Commentary

Addressing the Needs for International Training, Qualifications, and Career Development in Occupational Hygiene

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ABSTRACT

Thirteen member societies of the International Occupational Hygiene Association (IOHA), all 11 national certification bodies, and IOHA itself are now cooperating in a new international training and qualification system. The structure broadens access to occupational hygiene education and training worldwide and complements existing professional accreditation schemes. There are currently 46 Approved Training Providers in the scheme and up to the end of June 2013, approaching 200 courses had been delivered in more than 32 countries, with nearly 2400 examinations taken in 7 languages. This influx of students, particularly in developing countries, is helping to address the worldwide need to combat occupational illness and is creating the foundation for sustainable growth in provision of occupational hygiene globally. The scheme originated in 2006, when the authors were instrumental in bringing together a group of senior hygienists to review the needs of industry. The resulting position paper, reflecting the perspective of major multi-national companies, was subject to widespread consultation with a diverse group of stakeholders from across the world. This led to the formation of the Occupational Hygiene Training Association (OHTA), as a not-for-profit organization, to operate the system. It is accessible through the OHTlearning website that provides free downloads of educational materials and details of training events. In this commentary, we outline the needs that brought this about, identify the key stakeholders involved, review what has been done so far, and discuss some plans for the future.

KEYWORDS: career development; developing countries; education; international; OHTlearning; OHTA; qualifications; training

THE WORLDWIDE NEED

The International Labour Organization (ILO, 2004, 2005a,b, 2013) estimates that each year a total of 160 million new cases of work-related illness occur globally (35 million due to exposure to chemicals) and 2 million lives are lost to occupational disease (3% of all deaths). Just four selected occupational risks (workplace carcinogens, airborne particulates, ergonomic stressors, and noise) are responsible worldwide for 37% of back pain, 16% of hearing loss, 13% of chronic
obstructive pulmonary diseases, 11% of asthma, 9% of lung cancer, and 2% of leukaemia and caused 538 000 deaths worldwide (Fingerhut et al., 2005).

Standards of workplace health protection are strongly linked to socioeconomic conditions (WHO, 2002, 2006). Rapid industrialization in emerging economies is driving an increase in the number of job-related illnesses (ILO, 2005a). ILO (2011) estimates that the number of work-related deaths from exposure to hazardous substances has increased from 438 480 in 2001 to 910 000 in 2008, though this apparent increase may in part be due to improvements in data reporting.

There are different challenges in developed countries. With the shift in mineral extraction and heavy manufacturing industries to emerging economies, the growth of the service sector, and the trend towards employment in smaller organizations, there is a widespread perception that skills in workplace health protection—particularly occupational hygiene—are becoming less relevant. Fewer corporations now have hygiene departments, and many university courses and research programmes have closed under budgetary pressures. Yet the incidence of occupational illnesses such as lung disease and cancer remains high (see Rushton et al., 2012). Moreover, innovations such as nanotechnology, biotechnology, and materials recycling have created new exposure risks and need research. At the same time, society is demanding higher standards of health protection with growing concern over issues like individual susceptibility, psychosocial hazards, and work design.

Clearly, workplace health protection remains an important challenge worldwide. It is a multi-disciplinary subject requiring the combined knowledge and skills of doctors, chemists, engineers, nurses, and others (Robens, 1972). Yet efforts for development of the core skills of occupational hygiene, which are the province of the scientist and the engineer engaged in the measurement and physical control of environmental hazards, have not prospered.

As a result, supply has not matched need. Henshaw (in a presentation at the American Industrial Hygiene Conference and Exposition, Denver, 2010) and Tresider (2012) estimate an additional need for 37 000 professional occupational hygienists globally based on the ratio of hygienists to the working population. According to Burton (2004), in 1991, U.S. News and World Report said that industrial hygiene would become one of the ‘top 20 professions’, but numbers of professional hygienists globally are not yet increasing. There is even concern that numbers may decrease in countries such as the USA and UK unless something is done to stimulate demand and supply. ‘OH is not progressing or even, is losing its visibility almost everywhere’ (Guillemin, 2006). Furthermore, the majority of countries have no recognized focal point for occupational hygiene. Only 28 (IOHA, 2012) of the 197 countries in the United Nations (United Nations, 2012) have member organizations in the International Occupational Hygiene Association (IOHA). The total membership of these societies is around 19 500, of whom around 50% are in the USA. Only 7868 are professionally accredited (Tresider, 2012).

