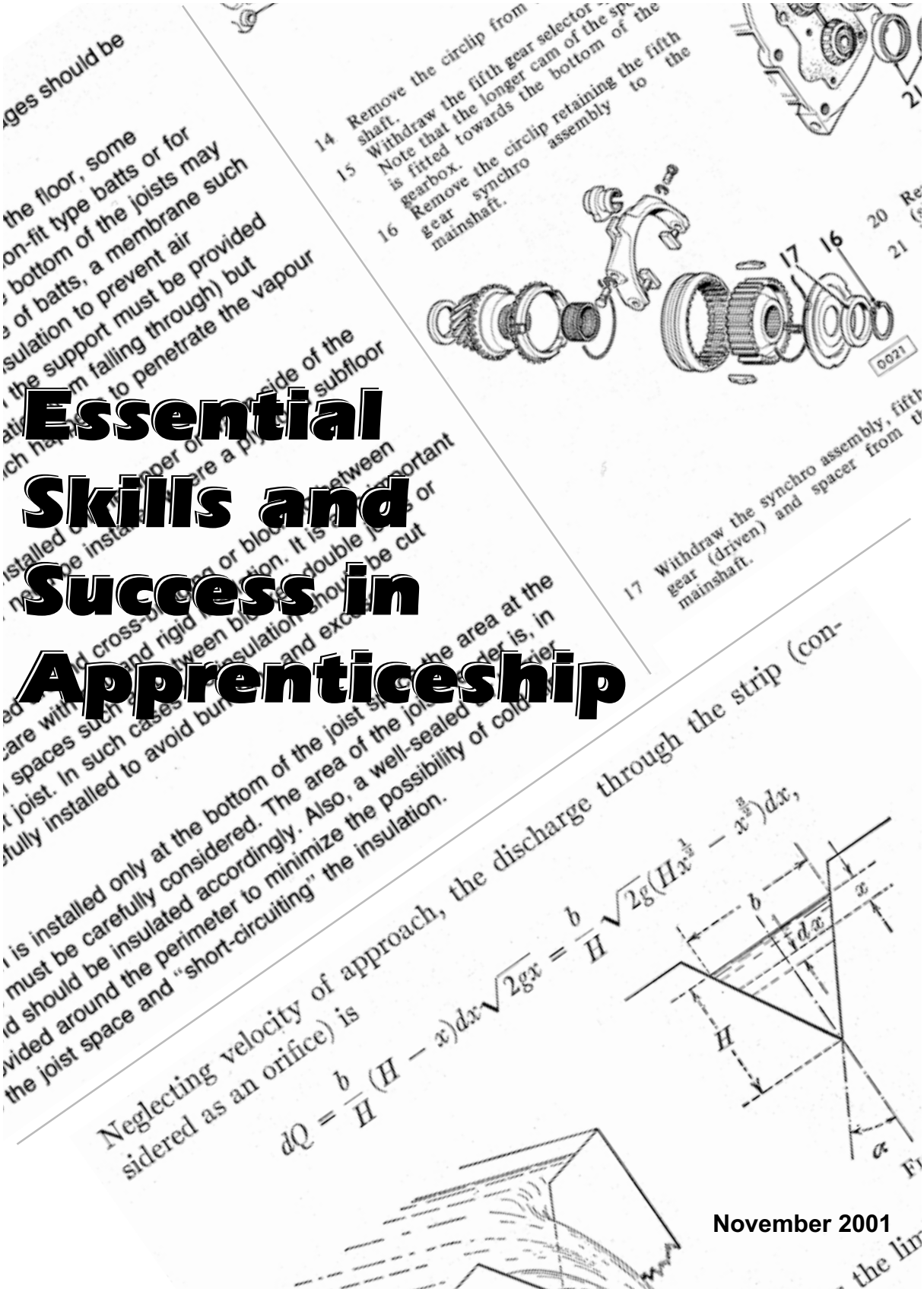
Essential Skills and Success in Apprenticeship



November 2001

Essential Skills and Success in Apprenticeship

This background paper was prepared for the November meeting of the Canadian Council of Directors of Apprenticeship at the request of Human Resources Development Canada. However, the content of this paper and the opinions expressed in it are the responsibility of the authors.

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Executive Summary

Essential Skills and Success in Apprenticeship was prepared as background to stimulate discussion at the November meeting of the Canadian Council of Directors of Apprenticeship in Ottawa. The task was to highlight essential skills - reading, document use, numeracy, problem solving, etc. -, define the issues and report on solutions or responses where they exist.

Changing policies in entry standards suggest that different jurisdictions are employing a range of strategies to select apprentices with sufficient skills to meet the challenges of technical training. Some policies call for increased grade level achievement, others implement custom tests. Despite these efforts, predicting the competency of a population of adults who left the school system ten years ago remains a challenge.

Critical to this discussion is defining just what essential skills are required for apprentices to do well in training and on the job. The more accurate and detailed the list, the better the chance that appropriate tools can be developed to assess individuals to determine their readiness. An essential skills list identifies what is unique to apprenticeship. Some topics might be integrated into apprenticeship and some can be addressed outside the system. Armed with appropriate in-context curriculum, a far reaching support network might be in a position to help apprentices to prepare for the significant demands of reading, document use, numeracy and learning skills they need for success in trades.

Apprentices do fail exit tests and simply move out of the apprenticeship system. These poor test results may be due in part to lack of the skills needed to read and answer knowledge testing questions. Test results can be studied more closely to inform the strategies that will enhance success without compromising the standard setting function for which these instruments are intended.

Currently, apprentices are, for the most part, on their own to find help when they need it during the four year training period. It is likely that only a few have debilitating learning problems. However, results of our survey and our experience indicate that many apprentices need more adequate essential skills than they currently have. Reading and remembering, taking notes, and setting up problems in mathematics are only some of the topics that could facilitate technical training. This situation seems to come about not because of lack of services but through lack of coordinated focus on responses tailored to the specifications set by apprenticeship demands.

The apprenticeship training systems across Canada currently accommodate almost 200,000 apprentices. With an impending skills shortage, we need to double our efforts to ensure success for those in the system and to attract well-prepared candidates in the future.

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Essential Skills and Success in Apprenticeship: A Background Paper

Introduction

> *Jerry, a man in his mid 40's, is an apprentice electrician. He graduated from high school with marks in the 90's in both science and mathematics. Although he chose apprenticeship later than most, he has been fully employed since he started on this path. Despite a good academic background and a positive experience in the trade, he has just failed his third year exams in technical training - for the second time. This result has serious implications for Jerry's future in the trade and it should bring up a series of questions for industry training and apprenticeship.*

We began this background study with a strong belief in the apprenticeship system and its successes. That is still true. In our experience and research, however, it is clear to us that Jerry's story, while unique to Jerry, is repeated in various ways in apprenticeship programs across the country. We work on the premise that the essential skills described in this paper are a critical factor in Jerry's, and others,' success.

We will take a somewhat restricted view of essential skills,[1] focusing most attention on reading, document use, and numeracy. We will report on the results of conversations and interviews across Canada about how essential skills needs are being addressed now. The paper ends with recommendations that indicate a need for further research and action to make sure that these core 'literacy' skills are at the centre of any discussion about entry into apprenticeship, success in apprenticeship, or competence at work after training.

Sources of Information

In preparation for this background paper, Canadian Council of Directors of Apprenticeship (CCDA) and Interprovincial Standards Examinations Committee (ISEC) members were invited to share their views about the role of essential skills in apprenticeship training. Many agreed to be interviewed or wrote thoughtful responses to a number of questions that had been sent out. We also contacted some key individuals who have organizational roles in projects involving readiness for apprenticeship. A third group of individuals, instructors, apprenticeship counsellors and learning centre instructors were, contacted for an 'on the

ground' perspective. These conversations helped to identify several themes, including predicting readiness for apprenticeship, finding resources for training, improving results, and discovering what approaches are effective. Several key questions emerged:

Is school grade level a good indicator or proxy for these skills?
What are the essential skills needed to succeed in apprenticeship?
What resources are available for apprenticeship preparation?
How does preparation impact success in technical training?
What are effective interventions to ensure success?

Lastly, we sifted through some recent reports and policy papers, and toured the extensive network of Canadian web sites devoted to career development, apprenticeship, and essential skills. This paper is intended to be a broadly-based and regionally representative snapshot of the issues. We make no pretence of having carried out a rigorous literature review or having generated statistically valid survey data. We listened to those with a stake in apprenticeship and looked at printed sources until we noticed several repeated themes. The paper that follows is a compilation of what we found.

Essential Skills in a Changing Workplace

A glance through any of the National Labour Market Studies produced by industry and government over the last five years[2] reveals that several issues which affect the need for essential skills are common to all trades.

