Industry demands for more relevant education and training, coupled with decreasing interest in construction–related university courses, have triggered re-thinks of traditional teaching-learning modalities. This paper draws on innovations from Hong Kong, Singapore and the UK, to give examples of appropriate education and training initiatives to address such needs. A study of learning approaches by construction students in Hong Kong illustrates the importance of identifying appropriate teaching-learning strategies at the outset. Two web-based platforms are presented for stimulating undergraduate learning through virtual site visits; and information & knowledge management of construction industry personnel. Two programmes that promote inter-disciplinary teamworking at undergraduate level are also introduced. Two initiatives involving students in Singapore indicate how they may be mobilised to evaluate the work of their peers, including group-mates. The initiatives from the UK aim to improve critical government-industry-academia interfaces, in formulating an ‘innovation generation and diffusion framework’ and ‘knowledge transfer partnerships’. While presenting specific initiatives, this paper does not prescribe any panaceas. Instead, it illustrates the general imperative for significant and continuous changes in construction engineering education and training, provides useful examples from three regions, and indeed this overall example of learning from each other through such consolidated comparisons.

1. INTRODUCTION

Recent recommendations for construction industry reforms in many countries[1-5], have highlighted the needs for dramatic realignments of project structures and cultures. Innovative structural arrangements for project procurement and implementation, by themselves require realigned mind-sets and approaches among project participants. Such radical changes cannot be achieved overnight, and indeed need building up from bottom-up inputs into the education and training of those entering the construction industry.

For example, performance gains are expected from unlocking potential efficiencies through integrated teams and relational approaches[4,6] as confirmed by recent surveys in Australia, Hong Kong, Netherlands, Singapore and the United Kingdom[7]. However, mobilising such efficiencies requires radical realignments of individual attitudes based on the imperatives for joint approaches to the cross-functional and inter-disciplinary processes needed in increasingly complex construction projects. These realignments, in turn require specific initiatives to pull and uplift education and training protocols away from hitherto compartmentalised programmes within disciplines that perpetuate professional stereotypes and mutual mistrust.

Furthermore, declines have been noted in the numbers of school-leavers being attracted to construction industry related courses in many countries. While the reasons have not been formally explored as yet, anecdotal comparisons point to many factors, such as perceived difficulties of the courses themselves e.g. of a need for advanced mathematical skills in engineering courses; as well as apprehensions of the ‘dirty, difficult and dangerous’ perceptions of the construction industry[8], and a notoriety for high pressure short term projects, disputes, long working hours and high stress levels[9]. For example, the Institution of Civil Engineers in the UK recently projected a large gap that will arise in a few years between civil engineers retiring from the industry and those entering the profession; while Carter[10] compared the need to recruit 36,400 white collar workers to the construction industry by 2010, with falling numbers of applicants to built environment degrees and lower retention levels of graduates in the industry. In Hong Kong too, civil engineering courses for example, attract less highly qualified secondary school leavers compared to previous years, while some graduates actively consider, if not move to other professions, such as in banking and accountancy.

It therefore appears that special initiatives are needed to attract and retain more good quality people in construction industries worldwide. This paper
examines a cross-section of some innovative education and training initiatives in Hong Kong, Singapore and the UK. These include (a) assessments of learning motivations and strategies of construction students; (b) initiatives for increasing group work and interdisciplinary interactions; as well as for evaluating peers, including group-mates; (c) web-based platforms for accelerating learning, as well as for improving information & knowledge management and boosting interactions between construction organisations; and also (d) for promoting partnerships between industry, academia and government organisations for enhancing research, development and dissemination (RD&D). Benefits of such international comparisons and cross-fertilisations are evident. Although region-specific initiatives must continue to address local priorities and suit local conditions, they could be better informed, and thus better formulated, based on lessons learned elsewhere.

**2. SOME HONG KONG BASED INITIATIVES**

This section summarises relevant outcomes from initiatives to (1) assess the learning approaches of construction students in Hong Kong, (2) facilitate virtual site visits for such students (3) provide real inter-disciplinary working experience for engineering and architecture students, and (4) improve information & knowledge flows and management, and to provide training for performance improvement through organisational interactions and benchmarking.

**2.1 Initiative to Evaluate Learning Approaches**

Declining student intake numbers and apparent drops in interest in construction related education, could be arising from many sources, including perceptions of dropping career prospects in terms of remuneration, quality of life and even ‘social status’, vis a vis other courses such as in business, finance or law; and also on how interesting/ difficult such courses may seem. Experience indicates that some of these perceptions are based on feedback from students who are presently on, or those who have recently completed such courses. Furthermore, curriculum development in general, and more specifically the significant changes needed in traditional teaching-learning modalities to meet the bottom-up demands for industry transformations as outlined in the Introduction, require an initial assessment of the current learning approaches of construction students.