Analysis by industry confirms the shortage of supply. In 2007, a survey commissioned by the oil company BP from Deloitte Consulting LLP, of 21 companies with global reach, confirmed that demand was increasing in all regions, whether developing or developed. The top two issues identified were the shortage of competent recruits and the lack of suitable training courses.

One reason for the shortfall has been the heavy reliance on university-level courses as the route into the profession. Employers need people with various levels of hygiene skills to suit demands ranging from technical support work to research. Education and training in occupational hygiene have not kept pace with economic, technological, demographic, and social developments. Although the occupational hygiene profession cannot be sustained without a strong academic background, reliance on university graduates alone has not created the environment in which both the profession and academic centres can prosper. It would be preferable, in addition to the graduate route, to train people at a lower level and then develop those who have appropriate aptitude to higher levels of skill. In this way, the spectrum of people available would better match the spectrum of demand.

This approach would also create a pool of people who can potentially be developed to higher levels within the occupational hygiene profession. Many candidates are currently drawn into other professions because there is no such development pathway. Simply put, opportunities for entry into the field of occupational hygiene have been too limited.
There is much to learn from other professions in both the health and safety fields. For example, UK professional health and safety membership organization—the Institution of Occupational Safety and Health (IOSH)—offers qualifications at different levels of practice which can be seen to be contributing to the growth and influence of the profession (IOSH, 2012). The provision of a structure that provides access for practitioners with a wide range of abilities raises awareness and encourages entry to the profession. This approach, together with modular training programmes, has long been advocated in occupational hygiene (Hale et al., 1986) but has only been used to a limited extent.

Other contributors to the shortfall in supply include low public awareness of the value of occupational hygiene and the failure of the profession to secure widespread support from politicians, employers, and trade unions.

**DESIGNING AN EDUCATION AND TRAINING SYSTEM**

A range of requirements is needed to ensure competence in occupational hygiene. Figure 1 shows the elements based on the IOHA National Accreditation Recognition (NAR) scheme (IOHA, 2009), which recognizes professional certifications offered by national bodies. Academic study is only one component. Experience, practical instruction, and ethical practice are also important. Education and training, therefore, need to sit inside this established framework of professional practice.

With these challenges in mind, we formed in 2005 a group of senior hygienists from major multinational organizations to explore the issues and set out options. After a series of meetings, the group produced a discussion paper (Alesbury et al., 2006). This highlighted barriers to change and included ideas on how they could be addressed. It was widely circulated through IOHA member organizations and was presented and debated in workshops at national and IOHA conferences in Australia, Brazil, Ireland, Italy, Netherlands, Taiwan, UK, and USA. Short updates on development of the scheme have been published previously (Bailey and Alesbury, 2009; Alesbury and Bailey, 2011; Alesbury, Bailey and McClellan, 2011).

To overcome the scale and complexity of the issues involved, a collaborative effort was needed. It leveraged the limited resources available to develop a workable international training and qualification solution that would help to balance global supply and demand. With course development funded by multinational companies such as the oil company BP and the pharmaceutical company GlaxoSmithKline, this has matured into a far-reaching international initiative.

Our small steering group consulted a wide range of international stakeholders, including training providers and employers, as well as IOHA, national associations, and exam boards. National organizations were engaged through a Memorandum of Understanding (MoU), signed by 13 IOHA member societies. In addition, all 11 IOHA NAR examining boards (as of May 2013) signed a memorandum of agreement in support of work to develop the corresponding international qualifications framework.

The vision that emerged was based on the need to:

- re-define core technical, management, and leadership competencies appropriate to a global profession in the 21st century;
- build capabilities close to the point of need;
- promote consistent quality of training;
- encourage international transferability of skills and qualifications;
- create a sustainable business model.

To deliver the shared vision, the Occupational Hygiene Training Association Ltd. (OHTA) was registered as a not-for-profit company in the UK in September 2009 and signed an MoU with IOHA.

