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Interdisciplinary Studies: An imperative advancement in Environmental Remediation

JAYSHREE RAMKUMAR

Analytical Chemistry Division, Bhabha Atomic Research Centre, Mumbai, India.

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Serendipity and science have always gone hand in hand. However it is seen that in almost all the studies it was not sheer luck or coincidence. It was always an insight of the scientists and the out of box thinking ability.[1] As Einstein aptly quoted, “Creativity is seeing what everyone else has seen and thinking what no one else has thought.” Similarly Louis Pasteur, an artist with profound taste for paintings could identify and establish the chirality of optical isomers. He was also credited for many discoveries.[2] Ancient Indian education stressed on the need to learn various concepts including art.[3] Research spanning across different disciplines has been continuously increasing due to the enhanced complexity of the problem faced. To understand the concept better, it becomes important to understand the terminologies involved. Discipline is defined as branch of knowledge. Intradisciplinary refers to working of several researchers within the same field. Multidisciplinary studies involve the colligation of different disciplines but not integrating them into one. Hence the knowledge of one discipline is perceived on basis of another discipline and boundaries of the disciplines are maintained strictly. Interdisciplinary approach involves the integration of knowledge and protocol of various disciplines leading to solution for a common goal. Transdisciplinary is the stage wherein the discipline boundaries do not exist.[4] In general most of the solutions for common problems involve a interdisciplinary approach to provide a solution. One of the most common examples of research of this nature is the studies pertaining to environment. Environment derived from French word “environia” meaning "to surround" and it refers to the surroundings around humans.[5] Thus the degradation of environmental media like ground water is identified by the environmental scientists. However in order to assess the degree of contamination the role of analytical chemistry becomes very imperative. Hence the problem identified by environmentalist is now the focus of analytical chemist to determine and then remove the particular toxic species. To achieve this, the material scientists develop highly specific materials. There have been many studies carried out with this interdisciplinary approach.

CONTACT Jayshree Ramkumar jrk@barc.gov.in Analytical Chemistry Division, Bhabha Atomic Research Centre, Mumbai, India.

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The very first study in our group was the focus on the removal of fluoride from water bodies using nanosorbent which was synthesized for this particular application.[6] Another approach was to evaluate the removal efficiency of materials synthesized for other applications. The very first study in this direction was aimed at using borosilcate glass samples which were already used for nuclear waste vitrification. It was seen that the glass could behave as room temperature sorbents for different metal ions and dyes.[7-10] Zinc oxide nanoparticles synthesized for biological applications were evaluated as sorbents. These studies showed that synthesis protocol affected the uptake characteristics of the nanosorbent leading to completely different removal applications.[11-14]

Conclusion

It is very clear that interdisciplinary approach helps in achieving the desired goal. However there is a need for caution with respect to various aspects. The very first step is how to ensure the complete collaboration of researchers of different disciplines and also decide whether the collaboration is continuous or for specific challenges. A major concern in this approach is the way to assess the success of the collaboration. It becomes essential to understand whether collaboration itself is the final goal or is the contribution of each researcher is to be evaluated. It is also not very clear as to what can motivate interdisciplinary approach or who can take the first step to achieve this. This concern arises from the fact that continuous research in a particular discipline tends to enhance the knowledge of the researcher which might not be possible if the time and resources were divided across diverse areas. Despite all these hurdles, interdisciplinary collaborative work is crucial as it can enhance innovation and also address real problems. Thus the expertise of each field helps to combat the problem associated with the environment.

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