While a course-specific assessment of how best to realign the curricula and teaching-learning mechanisms will be needed, this can draw on general studies like the initiative by Leung et al.[11], who surveyed construction students in five departments across the universities in Hong Kong. They hypothesised nine possible learning approaches, corresponding to the cells in a 3x3 matrix framework of three learning motives and three learning strategies.

This was based on the Biggs study process questionnaire, as assessed and adapted by Leung et al.[11], from a series of documents that they cited, authored by J.B. Biggs, including two published in 1987 by the Australian Council for Educational Research, entitled ‘Student Approaches to Learning and Studying’; and ‘Study Process Questionnaire Manual’. The three learning motives were named surface motive, deep motive and achieving motive respectively, while the three learning strategies were named surface strategy, deep strategy and achieving strategy respectively. The resulting nine approaches that combined a given motive with a given strategy, were called surface, discouragement, avoid failure, encouragement, deep, achieve success, fear of failure, hardworking and achieving. Space precludes detailed descriptions, that are anyway provided by Leung et al.[11].

Although statistical analysis indicated some differences between the five construction student groups in Hong Kong, in general the ‘achieve success’ and ‘avoid failure’ approaches were the most common; while the surface, discouragement, encouragement and deep approaches were also used by some students in different universities. Based on the data obtained and further analysis, the researchers also identified factors that both teachers and students need to pay attention to, in order to improve learning approaches e.g. ‘ownership of learning’ and ‘metacognitive learning skills’ for Group 1 students; ‘ownership of tasks’, ‘mastery learning’, ‘simple study techniques’ and ‘metacognitive learning skills’ for Group 2 students; ‘extrinsic motivation’, ‘warm classroom climate’, ‘involvement of task’, ‘mastery learning’, ‘simple study techniques’ and ‘metacognitive learning skills’ for Group 3 students etc. These indicate that the factors facilitating learning would vary between groups in the same region, and that group-specific approaches to teaching-learning may thus be valuable, although a general approach could be targeted based on a broad assessment. A lesson learned from the work of Leung et al.[11] lies in the need for an initial assessment of student learning approaches, before formulating the teaching-learning strategies and approaches that have been seen to be critical in facilitating the changing needs of construction education and of the construction industry itself.

**2.2 Initiative to Simulate Site Visits and Students’ Learning**

One of the ways to stimulate learning among students who may have been initially attracted to construction courses by spectacular infrastructure projects that have been rapidly transforming East Asian skylines for example, is to keep alive such interests through site visits. These would also reinforce the principles taught and practices talked about in their courses. Hong Kong was well positioned to do that with the boom in

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themselves been initiated in many subject areas. By themselves, successful PBL applications have been reported in disciplines starting with medicine, e.g. in universities in Canada with community oriented PBL[13] and in Hong Kong where PBL was seen to work even with students who came from a didactic learning background[16]; as well as in construction e.g. at the University of Newcastle in Australia. PBL targets a type of ‘bottom-up’ learning by requiring students to seek out and apply knowledge needed to solve real-life problems. Advantages of this approach include better
Figure 1. CIVCAL opening page

Figure 2. Opening page in the University of Hong Kong domain, with top row tabs leading to 13 ‘Projects’ while ‘More’ leads to 12 ‘Topics’
Figure 3. Second! Continuation Opening page in the University of Hong Kong domain, with top row tabs leading to12 'Topics'.

Figure 4. Thumbnail images and top part of basic Data from a sample exercise in Time Study (a sub-topic under the 'Construction Work Study' topic).
Figure 5. Image at the end of a Video Clip that shows one activity in the Concreting Cycle as observed during the Time Study under the 'Construction Work Study' topic.

Figure 6. Opening page of SMILE-SMC web-site.
appreciation of the value of such knowledge and higher probabilities of retaining what one has sought out oneself. In a combined initiative synergising group work with PBL, second year students in Civil Engineering at The University of Hong Kong are assigned in groups of around six, to solve multi-dimensional real-life problems, usually on feasibility studies for a potential development (recent examples include: a sports stadium, a cruise terminal, a special ‘district’ [combined for a whole district] cooling system, centralised automated refuse collection system, and a multi-purpose cultural centre), in a subject named ‘Engineering Design & Communication’ (ED&C). They are expected to assume roles such as architect, structural engineer, quantity surveyor, environmental engineer, geotechnical engineer or whatever other discipline is needed for the assignment; and to work as a team simulating a multi-disciplinary ‘consultancy company’. The technical outputs are by no means the only outcomes expected from such exercises. As implied in the ‘Communication’ part of the subject title, equal importance is assigned to the development of capacities to communicate better both within each group, and in group presentations to their ‘client’ (role played by a supervisory academic with an industry counterpart). Furthermore, the groups get a chance to build actual working teams. The literature shows that merely naming a project work group as a team, does not make them one, since the common purpose, goals and approach, as well as mutual accountability are critical in the latter [17].