**DEVELOPING THE COURSES**

Different levels of education and training are needed to meet the differing requirements of managers,
non-specialist employees, technicians, and professionals. A framework evolved (Fig. 2) that would not replace or compete with existing courses or accreditation schemes but rather complement and build on them, creating a coherent pathway for career development. The five levels in the model align with the industry training needs that were identified in the earlier discussion paper. Demand for courses at the lower levels would be greater than for current professional level training, leading to increasing numbers studying occupational hygiene. The levels are the following:

- **Awareness training** to provide introductory information for employers and employees who need to know about the hazards in their workplaces and how they are controlled to provide a safe environment.

- **A Principles course** to introduce the basics of occupational hygiene, explaining how to identify health hazards in the workplace, how to assess the risks they pose, when exposure measurements might be needed, and how control measures can be selected and tested. This is suitable for people from related fields such as safety and occupational medicine, as well as for managers and engineers who need a more in-depth understanding than just awareness. It also provides a foundation for studying occupational hygiene at the higher levels and encourages more people to enter the profession.

- **Intermediate (Practical) courses** in specific subjects for occupational hygiene technical staff who might measure exposure levels to chemicals or noise, or who might test control measures to see if they are effective.

- **Academic study** for people aspiring to become hygiene professionals with certifications recognized under the IOHA NAR scheme. Such professionals have responsibility for designing and delivering the occupational hygiene programmes in a workplace. Academic studies might typically be delivered through an academic component, such as a postgraduate degree at a university, to complement their practical skills.

- **Leadership building capabilities** to prepare senior occupational hygienists for leadership roles within large organizations or in consultancies. These leaders will have attained

2 The five-level framework of education and training, showing spiral learning.
mastery of technical and professional skills and in addition will play a major role in the future of the discipline. The American Industrial Hygiene Association (AIHA) Future Leaders Institute exemplifies the kinds of programmes envisaged.

Students can enter at whichever level is appropriate to their prior learning and experience, allowing them to build their skills in a flexible way. As students progress, topics are re-visited at each level, in a 'spiral learning fashion', with growing background knowledge and experience that allows for deeper insights. This offers the brightest and best of the students a route to higher levels of qualification, and we have worked with employers, universities, and others to encourage suitable students to progress. By this means, we would hope to increase the intake of students to undergraduate and postgraduate programmes. This in turn will help to strengthen the academic and research base.

We focused initially on developing the Principles and Intermediate levels in order to address directly the global shortage of skilled people. Professor Brian Davies at the University of Wollongong took the lead in developing and editing the first new courses, providing clear linkage to the academic roots of occupational hygiene. Further writers were drawn from academia, consultancy, and industry.

A modular format was chosen based on 5-day, face-to-face teaching units that provide flexibility to meet the needs of business and students. Course materials focus on good, current occupational hygiene practice and are independent of national regulations. Local regulatory requirements can be integrated by course providers, if required, or taught as an extra module.

Each course is supported by a comprehensive manual so that students have a reference point and teaching programmes closely match the flow of the manual. The courses contain substantial practical elements to give hands-on experience, an aspect rated extremely important by both students and employers. All course materials are published on the OHTA website (www.OHlearning.com) and are made openly available under Creative Commons licences.

Using this approach, competency is developed through a mixture of presentations, practical sessions, and working in small groups on case studies, with ‘overnight’ self-study exercises. This combination is proving to be more effective than lecturing to large classes, particularly where there are language and cultural barriers.

Although courses are prepared initially in international English, work has begun on translating these into Brazilian Portuguese, French, German, Indonesian, Mandarin, Norwegian, Russian, and Spanish.

We are currently developing materials for awareness and advanced level modules. The advanced courses are industry specific, designed to help trained occupational hygienists gain deeper insights into particular industries.

DEVELOPING THE QUALIFICATIONS FRAMEWORK

We worked in partnership with the British Occupational Hygiene Society (BOHS) Faculty of Occupational Hygiene in developing a new assessment process that allows OHTA to offer an international qualification system supported by the IOHA NAR certification bodies.

Syllabi, teaching materials, and examinations were developed in parallel to create a coherent package. We tried various approaches to assessment and introduced a formative process that helps students develop their knowledge while at the same time allowing tutors to assess their progress. It focuses on testing students’ understanding and practical application of subject matter, rather than short-term memory of facts. We replaced the original summative, multiple choice exam by short answer questions in an open-book assessment, which now forms part of the students’ learning process.

