REVIEW ARTICLE

# Competencies: A new currency for continuing professional development

**Anita Aperia[1], Jorgen Dirach[2], Mike Hardman[3*], Christa Janko[4], Jeff Kipling[5], Rosan Kreeftmeijer-Vegter[6], Rebecca Ludwig[7] , Lena Scott[1], Armel Stockis[8]**

[1] Department of Women's and Children's Health, Karolinska Institute, Stockholm, Sweden
[2] Novo Nordisk A/S, R&D Academic Partnerships, Novo Allé, Bagsværd, Denmark
[3] AstraZeneca, Innovative Medicines, Mereside Alderley Park, Macclesfield, Cheshire, UK
[4] Medical University of Vienna, Vienna, Austria
[5] Science Policy Consultant, London, UK
[6] EATRIS, De Boelelaan, Amsterdam, The Netherlands
[7] Helmholtz Centre for Infection Research, Braunschweig, Germany
[8] UCB S.A., Allée de la Recherche 60, Brussels, Belgium

**Abstract**: "No research without trained researchers" has become the mantra of the EU-funded Innovative Medicines Initiative (IMI) education and training projects. However, it is often hard to determine the type of training required at different stages of a scientist's career. The situation is further complicated by the constantly changing environment, e.g. the growth of disruptive technologies, societal expectations of biomedical sciences, the greater need for multi-disciplinary collaborations, and conservative or changing regulatory requirements. This article summarises the experience from a series of five EMTRAIN Public Private Partnership PhD workshops that included both scientific and transferrable skill training. This is followed by an example of a recently developed training programme, including a competency profile, for translational research and medicines development; the C-COMEND teaching programme. The emphasis is on competencies as a new currency for continuing professional development. Finally, this paper describes what we consider to be the next steps required by the scientific community to address solutions to the current training challenges so that society can benefit from the innovations that only science can provide.

**Keywords**: competency profile; continuing professional development; transferable skill training; industry-awareness; EMTRAIN; C-COMEND

*Correspondence to: Mike Hardman, AstraZeneca, Innovative Medicines, Mereside Alderley Park, Macclesfield, Cheshire SK10 4TG, UK; Email: mike.hardman@astrazeneca.com

**Received:** December 6, 2016; **Accepted:** December 28, 2016

**Citation:** Aperia A, Dirach J, Hardman M, *et al*. 2017, Competencies: A new currency for continuing professional development. *Journal of Medicines Development Sciences*, 3(1): 163. http://dx.doi.org/10.18063/jmds.v3i1.163

## 1. Introduction

At one end of the training spectrum, we have PhD students. Although gaining a full professor's position is historically considered as the aim of PhD and postdoctoral training, in reality this is a minority, alternative career[1,2]. There is an increasing recognition of the need for additional transferable skills to equip graduates for the labour market but often without the structured guidance to tailor training programs according to individual needs. The following extract from the Joint Declaration on Doctoral Training in Europe[3] highlights the current position. "Doctoral candidates should be offered the opportunity to acquire additional methodological competences as well as trans-versal, soft and generic skills helpful for careers in science, the wider science-based job market and in the job market outside of science. Doctoral candidates select such offers on their own choice". This last sentence demonstrates the need for guidance from other sources, as it is unrealistic to expect doctoral candidates to know which choices to make. Science today is a collaborative effort involving multiple disciplines. Therefore, scientists have a need to familiarise themselves with scientific areas outside their own core competence. For those at the other end of the spectrum, namely research scientists and other professionals working either in the wider science-based job market, or in the job market outside of science, there is a bewildering choice of

career opportunities available, each of which requires distinct transferable skills. One of the most effective form of guidance for any academic scientist or professional is a competency profile. This defines the competencies (integrating multiple components such as knowledge, skills, values and attitudes) required to conduct a particular role. Competency profiles are typically defined by professional bodies or learned societies in collaboration with employers. Competence has emerged as a global currency for continuing professional development (CPD), supporting mobility and addressing the constant challenges of a career in modern science.