While group-members play virtual roles e.g. as architects in the above second year exercises at the Department of Civil Engineering of The University of Hong Kong, they are elevated into a more realistic inter-disciplinary work situation in their third year. Here they form groups of about eight that include about two each of architecture and building services engineering undergraduates in an ‘Inter-Disciplinary Design Project’ (IDDP). They thus acquire first-hand experience of the pleasures and pains of working with other disciplines, which may often impose unexpected demands, such as to suddenly change an agreed design concept, or ask awkward questions e.g. as to why a certain type of roof span or column spacing cannot be increased, or why exactly an unfamiliar material cannot be used. Such questions may require revisiting fundamental theories and the basis for codes of practice or traditional rules of thumb, in order to provide acceptable explanations, or indeed to trigger innovative solutions. The process itself provides valuable learning outcomes, as has been appreciated judging from the feedback from the students towards the end of these projects. Such exposure to the thought processes and ‘language’ of other sub-groups widens their learning horizons. The common goals to complete a good project in time also inculcate the need for efficient teamworkng before students enter industry; while working together helps to replace stereotyping with mutual respect for other disciplines, and for multi-skilling, as is increasingly important in the industry.

2.4 Initiative to Improve Information & Knowledge Exchange and Performance Levels

A particular initiative for improving information & knowledge management, and boosting beneficial interactions and performance levels in the construction industry was launched by The University of Hong Kong (HKU) in late 2003. Named SMILE-SMC (‘Strategic Management with Information Leveraged Excellence’ for ‘Small and Medium Contractors’), it first focused on small & medium construction enterprises (SMEs), based on the facts that they ultimately carry out most of the actual work, while they often receive less attention and rewards, and thus have the least time and resources to improve themselves. For example, the value of sub-contracted work can be as high as 90% [18] in general; 95% of construction firms in the UK employ fewer than 10 people [19]; while 98.6% of construction firms in Hong Kong employ less than 50 people [20], which is the cut-off number below which they are considered SMEs. Industry improvements must thus necessarily target the training and development of this important but often neglected group.

SMILE-SMC was thus designed to empower the continuous improvement of small firms by providing a ‘SME-friendly’ Information & Knowledge Management (IKM) framework and innovative tools for continuous improvement in boosting productivity, quality and image, through strategic IKM. For example, savings are envisaged through faster access to critical information (e.g. on new business opportunities, and on changes/ variations in ongoing projects) reduced wastage (of resources) and less rework (in rectifying substandard or defective works). Information on specific objectives and development methodology are available elsewhere [20]. As described therein, many industry partners, including contractor associations, government bodies and ‘partner contractors’ contributed to the planning and carrying out of the R&D by the HKU SMILE-SMC team that led to the specific information & knowledge exchange, self-improvement and training tools that are now available in SMILE-SMC. The opening page of the web-site is at http://smile.hku.hk/ (Figure 6).

A ‘Trial Period’ was provided up to 31 December 2006. Even after this, the front-end and major parts of the web-site are available to any ‘visitor’; while some specially developed inner parts are restricted to ‘members’. Such members will need to pay a nominal annual fee, so as to finance the Operation & Maintenance, essential up-dating and any possible upgrading. Basic information is available to any visitor, but membership will enable additional and direct benefits, such as being able to publicise one’s
own services and/or needs to all those who visit the web-site. The following list summarises the ‘business’ and ‘process’ solutions offered by SMILE-SMC to help SCEs in boosting their competitiveness, productivity and image, e.g. in sourcing new business partners through the first three zones. Services are provided in six broad ‘zones’: Member Zone, Wanted Zone, Available Zone, Information Library, Discussion Forum and Performance Improvement. Other important features of the SMILE website include the, ‘News and Events’, a section for ‘search’, a section for ‘downloads’ and the self-learning package.

1. **Member Zone**: (a) members can publicise company information including descriptions of up to 5 projects; while (b) all who access the web-site can search for potential business ‘partners’

2. **Wanted Zone**: (a) contains messages on services, information, materials and people needed by members; since (b) members can advertise their own needs in ‘wanted’ messages

3. **Available Zone**: (a) will have messages on services, equipment and materials available with members; since (b) members can advertise their own ‘available’ items

4. **Information Library**: contains useful construction industry information, collected from various sources, while special information has been stored with specially designed flow-charts, check-lists etc. for later use by members, with a target to build this further into a valuable ‘one-stop’ information source

5. **Discussion Forum**: members can exchange ideas on hot topics and common concerns

6. **Performance Improvement Zone**: contains ideas on how IKM can improve performance levels, e.g. through special tools and plug-ins, such as for more efficient ‘electronic information exchange’ with sites and partners, convenient formats for capturing and retrieving operational and business information e.g. in purchasing, materials management and benchmarking platforms; all of which can be made available to members.