This style of teaching and assessment puts a considerable responsibility on the tutors, so delivery has been restricted to approved training providers that have a course director who is professionally qualified with a qualification recognized by the IOHA NAR scheme.

Students completing the Principles course receive an Award of Successful Course Completion at the Foundation Level. Those completing the practical modules receive awards at the Intermediate Level for the chosen subject areas. The courses currently available are the following:

Foundation module
W201: Basic Principles in Occupation Hygiene

Intermediate modules
Students who successfully pass six intermediate modules (including W501, W503, W505, and W507) can apply for the International Certificate in Occupational Hygiene (ICertOH) by submitting a portfolio of their experience and taking an oral exam. The term ICertOH was agreed by the IOHA National bodies to avoid any potential confusion with the professional level accreditations they individually offer.

The outcome is a standardized system of foundation and intermediate level training and qualifications that increases potential for local development and provides a means to train large numbers of individuals in a cost-effective way.

There are no entry qualifications for the courses but those students who lack a strong scientific or technical education do find the intermediate modules very challenging and benefit from some preparatory work to develop a suitable level of study skills. Knowledge of mathematics, statistics, chemistry, engineering, and biology is needed in a number of courses, and students are directed to suitable materials that can be used for background study. Those who are new to occupational hygiene are encouraged to study the Principles course before embarking on the intermediate modules. Students also benefit from being employed in an appropriate setting and having the support of their employer.

**OPERATING THE SYSTEM**

OHTA is an independent organization managed by a Leadership Group of senior hygienists drawn from stakeholder organizations and responsible for the strategy, governance, and direction of OHTA. It operates entirely on a voluntary basis, meeting periodically by teleconference. OHTA tries to avoid duplicating the work of existing hygiene organizations, relying instead on the support of national associations and examining boards. Funding and support have been generously provided by a number of these organizations, plus major companies, individuals, and suppliers to the occupational hygiene market. With no staff or premises, we use the BOHS office as a postal address for contact.

The examinations and the qualifications process are overseen by the OHTA Qualifications Group which is drawn from all the IOHA-accredited certification bodies and supervises work on behalf of OHTA.

Training modules are delivered through a network of currently 46 approved training providers, including consultancies, not-for-profit organizations, and universities. Most of these organizations charge students (or their employers) their normal rates for delivering the training, so attending a training course is not normally free. It is important to mention, however, that OHTA does not currently derive any income from the training events or examinations.

Administration of the qualification process and approval of training providers are currently provided by BOHS on behalf of OHTA. BOHS levies an examination fee to cover its operating costs. Other national associations have also expressed interest in operating the examination and approval systems in their own countries.

The OHTA website (www.ohlearning.com) provides the following:

- Information on careers, training, and qualifications
- Details of training providers, course dates, and locations
- Free access to the training materials
- Lists of award holders
- Links to the global OH community
- Community pages for users’ training projects
- A forum for consultation and feedback on the training and qualifications system.

Students can supplement their study of OHTA modules with other sources of academic study or training to achieve the standard required for professional qualification under the IOHA National Accreditation Recognition Scheme (see Fig. 3).

The framework complements existing education and training in enabling a range of pathways for career development (illustrated by those in Fig. 4). Both postgraduate and work-based learning routes can lead to professional certification under an IOHA NAR scheme, but the OHTA route now also offers
additional opportunities for those wishing to practise at the technician or basic levels of practical work.

EVALUATION OF PROGRESS
Initial signs are encouraging. In just over 3 years since the launch of OHlearning.com in May 2010, 54,000 individuals from 192 countries have visited the website. Approaching 200 OHTA foundation level and intermediate modules were run in 32 countries, with 2364 exams taken to the end of June 2013.

Figure 5 shows the growth in the number of exam candidates in each quarter since the start of 2010. Many are from developing countries and are new to the field of occupational hygiene. The first six students have now completed the necessary number of intermediate modules and are compiling the Personal Learning Portfolio for their ICertOH.