There have been a number of EU-funded initiatives that have included additional methodological and transferrable skills for doctoral training and for use in the development of competency profiles. These include: IMI European Medicines Research Training Network (EMTRAIN), Public Private Partnership (PPP) PhDs and industry awareness[4]; European Institute of Innovation and Technology (EIT) Health Campus programme, a program that focuses on fostering excellence and innovation in health and business education[5]; and Erasmus Competency-based course on Translational Research and Medicines Development for PhDs and Postdocs (C-COMEND) that teaches the skills and competencies required to successfully contribute to translational research and medicines development[6,7]. The EMBL Conference in July 2016, entitled Lifelong learning in the biomedical sciences[8], was the first conference to address career development and competency profiles across the academic and professsional sectors. At the end of the EMBL conference, it was clear that although a great deal has been achieved, there is still a lot more to be done.

This article summarises the experience from a series of five EMTRAIN PPP PhD workshops that included both scientific and transferrable skills training. This is followed by an example of a recently developed training programme that includes a competency profile for translational research and medicines development; the C-COMEND teaching programme. Finally, this paper describes what we consider to be the next step required for the scientific community to provide solutions to the current training challenges so that society can benefit from the innovations that only science can provide.

## 2. EMTRAIN PPP PhD Workshops

The following is a summary of: the format of the workshops; the range of workshop topics; the participants' view of the most popular sessions and some of the lessons learnt. The materials are freely available at www.emtrain.eu and we hope that others will "steal with pride" when they are designing workshops with similar aims and objectives.

The workshop objectives have been:

1. To create a forum for PPP PhD-students from across Europe in which they meet, share experience and connect as a step towards growing into their role as biomedical industry-aware scientists.
2. To help stimulate the creation of a social network of PPP PhD students.
3. To enhance the interaction between industry and academia.
4. To increase medicines-industry awareness in PhD students.
5. To address scientific and transferrable skills training.

In total 135 students from 18 companies, 70 universities and 24 different countries (some from outside the EU) have attended the five workshops and most are now members of the social network. The feedback from the participants has proven that the workshops were successful in producing a cohort of industry-aware PhD students. The background behind the establishment of such PPP PhD workshops has been published[5]. Each workshop had a different scientific theme that depended partly on the expertise of the industry partner and partly on current topics (Table 1), but all included components that trained transferrable skills.

**Table 1.** Themes of the workshops

| Year | Host | Theme of workshop |
|---|---|---|
| 2012 | AZ | Importance of multidisciplinary research for drug discovery. |
| 2013 | GSK | Future directions in the field of drug discovery: Interaction with academia, SME, and activities in emerging countries. |
| 2014 | UCB | New horizons for drug development. The role of discovery in the field of drug development: In house examples. |
| 2015 | Janssen | Translational medicine. |
| 2016 | Bayer | Innovative approaches to address unmet needs in common and rare diseases. |

The workshop duration was consistent and balanced time away from the attendees' PhD research and participation at the workshop. The duration of each workshop was 4 days, from Sunday to Wednesday lunchtime, and each workshop was hosted by one of the European Federation of Pharmaceutical Industries and Associations (EFPIA) company partners from the EMTRAIN consortium. The host company provided the meeting room facilities, several speakers and hospitality in the form of lunch and dinners. This reduced the cost of the project and was an important component of the private partners' contribution to the project. The private partners/co-supervisors also funded the travel and accommodation costs of any students who were working with them. The other students either secured their own funding or applied for a small number of bursaries, provided by the EMTRAIN project. We considered that having 26 to 28 students per workshop was a good number to allow effective interactions and yet be manageable from a time and logistics perspective. Those selected to participate

in the workshops were mainly PhD students from PPPs but we also included some non-PPP students and a small number of postdocs, who were able to demonstrate an interest in the pharmaceutical industry. The maximum number of attendees was limited by the practical consideration of the time needed for student presentations. After the first workshop, we also included 2 "senior" students/network facilitators who were chosen from the previous year's workshop attendees.