Technological Change

The first of these is the increasing complexity of materials, tools and processes. 'Technical' change is a feature of any discussion of work or training for work. Constant change drives the need for tradespeople to attain greater skills and engage in constant learning. A consequence of constant technological change is the requirement that the current workforce has to learn how to use the new technology. The need for recurrent trade training is nowhere more obvious than in the motive trades. Advances in automotive technology—ABS braking systems; computer controlled fuel injection; air bags; and GPS systems—have added several thousand dollars worth of electronics to the typical vehicle and driven many auto service technicians back to school. This need for constant updating is the current situation and we have no reason to believe it will be different for apprentices when they become journey workers.

A feature of recent changes in the workplace noted in several of the National Occupational Analyses is the introduction of technology to enhance productivity. In most cases the result of enhancing productivity is to replace 'manual' work with 'cognitive' work. Welding a pipe may no longer mean having a good eye and a steady hand; using the new orbital welder requires reading the manual, looking at the chart, thinking about the requirements of the job and programming the machine to do it. Information technology and automation have permeated most workplaces, and while they are making some work redundant, have raised the level of skill needed for the remainder.

Changes in Health, Safety and Environmental Legislation

Work practices are increasingly governed by an array of codes and legislation. Front-line workers such as tradespeople are expected to understand, apply and, in some cases, interpret this legislation. Imagine an electrician working in a food processing plant somewhere in Canada who will have to consider the electrical code, health and safety regulations, WHMIS requirements, environmental standards and the processes required under HACCP certification. It is a lot to read, a lot to remember, and when it is necessary, a significant literacy task to find and integrate information needed to complete even straightforward trade tasks.

Changing Business and Work Models

The move to adopt business standards such as those promoted by the International Organization for Standardization (ISO) has also driven up the requirement for literacy in the workplace. Standards require written work procedures, documentation of processes, and measurement of inputs and outputs.

The 'tightening' of the economy during the last decade has flattened management and driven accountability and decision-making to lower levels in the organization. Many tradespeople now find that they have to create budgets, measure productivity, and justify business decisions they have made. Given these trends of technological change, increasing legislation and new ways of doing business, we can only conclude that apprentices will need to be more highly skilled learners than in the past.

Essential Skills and Apprenticeship

1. Entry Standards: Educational Requirements for Entering Apprenticeship

In this section, we will argue that when essential skills are considered, there is a large 'disconnect' between high school preparation and the skills and knowledge needed in apprenticeship. While 'grade level completed' may demonstrate general ability, we will contend that it is a not an accurate indication of essential skills preparation for apprenticeship. In fact, it is almost irrelevant in the case of people who have been out of school for ten years or more.

Grade levels are set in every jurisdiction with the exception of the NWT and Quebec where an age limitation has been set. Across the country, there is a general agreement that grade levels serve as a proxy for skills; however, proponents express varying degrees of faith in exactly what those skills are. There is also confusion about which of the skills represented by grades completed are required for particular trades. Given the variety of programs and courses that make high school graduation possible, several people pointed out how difficult it is to decide what skills the new apprentice can be counted on to have. These differences may account for the lack of consistency of grade level requirements across Canada even within Red Seal trades. On the whole, there is minimal analysis of which courses constitute the 'right' skill set. In each jurisdiction, trade stakeholders make decisions about what is required. Electrician apprentices are the most likely, but not the only trade, to have school programs scrutinized and particular courses demanded. Union training plans are possibly the only group who consider letter grade achievement in these identified courses. Whether breadth of exposure will achieve more qualified candidates than mastery of a narrower range of skills is a debate that deserves more discussion.

Grades as Entry Requirement

Several provinces have recently or are considering increasing grade level requirements (PEI, NS, NB, NWT, MAN), often to a blanket policy—Grade 12 for all trades. Other provinces require Grade 12 for many trades but not all. Pressure from the industry and sometimes instructors to reflect the increased technical complexity of many trades has brought about this increased grade level requirement. Educating the public, that is, changing the perception that trades require higher skills, seems at least part of the motivation. Some report an 'improved' situation, where essential skills issues have been improved by adopting a Grade 12 entry requirement, although some wonder about people who might have been eliminated and whether those screened in by this criteria will want to stay.

Implicit in these grade level benchmarks is the expectation that attainment in school will eliminate essential skills issues during apprenticeship. A significant number of respondents have been disappointed by this assumption. “Grade 12 is no guarantee” and “We don’t know what it means” are typical of these comments. Often such comments were followed by illustrations of surprisingly inadequate skills despite grade level accomplishment. Several reported IP test-takers asking invigilators the meaning of words such as “perpendicular” and “horizontal.”

Alternatives to High School

In nearly every jurisdiction apprentices who meet the prescribed grade level requirement are unchallenged as to what skills they have at the time they enter apprenticeship. The ‘non-qualifying’ group however is given a range of options to meet these academic benchmarks. Several respondents point out that academic levels are only one criteria contributing to successful apprenticeship. Representatives of apprenticeship are hard pressed to turn down candidates for lack of academic requirement, especially when an apprenticeship candidate has been selected as suitable by an employer. Acceptance of this principle of inclusion leads jurisdictions to accept a wide range of ‘equivalents.’ For example, the GED (General Education Diploma) is often accepted as a substitute for Grade 12. There is certainly debate, especially in academic circles, as to how ‘comparable’ these equivalents are; however, the differences are overlooked. In some provinces, such as Alberta, custom assessment tools have been designed as an alternate means of ‘proving’ entry level skills. Some provinces allow entry into apprenticeship for those without the necessary educational requirements, but specify the completion of ‘remedial’ academic courses as concurrent training.

‘Grade Level Completed’ as a Predictor of Success

Does the highest grade level completed predict success in apprenticeship? There is little evidence to show that there is a correlation between school achievement and success in apprenticeship, not because it isn’t so, but because of lack of data. Common sense suggests that someone who managed to complete 12 years in a grade school program will be more likely to finish any program they enter. Whether candidates have the required skills is a different question and has led some provinces to consider alternate entry assessment as a measure of readiness. Except in NWT where such customized assessments are mandatory, in Nova Scotia where an interview process for all apprentices includes assessment and in some localized union training plans, apprentices do not have to prove their current essential skills.

Recent Research - Grade Level Completed and Literacy

The recent International Adult Literacy Survey (IALS) provides us with more information about the relationship between grade levels and literacy. The results of this survey (carried out at different times and in different countries) shows that literacy skill is quite malleable and changes significantly over time. In the populations surveyed, and Canada was among them, there was evidence of, for some, a gain in skills after school leaving and, for others, a decline. There is good evidence that given an environment rich in literacy challenges, literacy ability will be gained. The data also suggests that if not used, literacy skill can be lost.[3] As of 1996, approximately 44% of apprentices were starting their programs when they were 23-30 years old while another 44% were over 31 years old. As the table below[4] shows, most apprentices are not making a direct transition from high school to the trades.

Registered Apprenticeship Training, by Age Group
1994 to 1999

Age Group*	1994	1999	1994 to 1999 Change
Under 20	4,178	8,279	98.2%
20 to 24	42,860	49,197	14.6%
25 to 29	46,877	46,680	-.4%
30 to 34	33,913	31,733	-6.4%
35 to 39	19,370	24,071	24.3%
40 to 44	9,995	14,716	47.2%
45 plus	8,475	14,190	67.4%
Total	**165,668**	**188,776**	**13.9%**

