

Up-skilling the New Zealand construction industry: a critique of the learning options

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Abstract

Education for the building and construction industry in New Zealand is facing a considerable shift in scale because of the requirement for builder licensing by 2010. The Department of Building and Housing has authorised five educational options for the industry up-skilling programme: self-directed learning, reading materials provided by the Registrar, receiving formal instruction, attending an information session, or any other activity considered by the Registrar to be relevant. This paper questions the efficacy of two of these options based on research that was undertaken in 2005 to identify the preferred learning styles of those in the construction industry. We conclude that the options 'self-directed learning' and 'reading materials provided by the Registrar' will not provide pathways to educational qualifications, but may be barriers to the success of the up-skilling project.

Keywords: Learning styles, Builder licensing requirements, New Zealand

1. Introduction

Education for the building and construction industry in New Zealand is facing a considerable shift in scale. A significant number of professionals must be licensed by 2010. This new licensing system has been introduced to address a number of recent building failures in New Zealand. Problems with building quality appear to have arisen from a number of causes, such as: a move away from prescriptive standards to a performance-based building code, the growth of more complex residential buildings and the rapid development of new technologies, materials and systems [1].

However, from an educational perspective, the most glaring cause of complaint in the industry during the last 15 years has been the removal of formal educational requirements for builders. Therefore, the need to up-skill the construction industry is perceived as a primary solution to an endemic problem. Consequently, the Department of Building and Housing (DBH) has introduced a new licensing system, based upon nationally recognised standards of competence [1].

It is reported that in 2006 less than 50% of employees or owners in the construction industry had formal qualifications. These numbers are more staggering for the builders and carpenters. Only 35% had a formal education, which means that 65% of builders will require some educational support to meet the new industry requirements by 2010.

The DBH [1] has determined a programme for up-skilling the building and construction sector which includes a number of learning options:

1. self-directed learning,
2. reading materials provided by the Registrar,
3. receiving formal instruction,
4. attending an information session, or
5. any other activity considered by the Registrar to be relevant.

The balance of this paper attempts assess the efficacy of the proposed learning options in light of available data concerning the preferred learning styles of the building sector. Section 2 describes research undertaken in 2005 concerning the preferred learning styles of a sample of the building sector in New Zealand. The section provides a brief overview of the learning styles literature that underpins the objectives and methodology of the study. Sections 3 and 4 discuss the findings of the study in relation to two of the proposed learning options; self-directed learning and reading materials. Section 5 speculates on the outcome of the industry up-skilling project.

2. New Zealand building sector learning-styles study

In 2005 a team of researchers from the Centre for Property and Construction Research, Unitec New Zealand explored the learning preferences of the building industry in order to design a teaching model specifically for the building and construction industry [2]. The study included representatives of four stakeholder groups within the sector:

- apprentices
- experienced trades people
- building company principals
- building control officers.

If the extent of the literature is an indicator, educationalists believe that student learning styles are important (see Coffield et al, 2005 for an extensive review). Popular examples of learning-styles profiles are based on the process of learning suggested by Kolb [3]. In these models learners are attracted or repelled by individual preferences and expectations. For example, the

‘reflector’ needs time to think through the implications of any new material and is thus repelled by the necessity of having to provide evidence of instant learning. The ‘activist’ is repelled by excess detail when learning new material and prefers to focus on uncluttered tasks.

The social dimension of learning was identified in the 1970s. Witkin, Moore, Goodenough, and Cox [4] suggest that children learn through a variety of social factors: learning alone, learning with peers, or learning with teachers. They developed a dichotomy model based on dependency. Field-dependent children prefer learning in groups and with teachers setting the agenda and structure of the learning outcomes. On the other hand, field-independent learners prefer independent activity, self-defined goals, and structuring their own learning.

Another stream of learning-styles research focuses on learning preferences which are a series of ‘information processing habits’. Bandler & Grinder [5] suggested that information is accessed through specific senses including through the eyes, ears or hands. Therefore attention needs to be given to learning locations and the kind teaching materials available. For example, learners have preferences for how new information is presented; graphically, verbally, as text or by learning through personal experience.