The workshops were designed by a joint industry-academia programme committee in order to: enhance the connection between academia and industry; provide future perspectives on drug discovery and development; develop transferrable skills; encourage interactive participation; promote networking, whilst allowing the industry host to show-case their areas of research expertise but still including a wide variety of speakers from across the sector. Those managing the workshop "The Faculty" were a combination of speakers from industry, academia and funding bodies. The programme was designed to encourage as much active participation as possible (see below for more details) which we achieved through a wide variety of activities. One of these was a medicines discovery board game; a team-based, interactive simulation of developing a new medicine that introduced decision-making about risks and costs. This provided an excellent setting to train decision making, team work and negotiation skills. Early in each programme we included a networking session, led by the two "senior students". The content varied but it involved, "speed-dating"; allowing a few minutes to find someone to talk to and discover interesting facts about their background, hobbies, etc. before moving on to the next "date". The noise level in the room steadily increased during both of these events as the students became more involved and more enthusiastic.

One of the most popular sessions was when students presented their own research; 96% said that they "liked" or "liked very much" the student presentations. This session was also the core for transferrable skills training. For some students, this was their first presentation in English and it was also the first time they had had to present to a group of scientists from different scientific disciplines. These sessions provided a major and robust contribution to training in presentation and interdisciplinary communications skills. The quality of the presentations was extremely high and we offered personal feedback to any of the students who wished to discuss with a member of the Faculty. The format of these presentations changed over time based on ongoing reviews by the participants. In the first four workshops, each student gave a 10 minute presentation followed by 5 minutes discussion of their research project. In the last workshop (2016), we changed the format so that each student gave a 3-minute "elevator speech" followed by a poster session, including poster tours in groups led by members of the Faculty. This combined the opportunity for the students to give a very short, focused, message-driven presentation to an audience who were unfamiliar with the technical background, together with the opportunity to go into more details about the science when searching questions were asked about the posters.

Since part of the intention was to help students to be familiar with the research environment in the industry, site and lab tours were included in the programme. On one occasion, we toured an incubator bubble to hear about the practical challenges and skill sets required when setting up a spin-off SME. These tours also provided an opportunity for the students to talk to a broader group of scientists working within the industry and to understand the day-to-day activities involved in working in the R&D sector. The other interactive sessions included: breakout discussion sessions on a diverse range of topics addressing key issues of multidisciplinary research and ethics and panel discussions on topics including Ebola vaccines, paediatric clinical trials and the use of animals in research. The remainder of the programme was based on short presentations with plenty of time for questions and answers.

The most popular sessions, judged by the post-workshop student evaluation were:

- The medicines discovery board game
- The interactive session on the process of medicines discovery and development
- Presentations on the Innovative Medicines Initiative (IMI), Horizon 2020 and various funding opportunities, e.g. Marie Skodowska Curie
- Interestingly, in 2016, the most useful lecture, chosen by the students was: "Planning for successful publications"

Each student was asked to describe three highlights of the workshop in their own words. The themes and topics of the highlights described varied but nearly 24% of students mentioned networking activities as the highlight and 15% mentioned the insight into industry and an increased knowledge on the discovery of medicines as one of their highlights.

An informal, but key part of the workshops was discussions during lunch and dinner with Faculty members joining in to provide insights into both academic and industry careers and activities. It was considered, for a number of practical reasons and in view of the need for informality, that the use of after dinner speakers was not a good option. Finally, although we had planned to set up a social media network for the students, the first workshop attendees set up their own LinkedIn group spontaneously and we continued to promote the use of the network in subsequent workshops. In order to follow up on the

success of the PhD network, we sent out a survey to the participants one to two years after the workshop. There are no data yet from the 2016 workshop, but 43% of the students who attended the workshops run from 2012-2015 responded to the survey (Figure 1). We asked them, "*Have you been in contact with any other of the students after the workshop?*"

- 57.5% say they have been in contact with others, 12.5% say they have been in contact using only LinkedIn.
- 22.5% say they have had no contact but are part of the LinkedIn group, 7.5% say they have had no contact.
- 7 of the 12 students who had not been in contact with others say that they wish for contact with others.