The emphasis on practical ‘hands-on’ study and early experience in the workplace is proving popular with industry. Employers see early returns and appear more willing to fund further study. Reduced need for travel or absence from place of employment works particularly well. At least two major multi-national organizations have established career development programmes that incorporate these modules. There are also examples of high calibre individuals who have subsequently been sponsored by their employers for further study including distance learning Master’s programmes to attain the standard required by IOHA NAR certification bodies. Experience is showing that as awareness is raised among business leaders and allied professionals, they are more willing to call in a professional occupational hygienist when required, leading in turn to increased demand.
In association with the Australian Institute of Occupational Hygienists (AIOH), equipment manufacturers FisherScientific and Honeywell Analytics have established a scholarship scheme (AIOH, 2011) funding students’ attendance on modules and providing a model for improving access for those with limited finances. BOHS also offers a bursary scheme to support students wanting to take the modules.

4 Illustration of possible career pathway.
The complementary nature of the OHTA scheme and traditional postgraduate study is illustrated by the University of Wollongong where several of the modules on OHlearning.com were developed and are now used as part of a Master of Science degree course (University of Wollongong, 2012), which has also been translated into Spanish for use at the University of Antofagasta in Chile. Other universities are also expressing interest or are working on the inclusion of the modules in their programmes, including the University of Illinois in Chicago that offers an online distance learning programme based on the modules.

The development of this scheme has been dependent on the contributions and influence of a variety of stakeholder groups. As illustrated in Fig. 6, evolution and development of the scheme are through a virtual network with a diverse range of organizations, interest groups, and individuals. Contributions and feedback are provided through personal contact, through electronic communication, and through the community section on OHlearning—a forum which has been designed to facilitate feedback and discussion. Membership of the groups developing and maintaining the materials is drawn from the various stakeholders, and we are keen to build and extend this network of influence. Contributions, particularly on technical content, authoring, editing, and translating materials are always welcome.

**CONCLUSIONS AND FUTURE DIRECTION**

New training courses at entry level and technical level have been developed, tested, and made available in many countries. The new courses make possible a comprehensive framework for career progression in occupational hygiene and overcome the barriers to entry.

The numbers of trainees in occupational hygiene can now be increased rapidly compared with the numbers historically processed through postgraduate entry alone. Improving accessibility of training in this way provides a new platform to tackle the growing burden of occupational illness in developing countries.

The OHlearning qualification structure fits with the existing professional framework of national associations and NAR examining boards. The availability of internationally transferable qualifications represents a major achievement for the global occupational hygiene community, which few professions can equal. Already, there are examples of students who have studied the modules being sponsored by employers to undertake Master’s programmes in occupational hygiene in pursuit of full professional accreditation. If this trend continues, it will help to increase student numbers for growth in student numbers, Q1 2010–Q2 2013.
academic courses and contribute to the sustainability of academic programmes and the research base on which the profession depends. As the scheme develops, we are engaging with the wider community and stakeholders. Our goal is to increase the involvement of industry, employee groups, government, non-governmental organizations and academics to reflect their diverse needs and to broaden their awareness of, and engagement with, the principles of occupational hygiene.

The work to date has demonstrated the viability of the OHTA approach and has established a framework that can be developed to reflect the needs and priorities of stakeholders. Work is in progress to develop a wider range of course options and translations. Currently, most courses are only available for face-to-face tuition, and there is clearly potential for wider use of technology, including e-learning for delivery. Courses at awareness level are planned to address widespread hazards such as silica and will provide a means of increasing worker engagement. Advanced courses are being developed to address issues in specific industrial sectors, such as oil and gas, and pharmaceuticals. These will provide useful supplements to existing Master’s degree courses. We are also working with potential sponsors to create further scholarship opportunities.

As student demand increases and the scheme grows, so too do the requirements for resources and finance. The current governance structure is heavily dependent on voluntary effort. This leads to constraints in the development of new materials and translations into multiple languages. The rate of growth can only be sustained if there are improvements to administration and funding. With this in mind, we are currently in discussions to review the governance and operation of OHTA. The challenge is to adapt the business model to provide finances that sustain growth while maintaining the original ethos and open access model. Future funding arrangements must ensure the scheme remains accessible to students worldwide.
From the earliest days, we knew that engagement with and understanding of the needs of stakeholders were critical factors for success. Although progress is encouraging, the OHTA scheme will need to continue to reflect the needs of stakeholders if it is to have a sustainable future.

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