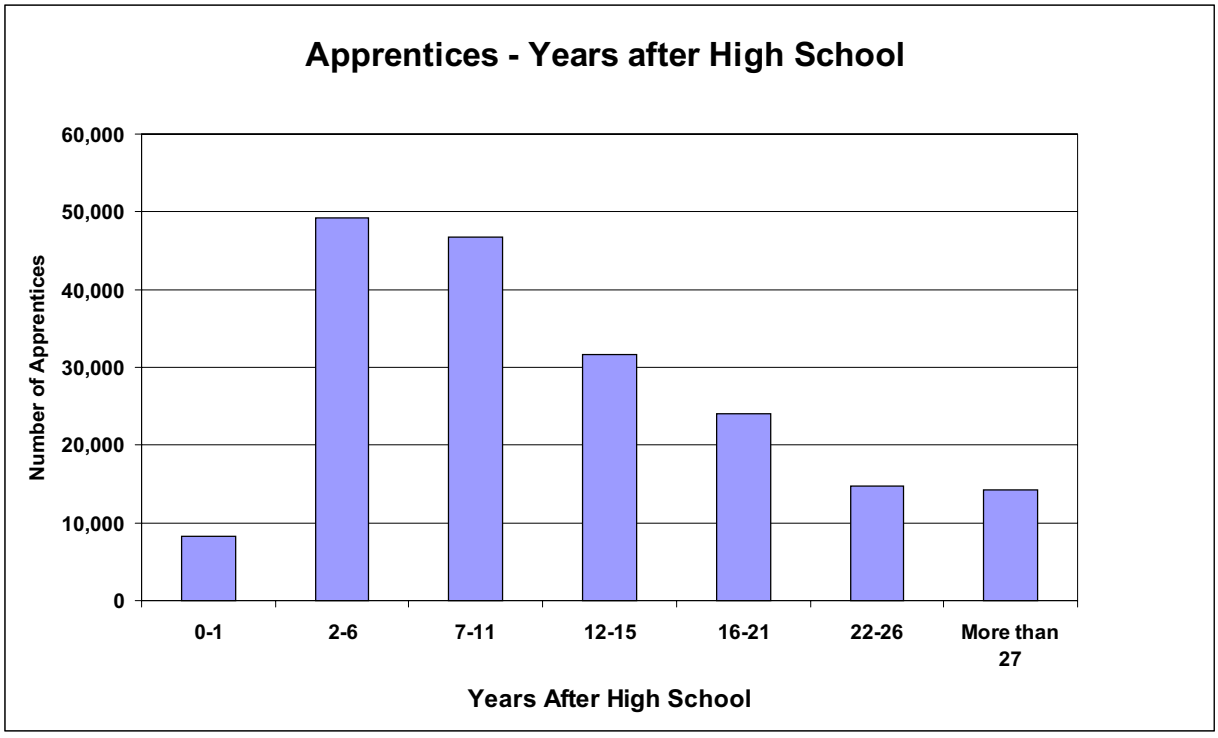
* Non-reported ages of 6% in 1994 and 2% in 1999 have been distributed across existing age groups.

Schuetze and Sweet[5] report that one of the most common school to work transitions is what they describe as a 'milling around pattern' which sees young people engage in extended periods of moving back and forth between education and work until they become 'settled' in a career. For the young people in question, these are years of part-time, seasonal and nonstandard jobs which neither recognize or reward their educational accomplishment, especially when this is high school completion or one year of college or university. They also note that during this period of unsystematic and haphazard work experience, young people may gain social skills and workplace attitudes, but they learn little in the way of technical skills and these jobs do little to reinforce school learning. The completion rates for all forms of post-secondary education indicate that a great deal of experimentation is taking place. Considering the average age, about 28 years old, of entry into trades, this seems to be true of apprenticeship programs also.

At 28, the average apprentice has been out of high school for 10 years. Scott Murray, a senior researcher at Statistics Canada who had a leadership role in the IALS project, indicated that high school grade levels are poor indicators of adult skills:

> "Although educational attainment is related to skill levels, it is a very poor indicator in a statistical sense. This is due to the fact, even at the point of graduation; it fails to capture the large variance in proficiency across individuals, across institutions and over time. This situation gets worse as individuals get farther away from the graduation point because attainment cannot reflect skills and learning acquired through adult education and training that does not lead to a higher level of credential nor skills acquired informally through job experience or living nor skills lost through lack of use. Evidence from IALS suggests that a lot of literacy acquisition, and presumably other learning, and some skill loss, occur in the 16-25 year old age range. Educational attainment is still important, it just isn't a reliable indicator of what people know and can do." (6)

In the public school system there is concern about the 'loss' of learning that occurs over the summer holidays. Imagine what that loss would be if summer holidays lasted ten years. Some indication of this loss can be drawn from the IALS survey which discovered a million and a half Canadians with one or more years of high school who were at the lowest level of literacy.(7) As the graph below demonstrates, most apprentices in Canada are entering occupational training a considerable time after finishing high school. While there has been a 98.2% increase in apprentices entering apprenticeship at school leaving age, the numbers are low. Far more significant is the increase of older apprentices entering the system, 16 to 25 or more years after leaving high school.



2. Entry Standards: Assessing, Identifying, Preparing

Several jurisdictions have become disenchanted with the grade level approach and have opted to develop a skills inventory of essential skills needed for success in apprenticeship training. The skills areas most often identified as important are reading, mathematics and science fundamentals. This process of describing what apprenticeship needs is critical in at least two fronts. The first is to establish a 'specification' for assessment tools that might be used to measure the necessary skills. The second is to establish firm requirements for knowledge and skills needed during apprenticeship training and to communicate these needs clearly to educators—K to 12, continuing education, colleges and private service providers—those who may be in a position to provide upgrading. As one respondent put it, "The better prepared; the better apprentices will do." Others see this preparation phase as 'setting people up for success.'

Ontario has led the way with a project called EARAT, which is the acronym for Evaluating Academic Readiness for Apprenticeship Training. This project has gone a long way in the process of identifying the essential skills needed for the in-school portion of apprenticeship training, trade by trade. Starting in 1994, observing and documenting technical instruction in Ontario colleges has formed the basis for skills inventories. The essential skills needed in apprenticeship training have been 'translated' into academic terms and assessments have been developed based on this analysis. Apprenticeship candidates in Ontario are encouraged to take this pre-entry assessment test on a voluntary basis.

In Alberta, a similar process has taken place. A researcher has analyzed apprenticeship curriculum for approximately fifty trades. Again a translation of foundational skills was needed to transform apprenticeship learning outcomes into the language of academics. From this information, five newly released tests have been developed to represent clusters of trades with similar essential skills requirements. The test is used as an alternate to a grade level requirement. The North West Territories use this instrument to measure readiness for all apprenticeship applicants.

Outside provincial apprenticeship systems, various trades have developed their own skills lists and assessments to test for these identified skills. Several union training plans and private deliverers require success on tests, most typically addressing mathematics skills, as a prerequisite for entry into training.

SkillPlan in BC has developed apprenticeship entrance tests for construction trades—carpenters, Sheet Metal, Glaziers, and Heat and Frost Insulators. Union training plans have incorporated the appropriate test as part of their respective selection process. Only the Carpenters test is available through the apprenticeship system and then only on a voluntary basis. The skills inventory used to develop these tools varies from the Ontario and Alberta model. Based on interviews with fully competent job incumbents, a review of technical

training requirements and validation from industry experts, the skills tested represent on-the-job and technical training essential skills needs. The methodology used is the precursor to HRDC's essential skills profiling methodology.

In all cases, candidates who fail tests are encouraged to upgrade in various ways. Preparation information for each of these tests varies. In some cases, diagnostic information is available and can be used to direct upgrading. Getting the skills list right is critical to efficient use of energy spent in upgrading. If the assessment tool correctly identifies the apprenticeship skill, then time spent in upgrading will be directly related to learning in technical training and not just getting through the first door.

Getting the 'Skills List' Right

Probably the most promising methodology for future development of skills inventories is that currently underway under the direction of Human Resources Development Canada (HRDC). Over the past eight years, HRDC Human Resources Partnerships has developed the methodology, skill descriptions and scales needed to describe the essential skills content of jobs. These essential skills profiles offer detailed descriptions of the literacy, numeracy, thinking and teamwork skills required by workers in each occupation profiled. Work is also proceeding to create essential skills profiles for Red Seal certified trades.

Perhaps the most important issue that arises in defining essential skills components is the attempt to fit apprenticeship skills into the academic system. In science and mathematics, the match is closer to traditional academic content than in others. Still many courses include much that is not directly related. For example, only parts of a physics course may relate to apprenticeship needs. One significantly missing piece of school system mathematics is its adherence to the SI (metric) system. Whether we like it or not, trades workers use both SI and Imperial measurement systems and need to be as comfortable in one as the other.

HRDC's Essential Skills profiling identifies at least three areas that are critical to apprenticeship that are largely overlooked, or addressed differently, in the academic system. These are reading, document literacy, and learning to learn skills. HRDC's essential skills profiles offer a systematic approach for describing essential skills for trades occupations. Like the DACUM approach used for content areas, this methodology provides the skills list from which instruction can be built. TOWES (Test of Workplace Essential Skills) is a newly developed assessment tool that provides individual assessment using the same recognized national and international benchmarks for difficulty levels. See Appendix.

Reading

Reading is defined by IALS as "the knowledge and skills needed to understand and use information from text." HRDC has adopted the same applied reading definition. This emphasis on finding and using information is different from traditional grammar, literature or written communications which are often the principle content of academic offerings. While this analytical orientation is valuable in its own right, it does not directly address apprenticeship needs in technical training or on the job. Getting information from text is challenging in trades where product information, codes and regulations are constantly increasing in number and complexity.

Research has pointed to the differences between reading in school and reading on the job. In a study of the relationship between high school and technical college reading and reading on-the-job, Mikulecky[8] found considerable differences in the scope and depth of materials encountered (reading demand), the purposes for reading, and the strategies used. Students in school reported that 66% of their reading was for the purpose of learning; workers reported that only 15% of their reading was for this purpose. Reading-to-do tasks comprised only 2% of the students' reading, while workers reported that some 35% of their reading was for this purpose. The difference for blue collar workers (skilled tradespeople) and technical school students was more pronounced; these workers reported that 58% of their reading had application as the goal, while this was the purpose of only 7% of students' reading in school. Refer to the Appendix for examples.