For example, the EIE (Electronic Information Exchange) has been developed to optimise email based communication across the construction supply chain. It targets avoiding duplication of data entry so as to reduce errors and improve efficiency. This requires the integration of functions across different departments e.g. component & material specifications (Design Dept.), order placing (Purchasing Dept.), order processing, manufacture & delivery (manufacturer), site installation (site engineers). The data to be exchanged can range from a purchase order specification for a construction component (e.g. window), to submitting daily site records from construction sites to head office, and issuing requests for information (RFIs). One of the major contributions of the EIE solution is to develop XML schemas for these construction processes. This would empower performance improvement in the context of communication and collaboration.

Benchmarking tools did not emerge as high priority items, during the needs analysis surveys, full Team meetings with ‘partner contractors’ and collaborating industry organisations, and the Development and Dissemination Workshops with the broader industry. Still internal benchmarking is recommended to start with i.e. within a company, across its own past and current projects, given the apparent reluctance for benchmarking between companies. Such reluctance for cross-company benchmarking is neither unexpected nor unusual, given the highly competitive nature of the industry. For example, the authors are aware of an unreported Sydney-based project in Australia that produced a set of useful benchmarking tools which highly placed industry practitioners participated in developing, and then strongly endorsed, but these tools were eventually hardly used. In this case, being ‘too busy’ at operational level and related reluctance to add new ‘forms to fill’ and additional reporting mechanisms were identified as the possible barriers, rather than a mere resistance to cross-company benchmarking, which had been endorsed at higher levels, while the system masked sensitive company specific data.

In the context of benchmarking, referring back to the CIVCAL on ‘construction work study’ described in a previous sub-section, this module also contains results from case-studies that highlight typical under-utilisation levels of resources such as tower cranes, truck mixers and different types (trades) of workers deployed on concreting operations. Highlighting such present low utilisation levels could also trigger initiatives for improvement. Such comparisons could therefore reach beyond teaching-learning, to provide a basis for benchmarking exercises, or as part of a training and continuing professional development package at a wider industry level.

3. **SOME SINGAPORE BASED INITIATIVES**

The examples summarised here focus on assessment. Taking assessment to comprise continuous assessment and final assessment, at the National University of Singapore (NUS), continuous assessment includes term papers, group projects and group tutorial presentations. This section describes some of the innovative initiatives to assess students’ effort in preparing group projects, and to allow students to participate in grading their peers. For comparative purposes and to provide a wider background to the importance of the assessment of learning, this section also includes references and pointers to an ongoing initiative in Australia that also addresses such issues.

For the purpose of discussing these assessment initiatives, it is convenient to consider a hypothetical class of 16 students who are equally divided into four groups (A, B, C and D). The students are labeled as
A1, … A4 (in Group A); B1, … B4 (Group B); C1, … 
C4 (Group C); and D1, … D4 (Group D). Also, the word instructor is taken to mean the subject instructor, who is usually a lecturer or tutor.

3.1 Getting Students to Evaluate their Group-mates

There are many advantages in getting students to work in a group. Some of these include encouraging interactive learning and improving communication skills. These could be the building blocks for the teamwork needed in industry as discussed in previous sections. However, there are disadvantages as well. Chief among these is the problem of ‘free riders’ or ‘social parasites’. Free riders get through the project depending on the extra efforts of others, although this is not ethical. Another major problem is that efforts of individual students are not visible, since the output is a report containing the names of all the students in that group. To overcome these problems, an education initiative to reduce the temptation to be a free-rider and/or to identify free-riders was designed and implemented as described below:

Table 1. Form for evaluating group members’ performance in Group Work

<table>
<thead>
<tr>
<th>Name of group member</th>
<th>Positive contributions of group member</th>
<th>Areas that group member can improve</th>
<th>Overall performance</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Florence Ling</td>
<td>• Searched internet for materials. • Prepared 50% of power point slides</td>
<td>• Should improve English. • Should not miss group discussions.</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>1. Student-evaluator (A1)</td>
<td>Do not rate yourself</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Member A2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Member A3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Member A4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other remarks:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Education initiative to discourage and/or weed out free riders

The instructor sets a group project assignment. Students in each group work together to complete the assignment and submit a joint report. Each individual group member must also submit an evaluation of their group members using the form shown in Table 1. These students evaluate fellow group members and their own strengths and weaknesses during the preparation of the group project. They must not show each other the completed form, and the instructor also promises the students that their evaluations are confidential.

