TEACHING DRUG DISCOVERY AND DEVELOPMENT VIA ENQUIRY BASED LEARNING: A STUDENT'S PERCEPTION

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Drug discovery and development is an important topic for students of pharmacology, and allied biomedical subjects. It is a challenging subject to teach because the range of practicals that can be offered in University teaching laboratories are limited to simple experimental and analytical methods. Thus, students often find it hard to relate theoretical teaching about the complex techniques and decision making processes used in the pharmaceutical industry to their own experiences in the laboratory.

In an attempt to bridge the gap between our theory and practical teaching we developed an enquiry-based learning exercise (3D) simulating the process of drug discovery and development. Our aims in designing this activity were to improve student understanding of the drug discovery process by providing experience of handling large datasets, extended practice of data analysis techniques and stimulating research of techniques not encountered in the laboratory.

The 3D exercise is an e-mail based interactive simulation in which students work in randomly assigned groups of 2-4 and play the part of project managers in a pharmaceutical company. The exercise ran over 5 weeks and culminated in a reflective poster presentation. After selection of one of four fictional clinical targets, students passed through 8 stages in which they analysed and interpreted pharmacological, physiochemical and toxicological data for a library of 65000 hypothetical compounds. The data were revealed to the students in a stepwise fashion and at each stage they were required to analyse the data and selected a subset of compounds for further investigation. They then requested data for the next stage of the exercise for their chosen compounds. The data were structured such that at each stage of the simulation, fewer and fewer compounds exhibited the desired properties. For each disease the initial screening step yielded around 1000 "good" compounds with the choice narrowed to 2 or 3 by the last stage of the simulation. *In vitro* pharmacological data were provided in the form of summary parameters eg. pEC50, maximum effect, but for some compounds students were provided with concentration-response data and were required to determine the summary parameters.

A questionnaire consisting of 18 closed format questions using a 5 point Likert scale and 12 open format questions was used to gauge student opinion of the exercise. Scores of the Likert scale questions were analysed using Wilcoxon's Signed Rank Test with the question scores compared to the expected value (3), and are expressed as median (M), lower quartile (LQ), upper quartile (UQ), P different to expected value.

Analysis of the questionnaire data (n=24) revealed two main themes. First, students agreed that the 3D exercise improved their data handling skills (M=4, LQ=3, UQ=4, P=0.01) and improved their knowledge of the drug discovery process (M=4, LQ=4, UQ=5, $P<0.001$) . They also agreed that the exercise encouraged them to research and evaluate information rather than simply follow instructions (M=4.5, LQ=4, UQ=5, $P<0.001$). Thus the 3D exercise appears to be a valuable adjunct to lecture-based teaching. Second, students were ambivalent about the value of the exercise in developing team working skills (M=4, LQ=3, UQ=4, P=0.07) and the effectiveness of their group (M=2, LQ=2, UQ=4, P=0.39). Follow-up interviews revealed that they disliked allocation to random groups and preferred to work in friendship-based teams. This finding may reflect policy within our Faculty that keeps tutorial groups together in practical classes during their first two years.

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