Document Literacy

A significant item on all trades' skills lists is document literacy or "the knowledge and skills required to locate and use information contained in various documents." The array of documents used on the job includes drawings, maps, schematics, entry forms, and catalogues. It is easy to recognize how critical this skill is to success in all trades—document use is an integral part of trades training and critical to productivity and safety on the job. Document literacy has only recently been recognized as a separate skill domain. The importance of document literacy to many occupations has been highlighted in large scale assessments such as the International Adult Literacy Survey (IALS) and the earlier National Adult Literacy Survey (NALS) in the United States.

In countries like Sweden and Germany, adults are far more likely to be able to find information in graphs, table and other information displays than adults in Canada and the US. These are teachable skills, but our school system has not yet emphasized these skills as learning outcomes. Background on the subject of document literacy as it relates to trades training has been developed by SkillPlan[9] and HRDC.[10]

Learning to Learn Skills

The third area that needs to be added to any skills list is the ability to take notes, to study and to write tests–the foundation skills for learning in formal settings. These are often skills that are forgotten or were never learned by a generation of apprentices that have been out of the structured learning mode for years. These 'how to learn' skills are not limited to technical training; they are critical for on the job learning. At least two people interviewed made the connection between poor learners and employment. "I've been in class with apprentices that don't do well. Back on the job, they are the same ones who never get called over to learn something new. They just aren't very good at learning and they'll probably be the first to be laid off." Every National Occupational Analysis highlights the challenge of updating journey workers on new technology. The apprentices of today will be the journeypersons of tomorrow. They will need to meet the demands of new learning throughout their working lives, that is, if they want continuous employment. Not only will they be challenged by changing complex content but they will be challenged by the predicted e-learning medium that soon will be the delivery of choice in many jurisdictions. (Virtual class room in NS; similar goals for BC.) Apprentices and journeyworkers will need to be in full command of essential skills and be well disciplined, independent learners to participate successfully in this method of training delivery.

Essential Skills in the Trades Training Curriculum

Recent research has demonstrated how important essential skills are to the performance of most jobs and most job tasks.[11] Given that a significant portion of the work carried out by tradespeople relies on essential skills—reading, writing, document use and oral communication—one would expect to see these skills reflected in skills analyses. It is important to recognize that to get a full picture of trade occupations two components are needed, the occupational analyses and essential skills profiles. With a few exceptions, this is not yet the case. There is some recognition that certain trades require specific essential skills; instruction is offered for blueprint reading; electrical trade instructors spend many hours studying the electrical code and the skills needed to locate information in it; automotive technicians spend several training hours learning how to talk to customers.

Oral communication in BC, Alberta and possibly other jurisdictions has been given recognition in another context. Industry Training Boards have recognized the tremendous responsibility a supervising journeyman has in training apprentices and passing on skills and knowledge. A 'train-the-trainer' initiative is intended to support future journeyworkers in this important role.

The overwhelming impression, however, is that these skills are not isolated for instruction in most apprenticeship programs. One reason may be that trades instructors feel uncomfortable offering instruction in skills such as reading. While there are many fine instructors in trades training, as a group they are less well-prepared to teach the essential skills content of technical courses than may be needed. One of the first projects undertaken by the new federal 'Literacy Secretariat' in 1989 was designed to improve the ability of pipe trades instructors to informally assess reading skills and improve instruction by integrating 'content area' reading skills instruction.[12] HRDC's National Literacy Secretariat has supported numerous initiatives over the years to shed light on the essential skills needs of various groups at different phases of apprenticeship.

3. Is there an Essential Skills Problem?

The short answer is that we don't know. Like the predictive ability of entrance benchmarks, we have almost no research evidence to identify or characterize essential skills issues in apprenticeship through data collection. The RAIS (Registered Apprenticeship Information System) might be able to give us some insight based on the reasons why apprentices don't continue in the program.

Description This element identifies the reason for leaving the apprenticeship program. It should be reported for apprentices who discontinued, transferred to another trade or were suspended or cancelled (codes 3, 4 and 5 in element No. 12).

Codes

01 = Could not find work/not enough work.
02 = Laid off.
03 = Family responsibilities.
04 = Own illness or disability.
05 = Took work in another field/occupation.
06 = Didn't like/failed in-class portion.
07 = Didn't like trade/apprenticeship program.
08 = Lack of money/poor wages.
09 = Training allowance/UI benefits not enough/didn't get.
10 = Had enough training to get a good job.
11 = Failed exam.
12 = Became inaccessible as a result of my moving.
13 = Transferred to another trade.
14 = Suspended or cancelled.
15 = Other.
16 = At own request.
17 = Left the employer.
18 = Lack of practical.
99 = Not applicable.

Statistics Canada was reluctant to provide us with this information because this section is often not reported in compatible fields or not reported at all. Results of the National Apprenticeship Survey[13] suggest that apprentices are not comfortable with written tests and have a preference for more practical assessment methods.

Part of the difficulty in gathering meaningful data relates to questions about identifying skills and defining what adequate is. One of the major outcomes of the IALS study is the fact that people who are poor readers (Levels 1 and 2) often do not perceive that they don't read well enough to perform everyday tasks. For many apprentices and other adults, the ability to read words is not the issue as much as being able to apply those reading skills to find and understand what is read. This lack of adequate essential skills is often not obvious to the apprentice, and will likely to be kept secret if it is. One respondent suggested that in his experience, "Apprentices lacking essential skills will often point to, or suggest, other reasons for failure such as poor quality of instruction, lack of resources, or personal conflicts, and rarely admit that they lack the essential skills to achieve at the necessary level."

There are many reasons why apprentices may decide not to complete their programs, some of them economic, some situational. Lack of confidence stemming from lack of essential skills surely must contribute to these decisions. It is only human to avoid situations that are stressful and contribute to lack of self esteem. One instructor commented about first level apprentices, "You could see how fearful they were in the school setting; some of them would just get on the bus and head back home."

PEI's experience in a National Literacy Secretariat (HRDC) funded project attests to the difficulty of assessing individuals with low skills on a voluntary basis. In this recent project, researchers attempted to survey academic skills of trades workers. Offering confidential, no-risk assessment did not attract willing volunteers and certainly not ones who might be 'found out.'

Respondents to our survey expressed opinions ranging from, "Definitely, lack of essential skills is probably the main reason that apprentices don't complete" to, "Because we insist on Grade 12 completion, it's not a problem . . . except for reading comprehension." Many expressed frustration at the lack of systematic tracking data to learn more about how well-prepared apprentices were and what impact this preparation might have on success.

Evidence of Essential Skills Needs

While we may not have large scale research data, several forceful indicators are available to show that many apprentices start apprenticeship with inadequate essential skills. EARAT provides voluntary assessments in Ontario to hundreds of apprenticeship candidates. In their January 2001, general information sheet they are unequivocal in stating their findings.

> "A very considerable number of those who enter apprenticeship programs face great difficulty in meeting the academic demands of the in-college portion of their training. As a result, many otherwise well-qualified apprentices fail to successfully complete the college program and, thus to gain entry to their chosen trade."

In BC, ITAC (Industry Training and Apprenticeship Commission) conducted a limited pilot with carpentry apprentices.[14] Using an assessment tool based on an essential skills profile, the results show that 22 % of test-takers did not meet a 70% standard and 35% did not meet 80%. Informal comparison of apprentices' performance on the assessment with performance in technical training showed a high correlation.

These assessment results indicate that a significant number of apprentices are less prepared than they could be. Are the apprentices in Ontario and BC typical of apprentices across the country? Many of our respondents suggest that they are. The consensus is that essential skills are being addressed in technical training to varying extents. Some instructors are reading regulations out loud, others are teaching fractions and decimal placement. While some respondents see this as part of the job of instruction, others flatly reject it as part of apprenticeship standards. Perhaps a brief refresher on an unused skill such as trigonometry is not unreasonable; any substantive instruction however will tax the instructor's expertise and take valuable time from a program that is always under pressure to expand.

Failure rates at each level and final certification exams should give us some indication of success. Our survey initiated responses confirming that "you can prove anything with statistics." Some report that they lose 40% of the apprentices that start out. Others say only 12% don't make it. The number depends on who and what is measured. Putting aside that some apprentices move on before being counted, at least some fail, repeat or are unsuccessful in the exit gate. There is general agreement, albeit unsubstantiated, that essential skills contribute to this situation.