Using student A1 as an example, his continuous assessment grade for the group project is made up of the following:

- The instructor’s rating of the output, which is the group project. In the group activity, students A1, A2, A3 and A4 who worked together would be awarded the same marks, and this component carries a maximum of 30%.
- Average of ratings given by fellow group members (A2, A3 and A4) for Student A1’s performance in the preparation of the group project. Each group member gets a different rating for this item. If Student A1 had been a free rider, his group members would give him very low ratings here. They would also describe any recalcitrant behaviour in the qualitative part of the form under ‘areas that group member can improve’. Such ‘offenders’ have the opportunity to give their own versions, since they are required to state their own contributions [and limitations] in the evaluation form as well. The group members’ ratings are equally weighted with the instructor’s rating (30%) to show the importance of students’ ratings.
- The instructor’s rating of student A1’s evaluation of himself and his group members (A2, A3 and A4), using the form in Table 1. In order to make evaluation meaningful and motivating, the marks awarded for evaluating group members account for a significant portion (40%) of the student’s continuous assessment marks.

Expected learning outcomes

Using this initiative, students are trained to evaluate themselves and other people’s performance. After graduation, they would be better equipped to evaluate their peers and subordinates. They would also know how to look out for positive contributions and ‘give credit’ when and where credit is due. This activity thus trains them to be more effective managers.

Students also learn to observe and make constructive suggestions on how people can improve. This helps them to improve themselves. As future managers, they would be able to identify areas for improvement and for themselves and their subordinates.

Effectiveness of initiative

After this initiative was implemented, complaints about free riders came to an abrupt stop. Students participate fully in group work so that they would not be perceived as free riders. If there are free riders, they have been penalised through the low grades given by group members. Group members feel this is a fair system, and would not be complaining to the instructor. The instructor therefore need not be embroiled in a detective role in trying to find out if someone had been a free rider.

This education initiative is effective in teaching students how to cooperate with team members in their future workplace, through interpersonal facilitation, which is defined as interpersonally oriented behaviours that contribute to organisational goal achievement such as deliberate acts that improve morale and encourage a culture of being more cooperative, considerate and helpful. Students also learn how to work with others, willingly help co-
workers, avoid irritating others, and consider the rights and feelings of others.\(^2\)

It should be noted that this initiative may not be effective if group members are very close friends. They would be less willing to expose their friends who did not put in adequate efforts in group work. To reduce such possibilities, the instructor could assign students to groups randomly.

**Example of an Australian initiative to improve Assessments and Group Work**

While the approach taken in the NUS initiative as described above, incorporates innovative approaches, there are many examples of the importance assigned to assessments in general and group assignments in particular, with some other approaches being noted for comparison. For example, in Australia, the Centre for the Study of Higher Education (CSHE) was tasked by the Australian Universities Teaching Committee to develop resources that are being made available on the Assessing Learning in Australian Universities website [http://www.cshe.unimelb.edu.au/assessinglearning/](http://www.cshe.unimelb.edu.au/assessinglearning/).\(^24\)

As stated therein, in general: “the site is designed to support Australian universities and academic staff in maintaining high quality assessment practices, in particular in responding effectively to new issues in student assessment. The ideas and strategies are focused on the practical educational issues surrounding the purposes and design of student assessment and reporting, in particular the way in which assessment might be planned to optimise student approaches to study.”

In particular, a two year project, funded by the Carrick Foundation examines best practice in group assessment across a range of disciplines with the aim of developing a set of resources – a Web-based toolbox – for teachers and students undertaking collaborative projects. This involves collaboration between the University of Canberra, University of NSW, College of Fine Arts (Sydney) and Macquarie University, hence also providing another good example of inter-university synergies as in the Hong Kong CVIVCAL project described in the previous section. It is developing a ‘Group Assessment Toolbox’ to provide a web site of resources for teachers using group assignments. Current issues are described in [http://www.cshe.unimelb.edu.au/assessinglearning/AssessingLearning.pdf](http://www.cshe.unimelb.edu.au/assessinglearning/AssessingLearning.pdf), with various approaches to teacher and student evaluations of product, process and peers being indicated in [http://www.cshe.unimelb.edu.au/assessinglearning/03/group.html#commonIssues](http://www.cshe.unimelb.edu.au/assessinglearning/03/group.html#commonIssues).

**3.2 Getting Students to Evaluate their Peers’ Performance**

In a tutorial class, an instructor may set a question and a group of students are assigned to prepare and present the answer. If Group A is presenting the answer, students in Groups B, C and D may not pay close attention, or accept the information presented without critical thinking and evaluation. To keep the non-presenting students engaged in Group A’s presentation, an education initiative has been designed to require those not presenting to evaluate the presenters.

**Education initiative: peer evaluation**

For example, when students in Group A are making a presentation in class, students from other groups would evaluate A1, A2, A3 and A4’s presentation on clarity, accuracy and presentation skills, using the form in Table 2. Taking A1 as example, as a student-presenter, he is evaluated by both the instructor and students from Groups B, C and D (student-evaluators). In order to make peer evaluation meaningful and motivating for student-evaluators, the marks awarded by them account for a significant portion of the student-presenter’s continuous assessment marks, and the student-evaluators are also given marks for making an objective evaluation.

