55 - ANALYSIS OF LEARNING FROM ENERGY METABOLISM IN THE CONSTRUCTION OF A BIOCHEMISTRY EXHIBITION.

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INTRODUCTION

In August 2006, after starting a new curriculum in the course of Physical Education at the University Salgado de Oliveira University-UNIVERSO, Campus Belo Horizonte, with the introduction of Biochemistry Basic discipline, we began to search the best form of interaction between students in different periods of course. We observed the development of work exhibited in the central hall at block B, and realized that the place was very favorable to a presentation because of the constant movement of students which were promoted at this place, then known as the "Biochemical Space" the place chosen for the exhibition which has purpose of disseminating basic concepts of Biochemistry, linking them with lessons conducted in the 2nd period of the course of Physical Education. The themes which the exhibition is based are knowledge of the macromolecules and metabolic adaptations to training, thus, it does illustrate, demonstrate and exemplify the content and concepts worked in classroom and laboratory. Our aim in mounting the exhibition at the central hall of block B, was an articulate space for the dissemination of informal education with integration in the internal public of UNIVERSO.

According Gaspar (1993), the informal education does not follow the curriculum, does not offer degrees or diplomas, has no binding character of any kind and is not intended only to students but to the general public. These are, basically, the characteristics of museums and science centers.

The education process observed in the exhibition relates to the involvement and understanding of the material to be exposed by producers and the extent to which it is intended. According Marandino (2005), in the exhibition, the speech is a source of education among the public and knowledge, objects and phenomena, which are based on the science of reference, many of these elements come from scientific research, which have original parts, illustrate or portraying the history and development of knowledge. Other times are replicas that supposedly help with its presentation of science concepts, their phenomena, their relationship with society. There are also other types of objects_ and here we're considering those apparatuses mediators, images, sounds, or any others that are expected to make science more accessible to the public.

The objects in exposed locations acquire different roles depending on the senses that is proposed and the narratives proposals, and can sometimes sustain the discourse of science, sometimes the dissemination or education in science. Thus according Ramos (2004), the new contextualization involves the removal of a discourse, and the object of their context based to a different logic of objects and principles. That makes it, according to the author, the "culture exposed," a culture that even maintaining the discourse of science, is no longer science.

The "Biochemical Space" was developed in the Lourenço (2000) perspective, which classifies the objects exhibited in: scientific objects, with regard to disseminate scientific, educational objects, constructed for the purpose of teaching science, objects of dissemination of science, which were built with the purpose of presenting the principles of science to a wider audience. In this proposal, places and objects acquire meanings in the museums of science, not exclusively based on the logic of scientific discourse, but to serve other purposes: illustrate, demonstrate, illustrate, questioning, they propose to think about science, about human being. In the photo exhibition of practical classes approaching visitors to the laboratory stage, integrating students from several half of the course of Physical Education and invites the audience to reflect the space occupied by science.

In the "Biochemical Space" the metabolism of macromolecules is shown in comparative studies of metabolic responses among individuals trained and detraining. The graphic analysis of the process of degradation and release of energy are linked to knowledge and opportunities for macromolecular release of energy in specific metabolic states (MAUGHAN, 2000).

The macromolecules are numerous in the cells, they are formed by the union of polymers, constructed simply by covalent linkage between monomers, which are the smallest subunits. The macromolecules, from the same evolutionary origin, perform various biological roles keeping many features in common, both structural and mechanisms (BERG, 2004). According Alberts *et al* (2006), the energy metabolism is the subject of biochemistry, the authors describe the two opposing reactions that occur in cells with macromolecules, the catabolic, which degrade, and that the anabolic that recomposed. The understanding of available energy resources is facilitated by understanding the metabolism and molecular relationships in the sequence of obtaining energy.

METHODOLOGY

The "Biochemical Space" is an exhibition, whose construction process is based on work produced in class laboratory practice, in understanding and construction of macromolecules and graphic analysis of the metabolic adaptations to training.

1. Practice

Practice 1- Part One: Laboratory techniques - Improve the recognize, laboratory equipment manipulate and interpret experimental results by the students.

Part Two: Identification of carbohydrates - detect the different groups of carbohydrates present in solutions of fructose, glucose, sucrose and starch, with the help of trials of Benedict, Seliwanoff, Molisch and iodine.

Practice 2 - Solubility of carbohydrates and lipids - Test the solubility of monosaccharides in water and alcohol and the solubility in water and chloroform glycerides.

Practice 3 - Proteins in the diet - Separate the milk proteins by precipitation and decanting and identify the presence of proteins in body fluids by Biuret test.

Practice 4 - General reactions of enzymes - Check the enzymatic activity of catalase in various materials, comparing the action of manganese dioxide (inorganic catalyst) with the catalase (organic catalyst), the hydrogen peroxide.