4. Attaining Journey Person Status: Trade Certification Examinations

At the end of apprenticeship, most trades require a final 'trades qualifying' exam. In most training programs, this final exam will be the Interprovincial or 'Red Seal' exam, in other cases it will be a test constructed by a provincial trade certification committee. These standard setting tests as well as those used throughout apprenticeship are almost exclusively multiple-choice format. Because success in apprenticeship is tied to this measurement mechanism, testing issues warrant discussion here.

Cultural and Gender Bias in Testing

Apprenticeship exit tests have the potential to disadvantage the very groups that are seen by many as the 'answer' to skills shortages in the future. Despite their apparent objectivity in measuring content knowledge, even well constructed multiple-choice tests can be biased against certain groups. Test developers decide what questions to ask, how to phrase questions, and what distractors to use. All these are subjective decisions that can be biased in ways that unfairly reward or harm some test-takers.

The experience of Educational Testing Service (ETS), one of the world's largest and most experienced educational testing services is instructive here. The National Center for Fair and Open Testing (FairTest) brought forward a complaint of gender bias in the PSAT, or 'preliminary' version of the Scholastic Aptitude Test which they claimed underpredicts the performance of females.[15] In the settlement that followed Educational Testing Service agreed to changes in the PSAT and has voluntarily made similar changes in the SAT and other exams such as the GRE for the same reason of gender bias.

The concern about bias in testing should also be evident when testing apprentices and journeypeople who are aboriginal. In a discussion paper presented to the Canadian Educational Statistical Council, David Corson, points to the bias in standard testing that sees the over-representation of minority and aboriginal children in learning disabled classes, a phenomenon that is replicated in school systems across Canada.[16] Currently there may be insufficient apprenticeship testing data to adequately reveal such a bias, however, it is important to recognize this potential.

The apprenticeship systems across Canada have invested a great deal of time and money in developing resources for testing to uphold trade standards. Issues of bias are important to the discussion of success for apprentices who represent non-traditional groups as well as the main stream.

Distinct Set of Skills for Multiple-Choice Format

To ensure that apprentices will do well on tests, instructors need to take time away from content to specifically teach multiple-choice test strategies. Most people would agree that training is needed to write a multiple-choice exam successfully. Often chosen for its apparent objectivity and ease of marking, the multiple-choice format is far removed from job-site literacy requirements where technical terms are used in a meaningful context and trade know-how is demonstrated every day in practical tasks.

Multiple-choice items can be described as elaborate and unusual reading tasks. They are unusual in that the task involved, completing someone else's sentence, is not a common activity. They are elaborate to the extent that test-takers depend on a range of linguistic, syntactic and semantic cues to complete them. In layman's terms, this means that all multiple-choice items test reading skills as well as subject knowledge.

The completion of multiple-choice items often involves complex reading behaviour. In the sample question shown below, the test-taker has to make a choice to complete a 29 word sentence which starts with a subordinate clause and contains three relational terms and three qualifying adjectives. In the example, the test taker has to choose among four possibilities, *sheet piling, shoring, needling*, and *underpinning* to complete the sentence.

```
When an excavation is dug directly adjacent
to, and lower than, the foundation of an
existing building, permanent supports for
the existing footings and walls are known
as:

A.   sheet piling.
B.   shoring.
C.   needling.
D.   underpinning.
```

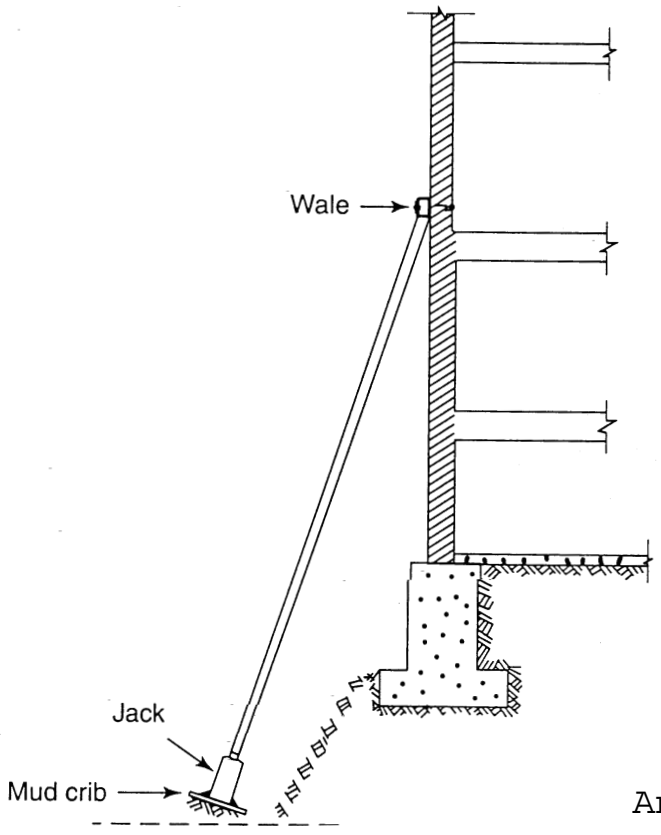
The test-taker must first identify the given information in this problem. Note that the relational information is given verbally, and that the test-taker has to interpret it without the aid of a diagram or drawing. This in itself is probably unusual for some tradespeople who usually get their 'relational' information from observation, drawings, floor plans, and maps. The conditional information that has to be identified is considerable–the existing foundation to be supported is for an existing building, and the supports are to be permanent. *Needling* may be involved as a part of the construction of permanent supports and is not incorrect. The test-taker must interpret the details of the information given in the stem to decide that *underpinning* is a better choice. In the recent IALS survey, the identification and matching

of multiple pieces of information drove up the complexity level of literacy tasks; we assume that same factors are at work here. This item demands a high level of reading skill to assess a relatively simple piece of vocabulary knowledge.

In this and in other multiple-choice items, the complexity of the reading task adds to the complexity of the item as a whole. In all cases, better reading skills result in correct answers that have less to do with knowledge than they do with essential skills. For example, good readers will reject an answer that does not make syntactic sense. He or she will quickly identify that the sentence in the item above should end in a noun, the name of a particular kind of support. The same test writer may also spot incorrect units beside a correct answer - *2000 pounds* - when the *2000* is correct but the *pounds* are not - and correctly choose 'None of the above.'

Consideration could be given to conducting some research to identify just how much existing test items depend on essential skills. This could involve incorporating items into existing exams that use alternate formats. For example, the constructed response item that follows mitigates some of the essential skills requirements but is still relatively simple to mark electronically. The 'constructed' part means the test-taker must know the correct response to provide it.

What process is shown in the diagram?



Ans. Shoring

To answer this question the test-taker analyses the drawing and takes into consideration – the excavation dug lower than the foundation of the existing building and determines that the mud crib, jack, and wale make up a support for the concrete form. The next decision in the thinking process is whether this is a temporary support or a permanent one. The test-taker rejects some of the possibilities. For example, *underpinning* which is a permanent support and correctly identifies the process as *shoring*.

In this constructed response example the emphasis is on knowledge and the document use skills actually used on the job. Unlike the special reading skills needed in multiple-choice test–taking, reading drawings is an essential skill needed every day by carpenters. This document use skill represents an authentic way of finding information and also tests knowledge of a technical term.

Continuing Research in Testing

When asked about Red Seal results, respondents to our survey were quick to report by separating test-takers into two groups, apprentices in the system and those challenging certification exams. In every case, apprentices pass more often. It is reasonable to assume that workers challenging the test may not have experience in all aspects of the trade covered in the technical training. These test results may also indicate a group who is less sure of their 'school skills.' Whether these results reflect less experience in the trade or poorer essential skills, we know that most will have little opportunity to prepare for multiple choice test taking. Even more than the general population of exam challengers, immigrant tradespeople are presented with a special disadvantage. In many parts of the world, this format is not used and is therefore not familiar to most people from those areas. Skills for Change, an advocacy group for immigrants points to the format of the trade qualification exam in Ontario (but typical of other jurisdictions) as a major barrier for foreign-trained trades people:

> ". . . the academically-based, written, multiple-choice exam is a major barrier for many foreign-trained tradespeople. Unlike foreign-trained professionals who are generally familiar with a written exam format, the Ontario exam poses a major challenge to many tradespeople whose training has been primarily hands-on. Exam preparation would therefore need to address not only language/terminology, but also exam-taking skills.[17]

In more than forty trades, the Red Seal exam or Interprovincial test is the final step in the journey to journeyperson status. Its importance is confirmed repeatedly in National Occupation Analyses as the means to "ensure national standards and to facilitate mobility." There is good reason to believe that these exit tests use the essential skills of reading, document use and numeracy as vehicles for testing trades knowledge. It is possible that these skills are seen as legitimate skills that trades people need, especially if they will face future tests in

this format. If this is the case, then the specialized test-taking skills should be identified as a learning outcome. If on the other hand, these skills are seen as a secondary or an unnecessary barrier to success, then a variety of testing formats including constructed response questions could be considered.