<table>
<thead>
<tr>
<th>Please circle an appropriate number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0=Extremely Poor; 6=Average; 8=Good; 10=Excellent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clarity (the extent to which you understood what was presented)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accuracy (correctness of the answer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presentation Skills (public speaking ability)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>

Other comments for the presenter:

Note: items 1 to 3 can be equally weighted, while comments can be considered as needed.

Using student A1 as an example, his continuous assessment grade for the tutorial presentation is made up of the following:

- The instructor’s rating of the presentation using the form in Table 2. The mark awarded by the instructor accounts for 50% of the total marks.
- Average of ratings given by classmates from other groups: B1, … B4 (Group B); C1, … C4 (Group C); and D1, … D4 (Group D). The average mark awarded by student-evaluators takes up another 50% of the total marks.

Student-evaluators also earn marks for evaluating their peers. A student-evaluator (say B1) is awarded a mark for his effort if the mark he awarded to student A1 falls within a specified range (eg ± 5%) of the instructor’s rating. This is to prevent student-evaluators from being biased in their assessments. For example, if they awarded their close friends with high marks or punish their ‘enemies’ with low marks, the student-evaluators will not earn any marks for the evaluation exercise, by virtue to the marks being outside ± 5% of the instructor’s ratings.
Learning outcomes
This method of getting students to evaluate their peers, achieves six identified learning outcomes. Firstly, students demonstrate mastery of the subject and better retention. The formal evaluation by the instructor and student-evaluators require student-presenters to search for additional materials and construct their own knowledge, thus encouraging deep learning. The student-evaluators are also involved in proactive learning because they need to do some work before the presentations in order to evaluate the presenters accurately.

Secondly, students learn how to ‘sell’ their ideas and defend their work. The ability to ‘sell’ one’s idea is important especially when students join the workforce. During the presentations, student-presenters learn how to ‘sell’ their ideas to the instructor and student-evaluators and defend their work.

Thirdly, students learn from one another. In order to give an accurate evaluation, student-evaluators not only have to read up on the presentation topics prior to the presentation, but they also need to listen attentively to the presenters during the presentations. Being attentive during the presentations enable student-evaluators to check their understanding of the topic and pick up new nuggets of information at the same time.

Fourthly, students develop better communication skills. During the presentations, student-presenters must make a conscious effort to communicate effectively as this is an evaluation criterion. While student-presenters learn the nuts and bolts of public speaking through hands-on experience, student-evaluators learn as they observe the presenter closely and conclude what works and what does not. By evaluating their peers, the student-evaluators also improve their own presentation skills.

Fifthly, students acquire the ability to think critically and evaluate objectively. As student-evaluators will only score marks if their gradings are within the specified range from the instructor’s, they have to think critically, learn to respect other people’s ideas and take care that their evaluation is not affected by their own biases or leniency.

Finally, students understand what an achievement-based work ethic is. Student-presenters have to put in extra effort in their preparation because they are graded by both the instructor and their classmates. This gives them a good understanding of achievement-based work ethic, where the reward will be commensurate with the effort, and therefore motivates them in their learning.

Effectiveness of initiative
When the method was first introduced, student-evaluators could earn marks if their ratings fell within ±10% of the instructor’s rating. It was found that when the instructor gave student-evaluators feedback on their rating accuracy, their ability to evaluate objectively improved. Therefore, in subsequent usage of this initiative, student-evaluators only earned marks if their ratings fell within ±5% of the instructor’s ratings.

The students appeared to enjoy learning with this method. Some comments from students are given: “Getting students to evaluate a fellow student’s presentation is an innovative learning method... We were asked to evaluate the presenter. This made us pay full attention.... The new method of earning marks is a great improvement; it encourages students to think critically.”

One limitation of this initiative is that student-evaluators’ ratings are compared to the instructor’s evaluation. Though the instructor’s rating may be a fallible benchmark, it is safe to regard his/her rating as being more reliable than students’ ratings.

4. SOME UK BASED INITIATIVES
This section contains examples of (a) an ongoing improvement programme targeting built environment students in the UK by a large-scale initiative for structured changes[25]; and (b) an initiative launched by the Welsh Enterprise Institute at the University of Glamorgan, targeting the training and development of small and medium construction enterprises (SMEs) for similar reasons as in the SMILE-SMC example from Hong Kong described in a previous section.

4.1 Initiative for ACBEE (Accelerating Change in Built Environment Education)
In 2003, ACBEE was set up to focus on the need for the built environment industry and higher education to attract and suitably educate the needed numbers of graduates for a fast changing industry and greater client demands. ACBEE encourages industry, higher educational institutions and professional bodies to work together towards more relevant education and training. This ties in directly to the process and culture changes discussed as necessary in previous sections, as arising from calls for industry reforms[4].