Practice 5 - Analysis of blood lactate - Check the involvement of lactic anaerobic metabolism by means of blood lactate after effort.

Practice 6 - Part one: Identification of individuals by DNA - To analyze the DNA from cutting fragments by using restriction enzyme from hypothetical, and simulate the electrophoretic pattern of five people, to resolve a case of dubious paternity, and recognition of one of three criminal suspects.

Part Two: Making of DNA of strawberry - To extract DNA from vegetable cells, considering the size of the cells and

larger quantity of material observed, comparing the human DNA with that of other species while respecting the ethical character of the biological manipulations.

2. Molding of molecules

The molecules are produced by students in extra class time in order to monitor the drive program "The chemistry of biological compounds". The work is carried out in groups, and it is the choice of one of the components: carbohydrates, lipids, proteins and nucleic acids. In the process of molding, the students discuss the chances of all arrangements and material to be used, considering the molecular configuration space.

3. Analysis of metabolic adaptations to training

The relationship between the understanding of macromolecules and their functions in the metabolic pathways and application to the study of various metabolic substrates during the practice of motor activities is stimulated by reading, analysis and presentation graphics, with the following topics:

1 - Metabolic responses to high-intensity exercises.
2 - Metabolic responses to prolonged exercise.
3 - Metabolic adaptations to training.
4 - Delivery of sources of blood and oxygen to the muscles during
Exercise.
5 - The physiology and biochemistry of the exercise.

RESULTS

In each semester, between 2006 (2) and 2007 (2), in a previously scheduled date, the hall of the Block B at UNIVERSO-BH, was reserved for exhibition of photos of the practices undertaken in the laboratory, the molecules and posters. The exhibition is open for students in all courses, and includes mainly those who had participated in the event, photo 1.

PHOTO 1- The "*Biochemical Space*". 2007 (2).

The analysis in Table 1, which represents the answers to a questionnaire made by 50 students who studied the discipline Basic Biochemistry and participate in drafting the "Biochemical Space " in 2006 (2), 2007 (1) and 2007 (2).

TABLE 1:
THE "BIOCHEMICAL SPACE" PROCESS OF PREPARATION AND CONTEXTUALIZATION.

Issues	Agree	Disagree	Unknown
The process of molding of molecules improves the learning of chemical components and their cellular metabolic activity.	94%	4%	2%
The construction of graphics about the metabolism during exercise promotes the learning of metabolic adaptations to training.	80%	6%	14%
The practices carried out in laboratories promote the learning of Biochemical concepts.	98%	2%	0,0%
The laboratories practic es are essential in involvement the student with the biochemical reactions and to the ethical handling of biological weapons.	94%	6%	0,0%
The exhibition in general invites the public to reflect the space occupied by science.	90%	8%	2%

Percentage of the responses of 50 students who had studied the Basic Biochemistry and were part of the "Biochemical Space" construction in 2006(2), 2007(1) and 2007(2).

The practices carried out in laboratories promote the learning of Biochemical concepts to 98% of students, and 94% feel that they are crucial in engagement with the biochemical reactions, in addition to promoting compliance with ethics in biological manipulation. The process of molding of molecules helps in understanding the metabolic pathways for 94% of students and the exposure of activities is a moment of reflection for 90% of respondents.

The Graph 1- considering the average response agree to the issues in Table 1 and presents an increasing at participation of students in the "Biochemical Space" preparation, and its relations with the learning of chemistry concepts, molecules and energy metabolism.

Temporal analysis of "*Biochemical Space*", sum and percentage of students who agree with the five issues of Graph 1 over three semesters: in 2006(2), 10 students has been asked; in 2007(1), 14; and in 2007(2), 26.

CONCLUSION

We recognize that, knowing the structure, function and location of macromolecules in the cell and understanding the production and storage of energy; analyze the metabolism of biomolecules; know the integration between the biomolecules in metabolic regulation, and applying the study of metabolism of various substrates during the practice of motor activities involved in Physical Education, requires strategies for transmitting knowledge that approach theory and practice in the teaching-learning relationship. From this pilot, consisting of a three semesters trajectory, we can reflect about the activities carried out, assess the possibilities of continuity, and make a more refined analysis of the learning process. The evaluation of the questionnaires answered by students involved at the process of building the exposure is a stimulus for continuity of work, and directs our attention to a more refined analysis of the graphics on the energy metabolism.

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ANALYSIS OF LEARNING FROM ENERGY METABOLISM IN THE CONSTRUCTION OF A BIOCHEMISTRY EXHIBITION.