5. Current Responses to Essential Skills Needs of Apprentices

Support Before Entry

An apprentice is most likely to get assistance with weak essential skills at the pre-entry level. In most cases, the apprentice who does not have the prerequisite academic levels is referred somewhere to earn school-based credentials and thus gain the 'equivalents' that are acceptable for entry. Some regions and some individual apprenticeship councillors are knowledgeable about the education system and can guide applicants to exactly the right person to speak to. Smaller jurisdictions have the advantage in synchronizing efforts between apprenticeship and colleges. In other cases, applicants are left on their own to break through the formidable layers of institutional bureaucracy on their way to search for upgrading. All of this upgrading is geared to fulfilling academic requirements and as pointed out earlier, may only more-or-less prepare apprentices for success in technical training.

Some applicants may choose to write an apprenticeship entrance assessment as a means of identifying skills upgrading needs. With a few exceptions, test-takers are given very little information about how they can prepare for these tests (standardized or custom). An applicant may be told the length of the test, the format, and general subject areas (for example, mathematics, science and English). A few of the counsellors we spoke to were familiar with the assessment instrument in question and could orally direct the applicant on "what to study." Others tell apprentices "you can't study." In Alberta, a set of self-study modules have been written to specifically prepare applicants to pass the entrance exam. Likewise, the BC Union entrance standard tests come with a preparation package which includes a skills list and sample questions.

What happens as a consequence of assessment varies. Diagnostic information on standardized tests may include numerical feedback, benchmark indicators and in some instances, a skills list. Developed by Bow Valley College (formerly Alberta Vocational College, Calgary), the *Apprenticeship Reading, Math and Science* program has been used as a preparation for and an adjunct to apprenticeship since 1991. Individuals failing the apprenticeship entrance examination are given the option of completing the course and then rewriting the entrance exam. For the most part applicants are directed back to the college for less specific upgrading. Most colleges have no trouble recommending a course and, in higher population areas, are able to offer a variety of options for times and delivery methods. The motivation to return to the school scene which for whatever reason was not successful the first time, takes resolve as well as financial resources. It is not uncommon for Adult Basic Education programs to report drop out rates as high as 60%. It is probable that successful ABE gradu-

ates do go on to successfully complete other learning experiences. Little tracking has been done to count or to document these apprenticeship candidates' success as a result of such interventions.

While these courses may meet the need for grade equivalency, they are unlikely to directly prepare apprentices for technical training. Quebec's apprenticeship system which is complementary to vocational schools may have the best opportunity to address essential skills. Exceptions may also include pre-apprenticeship programs which include essential skills related to single trades or a cluster of trades. There are many fine Adult Basic Educators who are dedicated to the learning needs of the adults they serve. However, without skills lists and knowledge of the requirements of apprenticeship programs, they may find integrating these specific needs into courses they teach difficult.

Support Apprentices in Advance of Technical Training

Given the characteristics of apprentice trainees, one would expect an extensive system to assess essential skill competencies and to provide additional learning opportunities when these skills are found to be lacking. In reality, our limited survey of training providers reveals that few have an organized system of supports for apprentices during training.

In some regions Grade 12 is not the barrier that it is in other regions; as noted previously, there is a wide variation in high school completion rates from province to province and region to region. Of the applicants who meet the requirements, many have been out of school for some time and may be counselled to upgrade in a subject for which they already have credit. If preparation is the key to success then many will want to prepare, or should be encouraged to do so. There does not appear to be much in the way of 'brush up' materials for apprentices which previews what they will be studying in technical training. A few trades require pre-attendance assignments but this practice is trade specific and there are limited resources for following up. In Ontario, apprentices who choose to write an EARAT assessment will be well-served with study materials, especially in background science. Contextualized learning materials are being continually developed in a flexible 'worksheet' format.

Although, few apprentices do so, they can purchase course materials in advance of technical training attendance. Where training delivery is by block, purchase is likely to be restricted to registered apprentices assigned to a school time. For out of town apprentices, accessing a college bookstore is not an option. Few are encouraged to prepare before training however in the Yukon apprentices, who will attend training in Alberta, are given a course outline and recommended texts in advance of attending.

In many jurisdictions, post secondary institutions offer courses called 'trades math.' Some offer courses that address successful learning strategies such as *Learning for Success Study Skills* program (BC). We were unable to find courses in delivery institutions with titles like

Reading for Technical Training or *Document Use for Apprentices.* One program, which adapts contextual materials to reflect the specific reading needs of workers, is *Effective Reading in Context* (ERIC). More recently, work has been done to develop its counterpart *Working in Numeracy* (WIN).

Another curriculum, recently released by Bow Valley College in Calgary, Alberta is called *Building Workplace Essential Skills*. This program takes an integrated approach to presenting reading text, document use and numeracy in workplace contexts. Using workplace documents, and tasks required of workers, participants learn to apply essential skills. Programs like these have the potential for adaptation to trade contexts.

An apprentice has the best chance of upgrading before attending technical training. Whether they do depends on many factors including the information and encouragement they are given in the apprenticeship office or union, the reception at a post secondary institution, whether they see value in preparing at all, finances, time and the support they get along the way.

Support During Technical Training

Once in the system, how are apprentices supported when they experience essential skills difficulties? When asked what resources are available during or after training sessions, some responses were fairly blunt: "Not a whole lot." "Limited." "None." True or not, these perceptions are shared by apprentices. The Floor Covering Industry looked at the support provided to apprentices during training and found it to be lacking.

> "The Workers' Survey found that there are important accessibility issues in the area of basic skills. Installers generally perceive that basic skills upgrading is not readily accessible to them. Indeed, half of the installers who attended trade school reported that basic math upgrading was *not* available." (18)

One instructor commented, "an apprentice might be able to find the learning center if they knew where to look." An apprenticeship counsellor was careful to point out that, "They (apprentices) are told on the first day of class that there are student services to help them and they are encouraged by us to use the services." Another said he tries to arrange for help and to let the apprentices know what help is available but added, "we don't promote this as much as we should."

Integration of Essential Skills into Technical Training

Technical instructors take varying degrees of responsibility for essential skills needs as they occur. Some are more willing and skilled than others to do this however in some regions they are the last stop. The only support available is "if the instructor takes the student aside and helps out, one at a time. If he doesn't help there is really no help. They fall by the wayside." In some cases it's a matter of how much time the instructor has. "Apprentices may receive help from a faculty member if that instructor has time." Another respondent commented, "For most of our instructors teaching math is not their strong point. They do try to do remedial work but most of them would like to give this part away." In some union training settings tutorial classes are scheduled as a part of training. In post secondary settings, many instructors have the option to refer apprentices with identified problems to others for help.

Some respondents felt confident that those contracted to deliver training are handling the situation. "Any difficulties will be dealt with by the college being attended." The majority of training is offered through post secondary institutions, primarily colleges, and most of them have a learning center, at least on main campuses. In some facilities, there may be a learning center or instructor designated for trades support. Most, however, provide support services for all of the college program offerings.

While instructors in learning resource centres may be dedicated, chances are they know more about academic programming than they do about technical training. Several respondents qualified statements by adding "depending on the nature of the problem." While it may work for service providers to divide skills, it does not address the 'applied' issue for the apprentice. The need for a mix of knowledge and essential skills makes effective support difficult. Unfortunately, the response to the apprentice will probably concentrate on one or the other.

Learning Disabilities

Expertise in assessing learning disabilities in these centres and elsewhere is particularly important. Not only could apprentices learn how to deal with their particular disability, they could qualify for further assistance including longer times to write tests or having tests taken orally. Learning disabilities is one of those areas of research for which we have gathered only limited information. Some estimates suggest one in ten adults have a learning disability which affects learning in a significant way. Based on an average adult population, 10% of apprentices are the same students who struggled in school, who didn't like the experience or were not rewarded for their alternate learning styles. Their history may be due at least in part to learning disabilities.

Tutoring Services

Some tutors can help with essential skills; others with trade content. In most cases, the apprentice would have to pay for this service. Difficulties with both content and the administration of tutor services suggest that they are not well used in some situations. These comments came from Nova Scotia, New Brunswick and Ontario but may not be typical of each region.

> "Student services at the institute do offer paid tutoring by peers but has never dealt with apprentices."

> "This tutoring is free but available only after assessment. It is not trades specific. In the past 4 years we've only seen 8 to 12 apprentices."

> "Tutors need to qualify by successfully completing that year of technical training. In the trades this is problematic because once a person is finished the training they are working and not available for peer tutoring."

More successful experiences are reported in Manitoba and Alberta but again may not be representative.

> "The first 8 hours (of tutoring) are free, after that the student must pay. It is trade specific because the peer tutor would be a strong student in that trade, recommended by the instructor."