A wide variety of questionnaires are available to identify learner preferences based on the specific models, usually from a single perspective. An exception is the model developed by Dunn and Dunn which is predicated on a view of learning that integrates the influence of social preferences and preferred information processing modalities [6]. These two types of preferences may be measured using the Productivity Environmental Preference Survey (PEPS) [7].

In the New Zealand construction industry study, representatives of all groups self-administered the 100 question PEPS. About 250 questionnaires were completed. However information concerning individual education qualifications was not requested, so we do not know how many people in this sample would be involved in up-skilling. Therefore, in this paper, we will use the data obtained from 153 building and construction students as a proxy for people who would undertake additional education as part of the industry up-skilling programme.

PEPS is designed to capture social as well as information accessing preferences. The PEPS contains 20 factors. Responses are analyzed to produce a score for each factor, rendering a mean of 50 and a standard deviation of 10. For each of the factors, a score of one standard deviation above or below the mean indicates an element that is significant for the respondent. Factors which fall in the ‘low’ 20 to 40 and ‘high’ 60 to 80 ranges are the factors significant for individual learning-style profiles [7]. Scores between 40 and 60 indicate some other mediating element [8]. Due to limited space only five of the 20 PEPS factors will be discussed in this paper because these factors relate specifically to the proposed DBH up-skilling programme.

3. DBH option 1: self-directed learning and PEPS factors

Self-directed learning is the first education option proposed by the DBH [1]. A cluster of four PEPS factors, **responsible, structure alone/peers and authority figures** provides insights into learning preferences related to self-directed learning.

As noted above one stream of the learning-styles literature suggests that there are two commonly identified types of learner: field-dependent and field-independent [4]. The difference between the two types of learner is the level of ‘other’ support required for learning. Thus, the preferred elements in the environment within which learning takes place are significantly different between the two types (Coffield et al 2005).

Table 1- PEPS factors indicating self-directed learning preferences

PEPS factor	>40 Low score indicative of independent learning	<60 High score indicative of dependent learning
Alone/Peers	A low score indicates that a learner prefers to work alone and may find the company of others distracting.	A high score indicates a strong preference for learning with peers because talking aids learning and understanding.
Authority Figures	A low score indicates a learner prefers to ‘get on with it’ and does not want continuous guidance.	A high score indicates that a learner prefers to work with an instructor or expert present.
Responsible	A low score means that a learner is less willing to follow instructions and prefers to carry out tasks they have initiated themselves.	A high score means that a learner requires detailed instructions and will normally attempt to complete the required tasks.
Structure	A low score indicates that a learner prefers to work out the details of a task and prefers to interpret the necessary requirements.	A high score implies that a learner wants the instructor to provide a large amount of detail so that no interpretation is required; timelines, itemised resource lists, and criteria for successful completion of tasks.

Table 1, based on what the PEPS factors, shows that low scores indicate field-independent learners and high scores indicate field-dependent learners. Field-independent learners prefer to initiate and design their own tasks while working alone and only having input from teachers once they have completed a task. Field-dependent learners prefer working with their peers on assigned tasks that have detailed instructions while having constant interaction with an instructor [4].

3.1 PEPS factors: Alone/Peers and Authority Figures

As noted the New Zealand study did not collect data on qualifications of the participants in each of the four stakeholder categories. However, we know that students are in the process of 'up-skilling' and thus, an analysis of their learning preferences may provide some insights into the possible success of the DBH up-skilling project [1]. The 153 building and construction students all had some connection with a tertiary educational institution in one of three New Zealand cities. The range in age was 16 to 45 and students were enrolled in courses ranging from pre-carpentry to Bachelor of Construction. Only one student was female. However, analysis of the data from this pragmatic sample indicates that little difference was noted in any sub-set [10].

The PEPS factor *Alone/Peers* has highest level of preference in this study. 80 individuals or just over half of all students (52.3%), the largest single group in this study, prefer learning with their peers. Only five students in this study indicate a preference for *learning alone*. The next highest number of students indicating a high level of preferences is for the PEPS factor *Authority Figures*. 76 (49.7%) of the 153 students have a strong preference for learning with authority figures close at hand to constantly provide feedback on student progress.