## 3. C-COMEND

C-COMEND is a two-year European training project supported by the Erasmus plus programme, which started on November 1st 2015 and is led by the European Infrastructure for Translational Medicine (EATRIS) www.eatris.eu to offer training in translational research and medicine development for biomedical PhDs and Postdocs. To ensure that the training covers all important aspects, a draft competency profile has been developed together with several different expert groups including EMTRAIN and the Global Collaboration[9], that reflects he needs in translational research and medicine development (Figure 2). The self-assessment tool of the Dutch Academic PhD Competence model[10] was used as an example

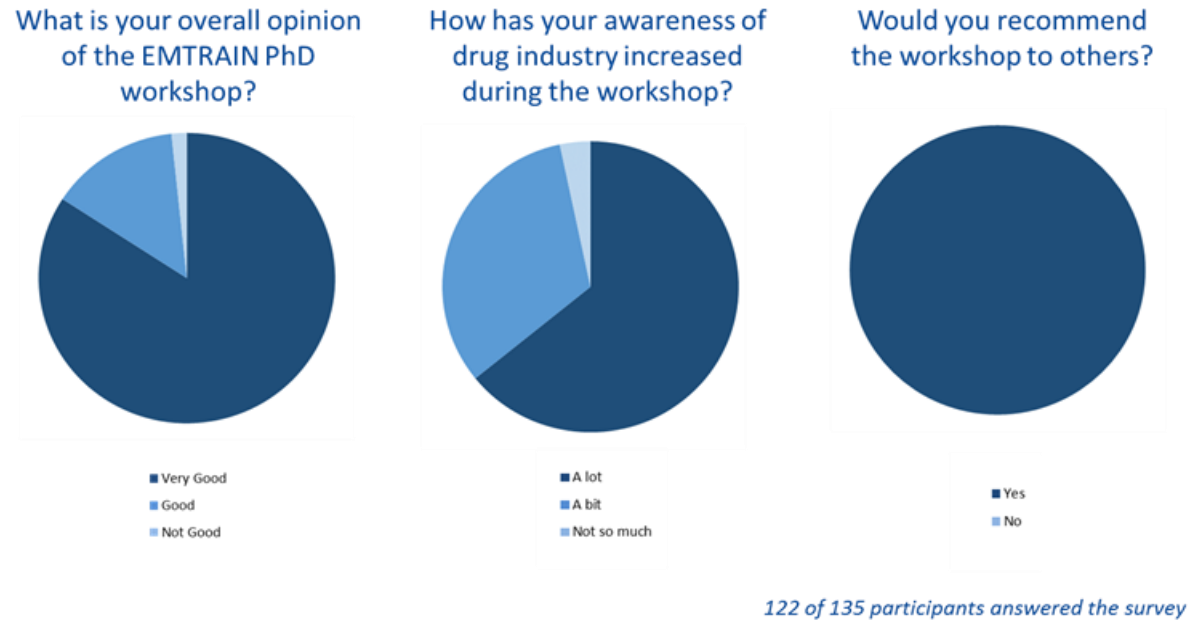


**Figure 1.** Overall summary of the 2012–2016 workshops

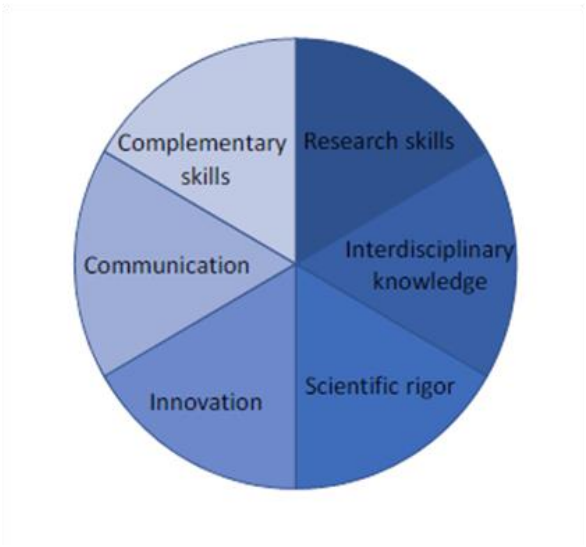


**Figure 2.** Translational scientist competency profile

of how a group of experts (EATRIS), working with a broad group of stakeholders, can provide a state-of-inspiration to design the first draft. This is an excellent the-art competency profile that allows members of the community to develop appropriate competencies.

