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Learning Biology Biochemistry Using Problem-based Learning Approaches

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***Abstract* – Biochemistry is a basic science subject introduced in the second year of the biology curriculum in Shanxi normal university. As the approach used in teaching biochemistry has always been the conventional lecture-based strategy, in this paper, we use the problem-based learning (PBL) as an innovative strategy in teaching the biochemistry. The study showed that the students found this alternative method acceptable particularly in motivating to clarify biochemical concepts and learn in depth, to develop skills required for life-long learning. This study will help to determine the educational role of the PBL in teaching the biochemistry.**

***Keywords* – Biology, Biochemistry, Problem-based learning approach, Normal university.**

I. INTRODUCTION

In normal schools throughout the china, there are pressures to reform the school curriculum and traditional teaching method[1]. As there is a change in emphasis in education from teaching to learning, for some normal universities have already completely given up formal lectures at the senior student stage. There is a recognised requirement for students to use educational materials on their own and working at their own time.

Against this background, it is evident that there is a need for new ways of presenting educational material to students [3]. PBL (problem-based learning) is recognized by educators as an effective alternative to traditional, teacher-centered methods. PBL approaches have been used in a number of professional education and training programmes, most systematically in higher schools. They have also been used in normal education [4]. The use of PBL, is often supported by reference to its apparent success at encouraging students to learn in depth, to develop skills required for life-long learning and in dealing with complex real-life problems. But, few teachers are willing to consider using PBL in their courses or making changes in their teaching methods. They point to cognitive framework deficits, restricted basic knowledge bases and the inability of some graduates to work effectively as independent practitioners.

II. IMPLEMENTATION THE PBL

The traditional teacher-centered methods do have certain weaknesses. Why provide students with overwhelming lists of detail if they lack the intellectual skills necessary to apply these appropriately? This reality means that the material presented to students must be carefully selected by focusing the learning on a real life problem, problem based learning may have a role in performing this function[6]. The commission of teaching instruction in Shanxi Normal University is supporting the development of PBL approaches within the field of biochemistry. As PBL is recognized by educators as an effective alternative to traditional methods. It is a process involving several steps. First, students are presented with a problem that is often ill-defined and complex. Students identify learning issues and possible sources of information.

Next, students engage in independent study by gathering and analyzing essential scenario information. When the students meet with the small group they critically discuss the practical application of the information to the scenario. Following completion of the scenario, students critically reflect on both the content learned and the process. The steps of PBL were modified to incorporate multiple groups with one faculty tutor. The specific process of PBL for this course is outlined below.

We have used PBL approaches when teaching biochemistry to biology students as a strategy to arouse students' interest and to develop their higher order cognitive skills and critical thinking abilities. In this paper, we report the outcomes of combining PBL with lectures on the abilities of students to formulate scientific concepts and/or resolve conflicting representations of basic science in well established text books.

Students on the enzyme engineering module investigated the feasibility of using enzymes as molecular markers of exposure to environmental stress. They worked in teams to develop a hypothesis, design an experimental protocol to test the hypothesis and test the protocol in the laboratory. Three lecture slots were reserved at the end of the module, two of which were used as feedback sessions to help students work through their practical work data. In the final session, students attempted to develop an overarching enzyme biomarkers concept from the range of hypotheses and practical data produced by the teams Whilst students were able to analyse the data they had collected and establish patterns between enzyme levels/specific activities and stress exposure, they had difficulty developing concepts without recourse to the subject expertise of a facilitator. These observations were consistent with those of others on the delay in cognitive development between students' abilities to use algorithms to solve quantitative exercises and their abilities to develop conceptual explanations for underlying biochemical phenomena.

III. EDUCATIONAL ROLE

PBL may be appropriate for students teaching as it provides more knowledge and fewer facts. The majority of

students felt that PBL enhanced their sense of autonomy and responsibility for their own learning. PBL may be done using traditional paper, techniques using computers are now available which can combine problem solving with traditional tutorial-based presentations and also allow assessment of learning.

Additionally, a deeper understanding of material can be achieved by browsing background information which can also assist revision [9]. The intention of PBL is not to produce a computer-based textbook, which can appear too wordy on screen, but to provide material which can be used in a complementary manner with existing text-books and course material [10]. In the example reported here, the use of PBL approaches proved useful to complement lectures. On completion of the case, the student receives instant feedback on his or her performance by the assessment program. An analysis of the answers is given to each of the questions asked and a print-out may be made. The information may also be saved to a computer disc and sent for assessment by a tutor. Informal feedback during the development of the prototype has allowed the design of an acceptable program interface and a formal evaluation of the first topic has been planned and will take place on an international basis. This evaluation will help to determine the educational role of the program.

IV. Conclusion

PBL as a method and philosophy is a widely adopted and effective approach to fostering autonomy, critical thinking and self-directed learning in biology students. These skills are needed for understanding the biochemistry curriculum.

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Author's Profile

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It is suggested that Problem-Based Learning (PBL) approaches to language learning - especially ones propelled by critical thinking frameworks (e.g., SPRE) - not only ease the transition to science courses where English is the medium of instruction but promote the acquisition of general competencies thought vital to 21st century success. Keywords: English for science and technology, problem-based learning, critical thinking.Â Over the years, SPRE has enjoyed widespread use in a variety of educational settings and contexts both within and without the field of language teaching. Problem-based learning versus lecture-based learning in a course of basic pharmacology: A controlled, randomized study. Medical Education, 33(2), 106â€“113.CrossRefGoogle Scholar. Association of American Medical Colleges (2005).Â A specific, problem-based, self-directed learning method designed to teach medical problem-solving skills, self-learning skills and enhance knowledge retention and recall. In H. G. Schmidt & M. L. De Volder (Eds.), Tutorials in problem-based learning. Assen: Van Gorcum.Google Scholar.Â Evaluation of an integrated curriculum using problem-based learning in a clinical environment: The Manchester experience. Medical Education, 34(3), 222â€“230.CrossRefGoogle Scholar. Ozuah, P. O., Curtis, J., & Stein, R. E. K. (2001). A list of deep learning implementations in biology. 1.5k stars. 418 forks.Â A toolbox for learning motifs from DNA/RNA sequence data using convolutional neural networks, this Tensorflow-based library supposedly runs on GPU out of the box and also does things like hyperparameter optimization and visualizations of what different network layers are learning. NLP inspired. Genomic-ULMFiT: ULMFiT for Genomic Sequence Data [github].Â We use this unsupervised approach to cluster natural variants and learn interactions between sets of positions within a protein. This approach generally performs better than baseline methods that consider no interactions within sequences, and in some cases better than the state-of-the-art approaches that use the inverse-Potts model. Problem-based learning (PBL) is a student-centered pedagogy in which students learn about a subject through the experience of solving an open-ended problem found in trigger material. The PBL process does not focus on problem solving with a defined solution, but it allows for the development of other desirable skills and attributes. This includes knowledge acquisition, enhanced group collaboration and communication. The PBL process was developed for medical education and has since been broadened in