These findings concur with a study of construction students in the USA. Choudhury [11] introduced Reciprocal Peer Tutoring (RPT) to construction students in classes over three semesters at Texas A&M. Small groups followed a set protocol of devising questions and quizzing one another and handing in correct answers to the teacher during class time. The Choudhury experiment models the preferences of the New Zealand construction students to work with peers in close proximity of an instructor.

3.2 PEPS factors: Responsibility and Structure

There appears to be little tendency within the sample towards taking individual responsibility for learning. In relation to the PEPS factor *Responsibility*, only about 12 % of respondents, 24, have a score below 40 indicating a preference for personal decision-making in relation to learning. On the other hand 64 students (41%) have a marked preference for following detailed instructions to completion of learning tasks. The PEPS factor *Structure* has a similarly high level of preference in this study. 74 individuals (48.4%) of all students prefer learning materials to be structured. In addition, the trend line is 60. Taking these two factors together implies that the majority of students in this study want well-defined learning outcomes, task completion timetables and assignments with an absence of ambiguity. As well they want instructors close at hand to check the progress of learning tasks that have a single learning outcome.

These learning preferences for New Zealand building students are not unusual. For example, accommodation of high levels of structure with low levels of personal responsibility is evident in a Toolkit designed for construction instructors in the UK [12]. An eighteen slide presentation provides students with a virtual tour of dry rot in a building. In addition, each slide poses a question to direct student attention to important points and to maximise their observation capabilities. The limited number of slides provides a high degree of structure, while the

questions indicate that the responsibility for knowing what is important remains with the instructor.

How do educationalists account for the need for a high degree of structure, plus a desire for sharing the responsibility for learning with peers and instructors? One explanation is that the majority of construction students in this study are surface, not deep learners [13]. Deep learners seek an understanding of what they are learning and need to be able to fit it into their cognitive structure. Surface learners focus on completing a task. The results of this study are indicative of the learning preferences of surface learners. While surface learning may not be the expectation of educators, it seems to be a common preference for construction students in Hong Kong [14] as well as New Zealand.

Whether or not the students in this study are surface learners, the preferences indicated by a majority of students in this study do not meet the criteria of independent learners. Thus, the ideal of an independent learner who works alone and takes responsibility for designing and completing learning tasks as suggested in the DBH [1] option for 'self-directed learning' is problematic. Based on the findings of this study, DBH option 1 will not be chosen by a majority of the industry to move forward the up-skilling project.

4. DBH option 2: reading materials provided by the Registrar in relation to PEPS and VARK factors

The second suggested education option to up-skill the construction industry in New Zealand is 'reading materials provided by the Registrar' [1]. As this option is very specific in what kind of learning is being offered, it would be prudent to gain a more accurate definition of the meaning of this information accessing modality [6].

The principle assumption of learning styles theory is that learning is a transformative process [13]. Information is presented, then internalised and transformed by individual cognitive processes to become individualised knowledge which can in turn be presented as information [8]. Bandler & Grinder [5] suggest that if information is not presented in a format that the learner prefers, then the information is probably ignored. However, the four information accessing modalities - auditory, visual, tactile and kinaesthetic - are the least used factors in the numerous learning-styles models according to Coffield et al. [9]. The difficulty in defining and then measuring a modality may be the reason.

In the PEPS model the distinctions between each modality are simplistic. However, a more accurate description of information accessing modalities is currently to be found on the VARK internet website [15]. Table 2 illustrates the difficulty of comparing different models, but it does seem important to do because of the additional insights that may become apparent concerning construction student preferred learning styles.

This paper will focus on two factors that appear to be significant to the New Zealand construction industry; visual and tactile modalities. Visual learning seems self-explanatory--

learning by seeing. In the PEPS model *Visual* has the specific meaning of learning through the process of reading. The Fleming model shifts the focus from the process of reading to the packaging of the reading material suggesting that it should include drawings and images [15].