> "If the problem were with the trade material, the apprentice and tutor would work through those materials. They could access weekly tutoring with a retired college math instructor. It could be trade specific if he brought his materials."

Let's return to Jerry, our third year electrical apprentice. We placed 7 calls to learning centres, each to a different province or territory, to ask what services are available to assist him. In one case, Jerry would be referred back to the apprenticeship office, in another he would be sent to a different post secondary institution for generic upgrading. One simply said they wouldn't be able to help. In four, Jerry would have to hire a professional tutor at his own expense and it was noted that the right tutor would be difficult to find.

What is clear is that not only is it unlikely that Jerry will get essential skills upgrading in the context of the electrical trade while he attends training but he will have an even more

difficult time once he leaves the institution. The question that should be asked is why did it take five years to start addressing this problem? Without skills upgrading intervention, the apprentice tackles each successive level of training in a deficit position. Essential skills needs are compounded each year and may stop an apprentice, like Jerry, after several years have been invested. If not discouraged and defeated along the way, then those individuals, who have hung in, may face the final blow with the Red Seal exam.

Delivery Models for Integrated Essential Skills Training

One model in the organized sector has a more holistic and sustained approach. The BC Construction Industry Skills Improvement Council, SkillPlan is a not-for profit organization that is partly funded through collective agreement. At SkillPlan, Workplace Educators are not governed by quotas or mandated curriculums. They address essential skills issues by offering responses that are appropriate to the apprentice or worker. Apprentices might meet SkillPlan Workplace Educators to prepare for entrance exams, in study skills workshops, or in tutoring sessions. They can access the service any time during their careers. Workplace Educators are backed up by trades instructors and materials to keep the essential skills training in context.

Providing services is not the same as a support system. From this discussion, services appear to be site specific and mostly unstructured. It is hard to evaluate how effective this intervention might be, however, the situation suggests that it isn't. The institution is responsible for the apprentice for a 4 to 6 week period. It might take two weeks before the apprentice or the instructor identifies the need and by the time the support system is ready to respond it's well into the third or fourth week. Whatever is gained in this short period is then shelved when the apprentice returns to their home community. Without a monitoring system, resources, encouragement or drive, an apprentice is unlikely to access the same services away from the technical training institution.

What strategies could be employed to provide better service?

Perhaps the observation that can be made in this discussion is the chasm between Apprenticeship and Education. From the ministry level to the instructors to the apprentices, this division is preventing effective synergy. It is time to join forces.

During our conversations with those involved in apprenticeship we also asked about solutions to inadequate essential skills. Here are some ideas we gathered about how this might be accomplished.

- Take a pro-active approach to learning assistance. Take the service to the apprentices.
- Learning assistance tutors placed in apprenticeship classes for as little as 3 hours a week could be a valuable resource. A personal relationship needs to be established between learner and coach; this is a start that may encourage ongoing learning.
- Create upgrading networks that will pass tutoring information from one location to another, from the college to the community. When an apprentice leaves the college, a learning plan needs to be established to encourage ongoing upgrading. Connection with support in the community will increase the chances that this will happen.
- Exchange professional skills. Apprenticeship instructors can invite a reading specialist to deliver a one hour presentation on technical reading to a class or model note taking. In exchange, a technical trainer might give an Adult Basic Education (ABE) class the opportunity to learn about how skills are applied. Team teaching is an option worth exploring.
- Provide joint professional opportunities. Academics need to learn about what apprenticeship is all about. Trainers need to learn more about teaching strategies.
- Develop self study materials that address essential skills in the context of the trade both on the job and at technical training. Teach cooks more efficient reading strategies using related safety materials. To do this will require the blended skills of content area specialists and teachers.
- Provide materials that preview technical training. Second year carpenters may need advance preparation to refresh their skills in trigonometry. Informal self assessments will help them to decide what they need to do to prepare BEFORE they tackle the next level.
- Gather the materials used in a myriad of pilot projects that teach trades content and essential skills together. Stop reinventing the wheel and start making traction.
- Make lists of all these materials and distribute widely to those who may be in a position to coach apprentices. Create a database.
- Educate the education system about apprenticeship. Almost every jurisdiction has high school apprenticeship programs. Make materials available that demonstrate how essential skills are used in apprenticeship. Support generic applied learning initiatives such as applied math, technical and professional communication and applied science. Co-develop courses specific to trades (NWT, Trades Science for Grade 10).

Summary

Our task was to highlight essential skills and their role in apprenticeship. In the context of a successful system that trains tens of thousands of apprentices for a hundred or more occupations, we found that this one aspect is not being addressed as effectively or consistently as it might be.

Despite efforts to equate academic achievement to adequate preparation, a reliable match still eludes us. Two issues emerge. Once an apprentice leaves the school setting, these measures become even less predictive. In Canada, the average apprentice completed school 10 years ago. Coupled with this reality is the limitation of the academic system to reflect the applications of essential skills needed for trades.

Embracing the dimensions of learning in apprenticeship means acknowledging traditional craft skills and the thinking skills that make learning new technologies possible. The challenge is to blend these skills at work and in technical training. To do so will require continued work on defining what is needed. When the Apprenticeship system sits in the drivers' seat in defining what skills are needed, the system can then turn to service providers to fulfil those needs more directly. This approach is respectful of adults who usually have limited resources to prepare for success. It may also motivate reluctant participants when they have confidence that essential skills training relates to their goal of completing apprenticeship.

Resources are available, the connections to apprenticeship program are not yet established. We were told about dedicated apprenticeship councillors, adult educators, and retired journeyworkers who go out of their way to make sure that apprentices have the assistance they need. Some institutions have recognized the issues and are addressing them. Unfortunately their efforts are not consistent even within jurisdictions. For apprentices who need better essential skills support, this service should not be a matter of luck.

Most important is leadership. Making resources available will require a change of resolve. The question of who owns the responsibility will have to give way to what can we do that would result in more successful experiences in apprenticeship.

By all accounts, Canada is facing a skills shortage. We have all heard the prediction that will lead industries to scramble for a shrinking pool of available young people. Perhaps apprenticeship policy should be spending more energy on 'saving' those already invested in apprenticeship and who have been invested in already. The alternative is to continue to recycle unprepared and unsupported candidates through the system, at great cost to all.

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Essential Skills and Success in Apprenticeship

Appendix

What are the essential skills needed by apprentices? Experience with apprenticeship and a look at existing Essential Skills Profiles reveals that apprentices are confronted by a number of essential skill demands both in the classroom and on the job site. As students, they are expected to read to learn, use active listening techniques, and develop good study and exam preparation techniques; at work, they must search for information in complex workplace documents, communicate this information to others, and use it to solve immediate problems.

Reading is the most studied of the essential skills and research highlights the differences between the classroom and workplace application of reading skill. When Larry Mikulecky, a workplace literacy expert, compared the reading done in school with reading at work, he found that workers used a wider range of strategies for dealing with on-the-job reading. They were more likely to use a combination of problem solving, note taking, and associating reading with what is already known. Students reported that their major reading strategy was to re-read the material several times. Reading in school was almost exclusively (95%) textbook material. Workers, on the other hand, had to contend with manuals, regulations, product directions, labels, computer screen printouts, and a variety of other materials.

Mikulecky concluded that there is little similarity between the reading done by high school students and that done by middle level occupations studied, nor between reading in technical colleges and the reading required by the occupations for which the colleges prepare students. One can also see that the corollary is also true. Reading skills developed on the job are not the same as the reading skills needed during recurrent classroom training.

What are Essential Skills?