An example of the competency "interdisciplinary knowledge" is presented in Figure 3. For details of the other competencies in the profile, please visit http://www.eatris.eu/documents/translational-scientist-competencies-profile-1_1.pdf. To help students visualize their growth over time, the skills can be graded using a 5 point-scale from 0 to 5 (5 = excellent, 0= poor) and entered into a spider plot (Figure 4). This spider plot can also be used by a supervisor and/or peers to provide a 3600 feedback. Based on the competency profile, the training was developed by adapting the framework provided by EMTRAIN courses to the new target group.

- A preparatory e-learning was included to cover the basics and bring all students to an equivalent level because other than the EMTRAIN cohort, the C-COMEND students usually do not have a PPP background.
- Strengthening the interactive aspect even more by providing fewer lectures and more student-led activities.
- Strengthening the patient's perspective by starting and ending each day with a video from a patient.
- Embedding work on the competency profile into the course: identifying strengths and documenting competencies in a portfolio.

| Interdisciplinary knowledge | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **A translational scientist has an overview of the whole drug discovery and development process including the roles of the different disciplines and professionals. This overview enables efficient collaboration with others across professions to collectively advance the development of a medical or health intervention.** | | | | | | |
| Pre-clinical research | Understands the full spectrum of pre-clinical research including target identification and validation, compound screening, in vitro and in vivo models of disease, lead molecule identification and optimization, and the studies required prior to initial clinical testing | | | | | |
| Clinical research | Understands the overall design and elements of clinical trials for medical and health interventions, the phases and associated requirements of individual clinical trials, and overall parameters for clinical proof of mechanism and proof of concept. | | | | | |
| Clinical implementation & public health | Understands the factors that affect the delivery, quality and costs of health care for individuals and populations and knows the environmental factors, including biological, physical and chemical factors that affect the health of a community | | | | | |
| Regulatory environment | Has awareness of the dossier content and requirements of main regulators/ regulatory authorities (European, US, Japan/ local authorities) and differences in approach/procedures between FDA/EMA | | | | | |
| Marketing | Is aware of the critical components for the development of a commercialization strategy and marketing plan to launch a new medical or health intervention | | | | | |

**Figure 3.** Interdisciplinary knowledge; an example of a required competency from this profile

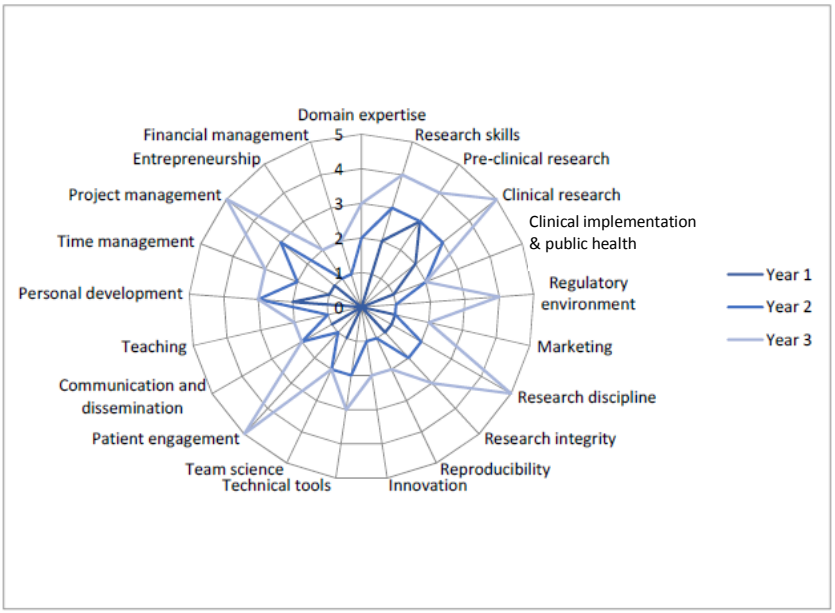


**Figure 4.** A spider plot of the competencies showing progression over time

C-COMEND has combined the development of a competency-profile in the area of translational research and medicines development with the tools to acquire the knowledge (e-learning and interactive workshop) and a means (spider plot) to assess the level of competence developed over time. There are other examples of competency-profiles on the LifeTrain website[11].

