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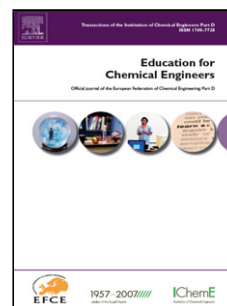
Title: Graphic web–apps for teaching ternary diagrams and liquid–liquid extraction

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Graphic web-apps for teaching ternary diagrams and liquid–liquid extraction

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Highlights

- Web-apps for teaching of liquid–liquid equilibria and extraction were developed
- The apps have a strong free-hand feel for visual and kinaesthetic engagement
- Students' marks improved; gap between poorer and better performing students reduced
- Students felt the apps increased their understanding of liquid–liquid extraction

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Abstract: Recent years have seen a rapid development in e-learning technologies. Specific topics; however, may require additional teaching tools created particularly for their unique characteristics. It is important that these tools are developed with learning outcomes in mind, and if possible are in a format easily accessible. We have developed graphic web applications for the teaching of liquid–liquid equilibria, single- and multi-stage liquid–liquid extraction using ternary phase diagrams. These applications allow students to draw liquid–liquid 2-phase equilibrium curves, calculate phase separation for a given mixture and graphically determine equilibrium stages; the correct results are then produced with hints for the students if they get stuck. Student usage figures and opinions have been collected for the application during trial use on a combined full-time taught and distance learning course in Engineering Separations at The University of Manchester. The current students have found these applications useful for developing their understanding of liquid–liquid equilibria.

Keywords; web-app, ternary diagrams, interactive tutorials, plotting graphs.

1. INTRODUCTION

E-learning technologies provide educators an ever growing array of tools, many of which are integrated in Course Management Systems (CMS) or Virtual Learning Environments (VLE). Along with modern multimedia and chat support services, these systems have user-friendly facilities for creating on-line assignments from a variety of pre-set question types. Amongst others, these types typically include “Fill in the Blank”, “Multiple Choice”, “Calculated Numeric”, and “Hot Spot” formats, the last being useful when students need to identify and pinpoint a specific location in a diagram or image. Despite the large number of choices and in-built flexibilities, certain subjects require uniquely structured question types not available in CMSs.

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