CAN 3D PRINTING & CHEMINFORMATICS ENHANCE STUDENT UNDERSTANDING IN BIOCHEMISTRY?

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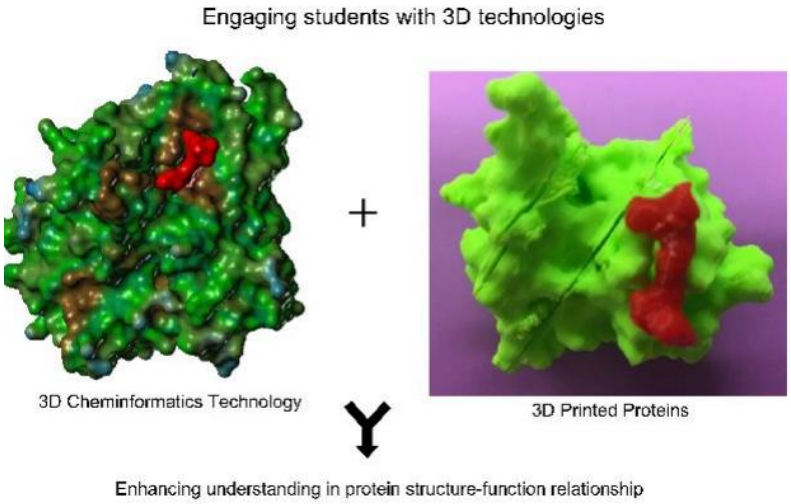
PROBLEM

Students often approach biochemistry with a degree of trepidation with many considering it one of the more difficult subjects. This is, in part, due to the necessity of making visual images of submicroscopic concepts. Molecular interactions underpin most biological processes therefore mastering these concepts is essential. Understanding the forces and mechanisms that underpin protein-ligand interactions is a key learning goal to mastering the protein structure function relationship.



AIM

We aimed to implement a prospective cohort study and a student-focused approach to compare 3D technologies in their effectiveness in enhancing student understanding of protein structure-function relationship.

DESIGN AND METHOD

The activities involved incorporating 3D printed proteins and cheminformatics which had the advantage of targeting students' visual-spatial ability. Learning activities, conducted in small groups, were specifically designed to enhance understanding of the protein structure-function relationship through a detailed analysis of molecular level interactions between proteins and ligands. Here we describe the methodology for preparation of the learning tools and how they were incorporated in the learning exercises in the form of both formative and summative assessments. We compared their perceived effectiveness via student feedback surveys conducted over three consecutive cohorts. In addition, we compared final grade outcomes across the cohorts to compare overall extent of student gains.

RESULTS

Results showed students were positively engaged with these technologies with a slight preference for cheminformatics and overwhelming support for 3D technologies. Sample written feedback included

comments such as “There should be more 3D teaching in chemistry generally - half the battle is trying to visualise atomic structures” and “the computational model helped me to understand the physical/chemical property of the molecule”. From an instructor’s perspective, we found significantly improved overall grade averages for the subjects following implementation of the assignments which may suggest these tools contributed to enhanced understanding

CONCLUSIONS

Student perceptions of the benefits of these technologies to aid in understanding the protein structure-function relationship supported their continued incorporation into the curriculum. Feedback obtained will inform future curriculum development.

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