www.amlett.org, www.amlett.com, DOI: 10.5185/amlett.2013.2001 Published online by the VBRI Press in 2013

Supervision of doctoral student by public-private sectors partnership: A special focus on healthcare nanotechnology

Dear Readers,

The supervision of conducting a doctorate degree in interdisciplinary science and technology such as healthcare nanotechnology, a strategic supervisory role is essential. Supervision of such doctor of philosophy (PhD) students immerses in an internationally leading education, research environment and provide a wide range of scientific and complementary training, executed both inter and intra university-private sectors joint supervisions. The focus of this editorial is to bring the criteria to produce trained, highly competent, enthusiastic and creative PhDs by the public and private sectors partnership. The interdisciplinary PhD supervision approach would make significant contributions to designed, constructed and commercialized new technology including personalized healthcare and medical nanodevices.

In the recent years, there is potential market for nanotech, which has the prospective to expand day-by-day due to the interdisciplinary role that appropriately designed and developed SMART technology can play in the diagnosis and monitoring for diseases such as diabetes; cardiovascular disease; infectious diseases such as dengue, malaria, HIV/AIDS and TB; epidemic and emerging diseases including meningitis, cholera, yellow fever, flu antibiotic resistant infections, and cancers as well as food monitoring and biosecurity fields [**1**]. Keeping potential market for the diagnostics and/or biopharma private sectors, the report intends to accelerate policies of interdisciplinary collaborative PhD supervision with the effective university-company partnerships at the education level.

Typically, any novel, emerging field, it is the originality, high class training and enthusiasm of the students at master and doctoral levels who do overcome the problems that certainly arise and who can realize the opportunities grasped through the new technologies that are developed [**2**]. The model of such doctoral supervision engages in an globally leading education, research environment and provide a wide range of scientific and complementary training, executed both inter and intra university-private sectors co-supervisions [**3,4**].

Moreover, to encourage and motivate PhD students, a set of clear aims and a study structure that is transparent, logical and makes optimal use of the collective expertise and skills in the inter-disciplinary environment is required [**5**]. In the supervision strategy, doctorate student with master degree in the biotechnology, chemistry, biochemistry, physics, biology, pharmacy, medical science and biomedical engineering and/or a closely related discipline having a good grounding in materials science with knowledge of advanced polymer synthesis and characterization with specific experience in the electro-rheological characterization with specific experience in the electro-rheological and magneto-rheological fluids, smart gels, electrospun fibers, colloids, shape-memory polymer alloys, piezoelectric polymers, multifunctional responsive assembly, nonlinear optical polymers, core-shell and core sheath fabrications, etc. in related disciplines with the commitment and flair to support and develop such supra-disciplinary nanotechnology field for whom additional training is to be fixed their career route [**6**]. The model strategy will give a valuable insight in the major arena of interdisciplinary research on materials engineering for example in the area of biomedical nanomaterials, advanced nanomedicine, nanotheragnostics and cutting-edge nanoscaffolds to the readers. The race will help young researchers/students, academicians and scientists from the privet sectors to choose such research study and supervision structure.

The university-private sector joint supervisions model could have potential to educate scientists across the field from skilled researchers to the early researchers. Such supervision provides cooperative environment with a primary and secondary supervisor from university and company, the latter providing course work and research training in a complementary research area enhanced by the scheduled mobility to the respective organisation. To deliver a major impact for the careers of PhD student and the multifarious fields of nanoscaled science and technology, such strategy trains and promotes researchers across the full spectrum of scientists, from the qualified researchers to doctoral students. By this mechanism, we can bring new researchers with joint supervisions to support the next generation of scientists with the knowledge, background and understanding to exploit nanoscaled medical technology both in scientific discovery and new commercial opportunities to secure the future success of companies.

In summary, the public-private sector joint PhD supervision offers a very extensive and thorough training package includes complementary skills including entrepreneurship exercise. It is well-structured and includes a balance of face-to-face, hands-on PhD courses and training as well as co-supervision package give individual freedom about the time and place for maximum convenience and impact. The people-investment delivers highly-desirable and successful doctorate who could compete very effectively carrier in the international job market, both in industry and academia. Once PhD course is complete, the doctorate researcher can help kick-start the

supra interdisciplinary field of nanoscaled science and technology to the benefit of the health care and well-being of peoples and industry. At the end, PhD students can have excellent career prospects both the public and private sectors after the completion of their doctorate degree.

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With kindest regards

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