Table 2 - Comparison between PEPS and VARK factors for information accessing modalities

PEPS	Visual	Auditory	Tactile	Kinesthetic
	The learner transforms information into knowledge by reading.	The learner transforms information into knowledge by listening.	The learner transforms information into knowledge by handling and manipulating instructional resources.	The learner transforms information into knowledge by active involvement and experience.
VARK	Visual	Aural	Read/Write	Kinesthetic
	The learner prefers the emphasis to be on the packaging of information: attractive shapes, colours and contrasting spacing composition. The learner transforms information into knowledge by making drawings or images.	The learner prefers information to be heard. The learner transforms the information into knowledge by telling somebody else.	The learner prefers information to be in the form of dense text. The learner will probably verify the information heard or seen by finding it in written form. The learner transforms information into knowledge by creating a written text.	The learner does not accept ideas presented as abstractions which the learner can not experience. The learner transforms information into knowledge by observing then doing.

In the PEPS model *Tactile* learners are advised to write as a way of satisfying the need to learn by handling instructional resources, one example might be to write what has been read [7]. Fleming creates a new category by combining the *Visual* and *Tactile* factors of PEPS to a Read/Write modality to describe the process [15]. Thus, even though both models use common words to indicate information accessing modalities, the models appear to provide significantly different process explanations. The PEPS model implies a single sense transformation process whereas the VARK model describes linkages between a number of modalities in the transformation process. For example, people who prefer to learn by reading will also need to

write what they have heard thus transforming information accessed through the ears into knowledge using both eyes and hands [15].

These definitional shifts between the two models may relate to the currency of the model. The Dunn and Dunn model was initially developed over 30 years ago [6]. Much research into learning-styles has been undertaken since then [9] and if the constructs are valid, then it would be expected that newer and clearer definitions of the learning process would be expected as suggested in the VARK model [13, 15].

4.1 PEPS and VARK information accessing modalities

As noted in Figure 1 a significant number of students in this study appear to have rejected *Visual* as a preferred mode of accessing information. Fewer than 5% of students preferred the *Visual* mode, but almost 15% rejected it outright and the majority of student scores were below the mean [10].

It may be that the obvious lack of preference for the PEPS *Visual* modality is an indication that construction students prefer the VARK definition of how information should be presented. Abdelhamid [16] found that construction students showed a marked preference for visual information defined as ‘pictures, diagrams, graphs, demonstrations’ in his study of Michigan State University construction management students. The US students appear to have the same preferences as the NZ students, if reading must be done, then the material should be visually ideographic.

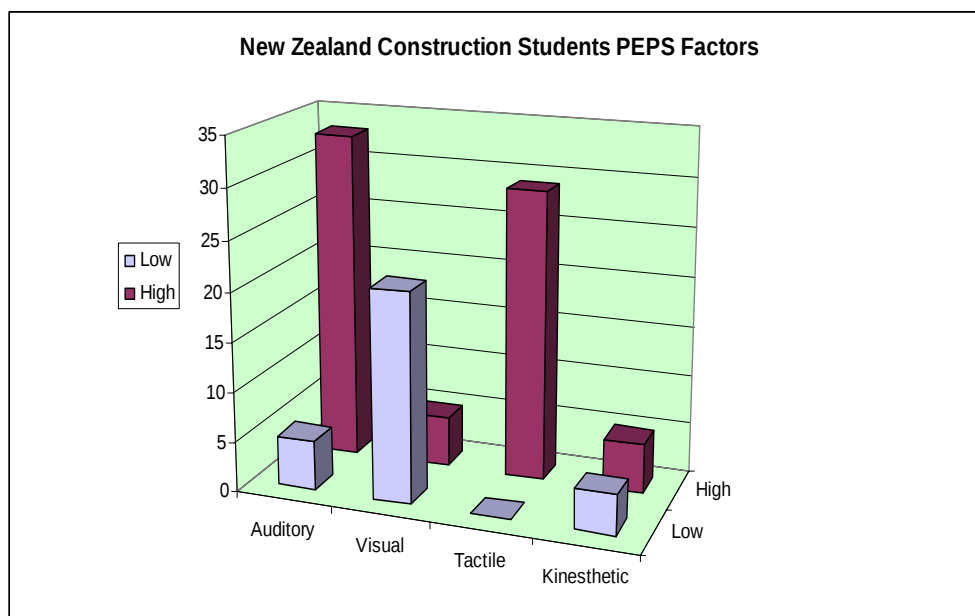


Figure 1 - Information accessing modality preferences of New Zealand building students

Figure 1 shows that the students in this study did not indicate an obviously negative response to *Auditory*, *Tactile* or *Kinaesthetic* modalities. Although the number of students with decided

preference for *Auditory* and *Tactile* are not great, only about 20% each, the mean for both was toward 60 rather than towards 40. And indeed not one student rejected *Tactile* as way of accessing information.

