# Chapter 5
# The Inclusion of Multidisciplinary Research in Science Teaching:
## A Novel Teaching Method

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## EXECUTIVE SUMMARY

*The educational process is described as a method whereby knowledge, skills, beliefs, values, and methods are transferred from one person to another. This chapter describes a series of research projects carried out from 1998 to 2013 that attempted to establish an effective process conducive to the transfer of chemistry and physics knowledge. The powerful combination of research and online studies with the latest technological tools are also discussed in this chapter. The chapter also provides the START model that signifies how different contexts may actually influence core learning. This further emphasizes the importance of the inclusion of research in teaching*

*and how it provides a fourth dimension to teaching. This work also elaborates the importance of the multidisciplinary research-based teaching and how it promotes independent thinking and flexibility among learners.*

## BACKGROUND

From 1990 – 2004, there was a gradual, yet very significant reduction in the number of students studying chemistry at the undergraduate level in the U.K. ("10th Report," 2006). This reduction compelled some universities to merge chemistry departments with other related departments to improve the numbers of students and the general economic viability (e.g. Manchester Metropolitan University merged the department of chemistry with materials science and the University of Manchester merged with UMIST). The reduction of chemistry students seemed to be related to the difficulty of chemistry students securing jobs after graduation, in addition to the disconnection of teaching of theories and how they relate to real-life applications ("Stem Briefing," 2009). The studies carried out by the Association of Graduate Recruiters (1995) showed that the employers believed that graduates could be better prepared for an employment environment by the university education. However, the graduate market as of 2013 still seems to be struggling with the same issues ("The Graduate Market," 2013). Duckett, Garratt, and Lowe (1999) suggested that graduate training included the skills that were most needed in employment for chemistry graduates. Moving forward, Brattan, Mason, and Rest (1999), in their findings, reported that most of the practical chemistry work was not geared to improving the key skills of students. Since a similar situation was also recognized previously by the research and surveys undertaken by Johnstone (1997), three possible implications were recognized. Firstly, after qualifying as chemistry graduates, their skills other than the subject knowledge may have failed to impress prospective employers of chemical industries since they lacked generic skills such as written and verbal communication, business awareness, pragmatic approaches, etc. Secondly, if the graduates of chemistry cannot impress employers from related industries, then they would not only have failed to secure jobs in the fields related to chemistry but invariably in other unrelated fields, since their knowledge was only concentrated on chemistry related fields. Thirdly, when the predicaments of chemistry graduates became apparent to other prospective undergraduates, then their perception of this subject as a choice of a future career would have also diminished to very low levels. These reasons were assumed as the logical reasons as to what eventually led not only to a reduction in the number of chemistry undergraduates, but also in the number of