ACBEE targets the above aim[25] through: (a) promoting successful case studies that demonstrate engagement between industry and higher educational institutions, (b) developing methods of measuring success levels and (c) encouraging courses that demonstrate improved industry performance.

The Chairman’s foreword to the ACBEE Report on phase 3 of their implementation programme[25] outlines their progress to date, including an overall model for industry/academic engagement, a framework for future work and Key Performance Indicators (KPIs), against the backdrop of increasing concerns about both skill shortages and capabilities of education systems to produce the type of educated and trained people needed in the modern economy. Phase 4 of the ACBEE work is expected to provide a proven model of how a good relationship works between
industry and academe. The proposed KPIs are expected to provide measurable and objective indicators that will enable organisations to benchmark their performance across their sector. The constant search for ‘value for money’ and for making a positive impact on the learning experience, drives the development of such KPIs.

4.2 Initiative for Generating and Disseminating Innovations in the Welsh industry

Innovative approaches are needed to deal with the special needs of small and medium construction enterprises (SMEs) as discussed at the outset in the Introduction. Furthermore, it has been found that ‘innovation take-up’ depends crucially on the relationships in the supply chain, between the larger firms and the SMEs. Miller et al.[26] state however, that; ‘distance and self-interest inhibit effective inter-organisation relations’. They concluded that (a) despite a general need to upgrade the capacity of the supply chain, there are obstacles in reaching this goal given current structures and relationships; and (b) therefore, any policy to develop technology transfer networks would need to acknowledge the process of building ‘conduits’ which facilitate the development of inter-firm management skills to build relationships that focus on the collective rather than individual firm. In parallel, ‘relationally integrated supply chains’ and shorter-term ‘relationally integrated project teams’ as envisaged by Rahman and Kumaraswamy [27], are increasingly seen to be feasible and popular, as per the evidence from a multi-country survey launched from Hong Kong and including Australia, the Netherlands, Singapore and the UK [7].

In the context of launching and implementing innovations, it was found in Wales that ‘technology transfer networks’ are one of the best types of fora for SMEs to learn from each other, to exchange experiences, and to diffuse technology. Furthermore, it was felt useful to determine an SME’s needs by evaluating and auditing recent activities and projects; and by drawing-up appropriate new agreements and contracts, and so spreading technological expertise and know-how, including on standards and regulatory issues, and also providing services such as for organisation, management and public relations [28].

Any over-arching organisation established for the above, to assist in, if not drive the innovation process within the construction industry, should permit flexibility and facilitate networking for the expected innovation process to develop and adapt as needed. After some of the new innovations are proven to be beneficial, the organisation should then act as a ‘project knowledge broker’ [29] and an ‘enabler’ of the wider business, strategic and operational needs of the construction industry [30]. This of course depends on the benefits of longer term relationships e.g. in reducing the potential for today’s collaborators to become tomorrow’s competitors. This underscores the need for effective supply chain, network and cluster management, for example as in (a) longer term ‘relationally integrated supply chains’ that extend beyond ‘relationally integrated project teams’ [27]; and (b) as may be formulated in ‘framework agreements’ such as those used by the British Airports Authority.

Based on the above, a team from the University of Glamorgan formulated a conceptual framework for innovation management in Welsh SMEs. It envisages developing the generation process through the interaction of key stakeholders (industry, government and institutions), concentrating on innovation enabling via the use of effective education and training, fora and conduits, and management of networks and their constituents, and diffusion to innovative SMEs and the industry more generally. The proposed framework for innovation management in the Welsh construction industry broadly includes: (1) effective management and governance by an umbrella body, (2) relevant education and training, and (3) suitable conduits and fora, as discussed above. These can mobilise Government, research institutions and the industry, in a framework that has been conceptualised and presented in detail by Miller et al.[31] at the BEAR 2006 international conference on built environment education and research.

In the broader UK context [19], presented the initiative on Knowledge Transfer Partnerships (KTPs) and the view on these of the Department of Trade & Industry - as arguably the leading initiative for transfer of knowledge and skills from researchers to business. KTPs are typically a three-way collaboration between a university, a company and a recently qualified graduate. Under the joint supervision of the university and the company, it is targeted to transfer knowledge and spread technical and business skills, increasing business interactions with the ‘knowledge base’, stimulating business training and research, and providing company-based training for recent graduates. Walker et al.[19] cited references to indicate that KTPs were widely regarded as having operated successfully, delivering strategic change, providing opportunities for learning and creating measurable business benefits; but added that ‘success ultimately relies upon the commitment of the senior management within the company, the KTP Associate’s capabilities and the quality of support from the knowledge base’, implying the university–based knowledge systems.