In a ‘hands-on’ industry such as construction, it comes as no surprise that students prefer to learn in ways that allow them to observe and try. Murray et al. [12] describe the SLICE Lecturers’ Toolkit. This initiative appears to be based on the perception that students learn in a variety of ways and construction students prefer visual as defined in VARK and tactile information accessing as defined in PEPS. Their course content is in the form of workbooks, so students can use their tactile preference. The workbook is highly visual ‘containing 22 colour photographs and 12 professional-level drawings. And learners are able to write in their workbook, either to satisfy a need for *Tactile* experience (PEPS) or a *Read/Write* information transformation process (VARK).

On the other hand, Dunn claims that ‘many adult males are neither auditory nor visual learners and some remain essentially tactile or kinesthetic all their lives’ [6]. If this is the case, it may account for the rejection of *Visual* as a modality of learning with this group. However, it is difficult to interpret the meaning of the low levels of preference for *Kinesthetic* information accessing found in this study of 152 male building students if the Dunn contention is true. At the same time the results may only be a reflection of the criticisms by some scholars that the PEPS lacks clarity as a survey instrument [9].

Another explanation for these difficult to interpret results may be the lack of compatibility between student preferred learning styles and the data collection process. Completing an unfamiliar questionnaire is a learning task. For example, the questionnaire required students to read text but not to write, and peer consultation was not encouraged. Maybe the learning environment that the building students prefer was absent while they completed the questionnaire, thus making learning difficult for some students. We can only speculate, but it does seem possible that if students had been able to talk with their peers and ask questions of instructors; if students could have written, drawn and found ways to tell others about the meaning of “I can sit in one place for a long time.”, then their scores for preferred information accessing factors may have been different.

Which returns us to the question of the appropriateness of the DBH [1] providing ‘reading materials’ as an educational option to ensure a competent building and construction industry. Even with the flawed PEPS instrument and difficulty of interpretation, construction students in this study clearly do not prefer to access information through text. Many of the students in this study appear to outright reject reading as a way of learning. But the extent of the problem appears to be more wide-spread because all groups in the exploration of construction industry learning styles indicated an aversion to visual information accessing [2]. Thus, educational options available for up-skilling the New Zealand industry must use other information accessing modalities.

5. Conclusion

We began this paper by asking the question the efficacy of the educational options proposed by the DBH in their attempt to expedite up-skilling of the New Zealand building industry. By focusing on two options in relation to the preferred learning styles of a sample of building students, we have concluded that these two options may prove to be a barrier rather than a pathway to a competent and formally educated workforce.

The first DBH educational option is 'self-directed study'. All stakeholders in this research preferred learning with peers in the presence of an instructor. The students in the study did not overwhelmingly prefer to design and carry out independent study. They wanted highly structured learning materials that detailed both inputs and outcomes.

The second DBH educational option is 'reading materials provided by the Registrar'. Participants in this research rejected text or reading as a preferred option of paying attention to information or transforming the information into personal knowledge.

It appears that DBH option one and option two are exactly the opposite of the educational alternatives that would provide successful pathways to up-skilling the building sector. Although this discussion focused on building students, data were also collected from a variety of other occupations such as fitters and plumbers, electricians, engineers, architects and building inspectors. We found a similarity between the builders and the other occupations but the number of responses was too small to make definite comparisons. However, if even a small number of other occupations have similar preferences, it could be argued that success of the construction industry up-skilling programme is more likely if an education opportunity takes into account the preferred learning-styles of the sector [9].

In addition the findings of this study have implications for a wider audience. Students in all subject areas that are encompassed in the field of the Built Environment may have learning preferences similar to the students in this study. If this is the case, then traditional classroom practice [12], as well as the push for use of distance learning, needs to be re-examined for effectiveness.

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