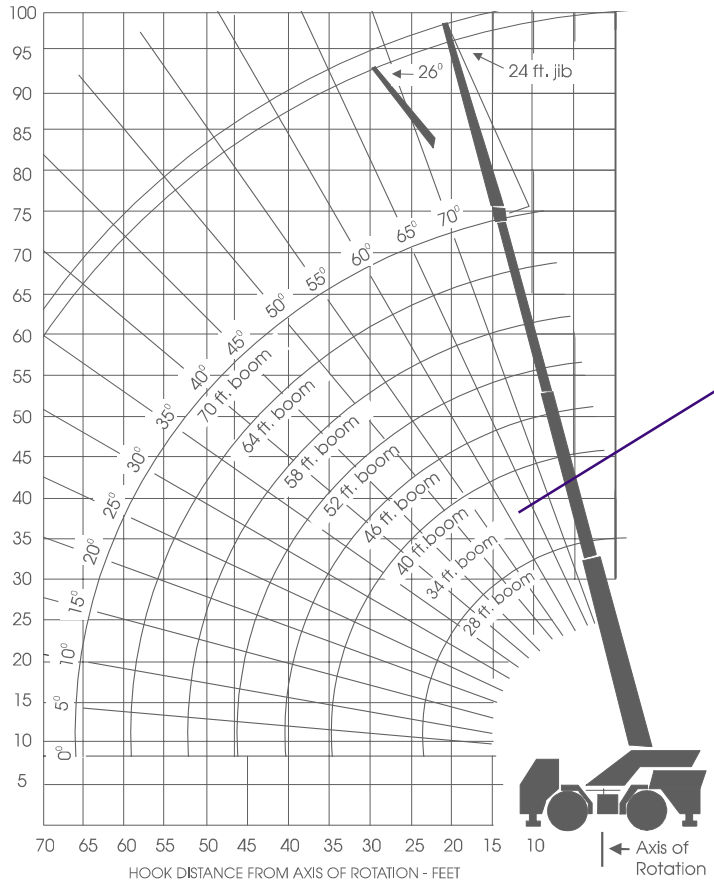
Essential skills are enabling skills that allow people to perform the tasks required in their occupations and provide them with a foundation for learning job-specific skills. For the purpose of setting skill standards in Canada, the 'essential skills profiles' developed as part of the Human Resources Development Canada (HRDC) *Essential Skills Research Project* include descriptions in the following areas:

Reading Text
Writing
Oral Communication
Problem Solving
Finding Information
Working with Others
Significant Use of Memory
Job Task Planning and Organizing
Use of Documents
Numeracy
Thinking Skills
Decision Making
Computer Use
Continuous Learning

Document-Use: Critical for Workplace Literacy

The Essential Skills Profiles show that a Mobile Crane Operator requires more complex document use and measurement and calculation math skills than does a Kindergarten Teacher, even though the entry-level requirement for the occupation of Kindergarten Teacher is a university degree (i.e., NOC Skill Level Category A), and a Mobile Crane Operator may enter the occupation with a secondary school diploma and a period of apprenticeship (i.e., NOC Skill Level Category B). The value of the Essential Skills Profiles and the related authentic workplace materials is that they consider the complexity level of each essential skill independently.

For more information about NOC and Essential Skills levels, see the user guide for the *Authentic Materials Collection* at:
www15.hrdc-drhc.gc.ca/awm/main/c_ap_relations_e.asp



Rated Lifting Capacities In Pounds
28 ft. - 70 ft. Boom

Radius In Feet	Outriggers Fully Extended - 360° Boom Length In Feet								* On Rubber	
	28	34	40	46	52	58	64	70	Over Front	Over Side
12	30,000	30,000	30,000	29,800	27,800				24,500	14,800
15	27,500	27,500	27,500	27,500	27,000	25,750	23,700		16,600	9,800
20	21,250	21,250	21,000	21,000	20,750	20,500	20,400	20,250	10,300	5,450
25		15,500	15,500	15,500	15,500	15,500	15,000	15,000	6,650	3,660
30			11,700	11,700	11,700	1				
35				8,650	8,650					
40				6,650	6,650					
45					5,250					
50										
55										
60										
65										
66.5					A6-829-00					

Capacities appearing above are based upon structural strength
Capacities do not exceed 85% of tipping loads.

The Load Chart relates load capacity to boom length and lifting radius using an involved 'intersecting list' structure. In the model of cognitive complexity used by Statistics Canada for the IALS study, the intersecting list rates highest for complexity among such list structures. The Kindergarten Teacher's daily register, a combined list, is a much simpler document.

NOTES TO LIFTING CAPACITIES

1.Rated lifting capacities are based on freely suspended loads. They are the maximum covered by the manufacturer's warranty with the machine leveled and standing on a firm supporting surface. Ratings with outriggers are based on outriggers being extended to their maximum positions

Apprentices are expected to 'read' complex charts for detailed information, often without a sufficient understanding of table structure. The Range Diagram shown on the facing page relates boom angle, lifting radius and boom length, in what is basically a visual representation of a trigonometric function. The Mobile Crane Operator uses this diagram in conjunction with the load chart to solve complex problems involving crane capacity, lifting radius, and boom angle. Nothing in the Kindergarten Teacher's day approaches this level and type of numerical calculation and document-use complexity.

e user depending on operating
g stability, hazardous surround-

centerline of the hoist line or

y, and condition. "On Rubber" loads
n a smooth and level surface only

are based on structural strength of
or the actual operating radius

those shown hereon. Handling of
urnished and installed by Grove

nust not exceed 90% of rated lifting

8.Power-telescoping boom sections must be extended equally at all times. Long cantilever booms can create a tipping condition when in extended and lowered position.

9. The maximum load which may be telescoped is limited by hydraulic pressure, boom angle, boom lubrication, etc. It is safe to attempt to telescope any load within the limits of rated lifting capacity chart.

10.With certain boom and hoist tackle combinations, maximum capacities may not be obtainable with standard cable lengths.

11. With certain boom and load co
Operational safety is not affected b

12. Keep load handling devices a r
boom.

13. If actual boom length is betwe

In the workplace, continuous text passages like these Lifting Capacity Notes are seldom read from beginning to end. Instead, reading in the workplace is driven by the need to find specific pieces of information which are needed to solve problems, make decisons, or complete calculations. The Crane Operator turns to the notes when needed, scanning them for specific information which may modify or explain the quantitative information found in load charts and range diagrams. IALS rated the resulting 'prose' tasks according to the type of match between given and requested information and the presence or absence of distracting information. Searching text for specific information accounts for most workplace reading activity.

* Chart based on 16.00 x 24 tires
pressures.

NOTE: Maximum On Rubber capa
Length.

NOTE: All Load Handling Device
allowances MUST BE MADE for th

Weights are for Grove furnished e

IDENTIFICATION

RT59/59S 1

PCSA CLASS 12-66

Assessing Workplace Essential Skills

TOWES, the Test of Workplace Essential Skills, has been created to assess literacy and numeracy skills needed by specific occupational groups in Canada. To ensure content validity, TOWES assessments are keyed to the content and complexity of job tasks as described in the Essential Skills Profile for that occupation.

TOWES' test items are based on authentic workplace tasks, and to a great extent, contextually relevant documents. All items use a constructed response format that tests skills in the areas of prose literacy, document use, and numeracy.

Test users include employers, adult educators and job transition groups. As part of the testing protocol, they agree to administer the test under standard conditions, share test results with test-takers, and suggest educational opportunities when they fail to meet the occupational skill criteria.

Sample Test Item:

TOWES
TEST OF WORKPLACE ESSENTIAL SKILLS

A painter needs a basic facepiece for a medium-sized 7700 Series respirator.

What is the catalog number for this part? _____

8.2 PREPARE FOR USE

1) Install a new pair of air-purifying elements.

2) Perform a fit check to make sure that components are functioning properly.

9. REPLACEMENT PARTS

COMPLETE ASSEMBLIES		
CATALOG NUMBER		DESCRIPTION
5500 SERIES	7700 SERIES	
5500-30S	7700-30S	Facepiece Assembly Complete, Small
5500-30M	7700-30M	Facepiece Assembly Complete, Medium
5500-30L	7700-30L	Facepiece Assembly Complete, Large

COMPONENTS (See Figure 11.)			
ITEM	CATALOG NUMBER		DESCRIPTION
	5500 SERIES	7700 SERIES	
1	7700-16	7700-16	Inhalation Connector
2	7700-17	7700-17	Inhalation Valve
3	7700-18	7700-18	Exhalation Valve
4	7700-19	7700-19	Exhalation Valve Seat
5	7700-20	7700-20	Exhalation Valve Guard
6	5500-92	7700-92	Cradle Suspension System
7	5500-11S	7700-11S	Basic Facepiece, Small
7	5500-11M	7700-11M	Basic Facepiece, Medium
7	5500-11L	7700-11L	Basic Facepiece, Large

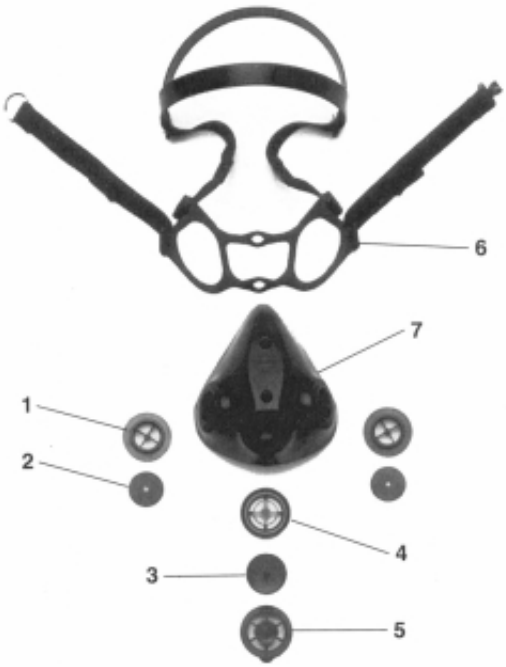


Figure 1.1