5. CONCLUSIONS

This paper has presented a range of education and training initiatives from different regions, incorporating comparisons with some similar initiatives elsewhere e.g. in Australia. The common underlying thrusts were directed to improving training and education of the people who populate or aspire to enter the construction industry, given the radical ‘rethinking’ and ‘re-inventing’ of industry structures.
that had been advocated for over a decade. Difficulties encountered in overcoming inertia, if not resistance, to such changes, were often attributed to the traditionally adversarial construction industry culture, that had to be radically transformed to enable the much needed teamworking across all disciplines in the industry and all stakeholders in a project, including clients, contractors, consultants, sub-contractors, suppliers and legal and financial advisers. This becomes more important with global moves to Public Private Partnerships (PPPs) for procuring and delivering infrastructure and public services. These partnerships involve multiple functions, including financing, operation & maintenance, many disciplines and longer time horizons e.g. up to 30 or even 50 years. Teamworking is thus becoming even more critical, and given the above-mentioned difficulties to its inculcation, bottom-up education and training is now needed to mould the mind-sets that can meet these challenges.

Examining examples of education and training initiatives can serve to trigger fresh thinking on what can be done to meet needs elsewhere, as well as to provide lessons on particular benefits, strengths and any potential pitfalls and downsides in designing and implementing such programmes. Each programme will be region-specific and must be designed carefully to meet medium and long term educational and industry needs. A well-structured and comprehensive ‘needs analysis’ will help in the appropriate choice of strategies and programmes, as in the examples of (a) evaluating current learning approaches and (b) the detailed needs analysis involving comprehensive industry surveys, a series of development, dissemination and training workshops, and full team meetings with partner contractors and collaborating industry organisations, all of which went into the ‘R’ of the R&D for developing the SMILE-SMC platform in Hong Kong.

Looking forward, it will be useful to design exercises to assess the outcomes and any improvements actually achieved through such initiatives, for the benefits of those who conceived, implemented and experienced them, as well as for others elsewhere who may learn something useful from these initiatives, whilst developing their own.

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REFERENCES

http://bmj.bmjournals.com/cgi/content/abstract/331/752

learning (PBL): the Hong Kong experience, Ann Acad
ubMed&list uids=11503540&dopt=Abstract accessed 4
Nov. 2006.

Conceptual Model of Partnering and Alliancing, Jnl. of
Construction Engineering and Management, ASCE, 133
(3) 225-234.

Subcontractor Selection employing Partnering principles,
ASCE Journal of Management in Engineering, Vol. 16,
No. 3, 2000, 47-57.

Knowledge Transfer Partnerships in the Construction
Industry: it takes three to tango!, Built Environment
Education Annual Conference (BEECON 2006),
London, UK, Sep. 12-13, Centre for Education in the
Built Environment, USB Flash Memory Drive, 12.

‘Developing web-based tools for Teaching, Training,
Learning and Development: the role of Academic
Institutions’, Journal of Architectural Engineering &
Design Management, Vol. 2 (1&2), Special Issue on ‘e-
Learning in the Built Environment’, Earthscan, London,
123-135.

Metaphysics Research Lab. Downloaded from
http://plato.stanford.edu/entries/free-rider/on

Interpersonal facilitation and job dedication as separate
facets of contextual performance. Journal of Applied
Psychology, 81, 525-531.

appraisal: concepts and techniques. Singapore:
Singapore Institute of Management.

24. CSHE 2006. Centre for the Study of Higher Education
(CSHE) Assessing Learning in Australian Universities
website http://www.cshe.unimelb.edu.au/assessing
learning/, accessed on 5 Nov. 2006.

25. ACBEE 2006. Accelerating Change in the Built
Environment, Report on Phase 3, Sep. 2006, ACBEE,
UK.

26. Miller C., Packham G. and Thomas B. 2004. Inter-
organisational relationships and their effect upon small
construction enterprises in South Wales: co-operation at

Assembling Integrated Project Teams for Joint Risk
Management, Journal of Construction Management &
Economics, Vol. 23, No. 4, 365-375.

Practice in Technology Transfer, DGXIII Tele-
communications, Information Market and Exploitation of
Research, Luxembourg, EU.

Management: Strategy and Implementation Using the
Pentathlon Framework, Houndmills: Palgrave Macmillan
Ltd., 2005.

30. Aouad, G., Kagioglou, M., Cooper, R., Hinks, J. and
Sexton, M. 1999. Technology Management of IT in
construction: a driver or an enabler? Logistics
Information Management, 12 (1) 130-37.

31. Miller, C., Packham, G., Pickernell, D. and
Kumaraswamy, M. 2006. A conceptual framework for
Innovation Management in the Welsh Construction
Industry, Proceedings of the BEAR 2006 International
Conference, Hong Kong, April 2006, CD Rom, 10.