## 4. Conclusion

The EMTRAIN/LifeTrain examples, the C-COMEND example and others have proven that it is possible to develop high quality competency-profiles that support PhD students, postdoc scientists and other professionals to acquire knowledge, develop the required competencies and collect the evidence in a competency-portfolio. This competency-portfolio can then grow over time as part of continuing professional development. If this is done in a format that can be understood by other members of the scientific community, it provides a workable "currency" for CPD.

## 5. The Future

Although a great deal has already been achieved, there is still a lot more to be done. In order to deal with the ongoing challenges[8], we still need to address:

1. Defragmentation of activities supporting continuing professional development through development of a stronger global network.
2. Incorporation of other parts of the scientific community, especially postdoctoral students.
3. Development of harmonised tools, processes, and good practices to facilitate development and maintenance of more high-quality competency-profiles.
4. Implementation of transformative learning that leads to competence.
5. A forum for sharing emerging ideas and practices, e.g. an annual conference.
6. Introduction of competencies grouped together to form entrustable professional activities[12].

Many of these are being addressed by the LifeTrain community. We invite other members of the biomedical community to join the community of LifeTrain signatories and support these aims at www.lifetrain.eu. We hope that other groups will develop workshops, "stealing with pride" from the examples given above and sharing their experience for the benefit of the whole community.

## Conflict of Interest

The authors declare there is no conflict of interest associated with this work.

## References


1. Polka J, Where will a biology PhD take you? viewed Aug, 2016. http://www.ascb.org/where-will-a-biology-phd-take-you/
2. Alberts B, Marc W. Kirschner, Tilghman S, *et al*. n.d., Rescuing US biomedical research from its systemic flaws, viewed Aug, 2016. www.pnas.org/content/111/16/5773.full
3. Joint declaration on Doctoral Training in Europe. n.d., viewed Aug, 2016. http://www.eurocollab.net/wp-content/uploads/2014/12/Joint_Declaration_on_Doctoral_Training_in_Europe_2014_11-1.pdf
4. Aperia A, Dirach J, Hardman M, *et al*. 2015, It pays to promote joint PhD programmes between academia and the private sector. *Journal of Medicines Development Sciences*, 1(2): 37–40. http://dx.doi.org/10.18063/JMDS.2015.02.002
5. n.d., viewed August 2016. http://eithealth.eu/programmes/campus-2/
6. n.d., viewed August 2016. http://www.eatris.eu/c-comend.html
7. n.d., viewed August, 2016. http://www.eatris.eu/documents/translational-scientist-competencies-competencies-profile-1_1.pdf
8. EMBL Conference, Lifelong Learning in the Biomedical Sciences, Heidelberg, Germany, 5–7 July 2016, viewed August, 2016. http://www.lifetrain.eu/join-us/embl-lifelong-learning-conference-2016
9. Gilliland C T, Zuk D, Kocis P, *et al*. 2016, Putting translational science on to a global stage. *Nature Reviews Drug Discovery*, 15: 217–218. http://dx.doi.org/10.1038/nrd.2016.33
10. Cohen A M, Stouthard M E, Korsten M E, *et al*. 2016, Skills and competences: Building perspectives for PhD candidates. Lifelong Learning in the Biomedical Sciences, EMBL Conference, Heidelberg (Germany), July 5th–7th, 2016. http://www.intrinsicactivity. org/2016/4/S1/
11. Competency profiles, n.d., Lifetrain, viewed August, 2016. http://www.lifetrain.eu/competencies/competency-profiles/
12. Entrustable Professional Activities (EPA), n.d., viewed August 2016. http://members.aamc.org/eweb/upload/Core%20EPA%20Curriculum%20Dev%20Guide.pdf