The MC-squared project

The MC squared project (http://www.mc2-project.eu) aims to design and develop a new genre of authorable e-book, which the project calls 'the c-book' (c for creative), extending e-book technologies to include diverse interactive components, learning analytics and collective design. As a research lens, literature from communities of interest (CoI) is used (Fischer, 2001). The project aims to harness the structure of a CoI to stimulate social creativity (SC) and creative mathematical thinking (CMT). In the UK CoI we are treating CMT in problem-posing and solving as entailing the indicators fluency, flexibility, originality, elaboration, and usefulness (Silver, 1997).

Evaluating CMT potential

In cycle 2 of the project, one of the research questions was: “how do five c-books authored by the CoI, demonstrate the elements of our CMT definition?” To address this question the CoI produced five c-books: one on transformations of graphs, one on planetary orbits, one on mathematics for biology, one on numbers and one on generalization. The c-books differed greatly in number of pages and number of interactive elements (widgets). After their conception, an evaluation instrument was used to evaluate the CMT potential. The instrument consisted of a template incorporating the creativity indicators mentioned above.

1. Transformations of graphs

This c-book is about transformations of graphs of reciprocal, trigonometric and polynomial functions. The CMT potential of this c-book mainly seems to be the potential for elaboration as it primarily aims to describe, illuminate, and generalise ideas. However, one page, the last one of the third section has a more open approach, giving a moderate element of flexibility and originality. Fluency was not really apparent. The c-book’s usefulness with its application in the UK curriculum is quite high.

2. Planetary orbits

This c-book is about the gravitational laws concerned with planetary orbits. The CMT potential of this c-book mainly seems to be the potential for fluency, flexibility and originality in its open simulation approach in the second half of the c-book, and a moderate capacity for elaboration. The c-book is multidisciplinary in nature but does not necessarily address a useful topic from a curricular point of view.

3. Mathematics for Biology

This is a c-book with maths, mainly statistics, content which is in the new Biology A-level curriculum. The fluency aspect is not really apparent in this c-book. Flexibility and originality are mainly apparent in the more open tasks that are presented, with the final investigation probably the best example of this. The CMT potential of this c-book moderately concerns elaboration because of its application of knowledge and algorithms to new data. The c-book is multidisciplinary in nature and addresses a useful topic from a curricular point of view.

4. Numbers and expressions

This icebreaker c-book asks students to rewrite numbers and expressions into equivalent numbers and expressions. The CMT potential of this c-book mainly seems to be the potential for fluency, flexibility and originality/novelty in students providing answers. This is only for a very limited content domain, which is convenient for the UK CoI’s Learning Analytics goal. For this reason elaboration is not very prominent.

5. Generalisation of patterns

This c-book features figural pattern activities encouraging algebraic ways of thinking. The CMT potential of this c-book mainly seems to emerge from the constructionist nature of the widgets involved and the potential for fluency, flexibility and originality/novelty in students providing answers.

It pays particular attention to the UK curriculum, potential usage in the classroom and links with Learning Analytics. It tried to take the CoI c-book unit productions further in that the activities included the c-book are quite open-ended activities and can support students’ exploration and experimentation.

Conclusion

The evaluation showed that most c-books had a mix of open and closed elements, sequenced in an intentional way to facilitate learning. Two out of five c-books (planets, and mathematics for biology) had a particular multi-disciplinary focus, while the other three stayed more in the realm of mathematics. It could be seen that the open or closed character of a c-book was mainly determined by the overarching learning objectives of the c-book. However, in all cases, the CoI still viewed them as creative products. In other words, creativity according to the CoI’s definition is not a simple case of creating open or closed tasks but more a carefully-designed sequence of ‘pages’ and tasks that together potentially induce creativity.

References


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