ABSTRACT

This work aims to show students the possibilities of the 2nd period of the course of Physical Education at the Salgado de Oliveira University-UNIVERSO, Campus Belo Horizonte to come into direct contact with the chemistry of molecules related to metabolism, during the construction of molds; performance of laboratory practices involving functions of carbohydrates, lipids, enzymes and nucleotides, and analysis of graphs of Biochemistry of exercise and training. This practice is a methodology for Basic Biochemistry discipline, which seeks changes in attitudes of students, to transform the knowledge gained in understanding the functions targeted for energy production. We use the "Biochemical Space" in the hall of block B, at UNIVERSO of Belo Horizonte, for exposure of molecules, graphics prepared by students, and photos of practices conducted in the laboratory from 2006 to 2007. The results are based on analysis of a questionnaire answered by 50 students at random, who made the discipline Basic Biochemistry. Of these, 94% agree that the process of montage of molecules it favors to the learning of its chemical components cellular metabolic activity, 98% say that the practices carried out in laboratories promote the learning of Biochemical concepts and 90% evaluate the exhibition as an invitation to the public for consideration of science's space. It follows that the practice helps in understanding the theory by facilitating learning and involvement with the content, and that the exposure of activities and history of photography is a time for internal integration and exchange of knowledge in different periods of the course of Physical Education.

Key words: Exhibition of Biochemistry, Changing attitudes, Energy Metabolism.

ANALYZE DE L'APPRENTISSAGE DU MÉTABOLISME ÉNERGÉTIQUE DANS LA CONSTRUCTION D'UNE EXPOSITION DE BIOCHIMIE.

ABSTRACT

Le présent document a comme objectif à montrer aux élèves les possibilités de la 2e période d'éducation physique à l'Université Salgado de Oliveira-UNIVERSO, Campus Belo Horizonte entrer en contact direct avec la chimie des molécules liées au métabolisme, au cours de la construction de moules, de la performance pratiques de laboratoire impliquant des fonctions de glucides, les lipides, les enzymes et les nucléotides, et de l'analyze de graphiques de biochimie de l'exercice et de formation. Cette pratique est une méthodologie de Base de Biochimie discipline, qui demande des changements dans les attitudes des élèves, à transformer les connaissances acquises dans la compréhension des fonctions ciblées pour la production d'énergie. Nous utilisons le “Space Bioquímico" dans le hall du bloc B,de la UNIVERSO de Belo Horizonte, pour l'exposition des molécules, préparé par les étudiants de graphiques et de photos des pratiques menées dans le laboratoire de 2006 à 2007. Les résultats sont basés sur l'analyze d'un questionnaire répondu par 50 étudiants au hasard, qui fait la discipline en biochimie de ces 94% d'accord que le processus d'assemblage de molécules d'propice à l'apprentissage et de ses composants chimiques activité métabolique cellulaire, 98% disent que le pratiques effectués dans des laboratoires promouvoir l'apprentissage des concepts biochimiques et 90% d'évaluer l'exposition comme une invitation au public pour examen de la science spatiale. Il en résulte que la pratique aide à comprendre la théorie de faciliter l'apprentissage et la participation avec le contenu, et que l'exposition des activités et de l'histoire de la photographie est un moment de l'intégration interne et l'échange de connaissances au cours des différentes périodes de cours de l'éducation Physique.

Mots-clés: Exposition de biochimie, Changement des attitudes, Energy Metabolism.

ANÁLISIS DEL APRENDIZAJE DEL METABOLISMO ENERGÉTICO EN EL PROCESO DE CONSTRUCCIÓN DE UNA EXPOSICIÓN DE BIOQUÍMICA.

RESUMEN

Este trabajo tiene como objetivo mostrar las posilidades de que los alumnos del segundo semestre del curso de Educación Física de la universidad Salgado de Oliveira-UNIVERSO, Campus Belo Horizonte entren en contacto directo con la química de las moléculas relacionadas al metabolismo, durante la construcción de modelos; realización de prácticas de laboratório involucrando funciones de hidrato de carbono, de lipídios, enzima y nucleotidios; y análisis de gráficos de Bioquímica del ejercicio y del entreinamiento. Esta es una propuesta metodológica práctica para la disciplina Bioquímica Básica, que tiene por finalidad promover cambios de actitudes en los alumnos, al transformar los conocimientos adquiridos en comprensión de las funciones organicas direccionadas para la producción de energía. Utilizamos el "Espacio Bioquímico", en el hall del bloque B, de la UNIVERSO de Belo Horizonte, para exposión de las moléculas, de los gráficos elaborados por los alumnos y de las fotos de las prácticas realizadas en laboratorio de 2006 a 2007. Los resultados se basan en el analísis de un cuestionario respondido aleatoriamente por 50 alumnos que hicieron la disciplina Bioquímica Básica. De entre estos, el 94% están de acuerdo com que el proceso de montaje das moléculas favorece el aprendizaje de los componentes químicos de las células y su acción metabólica. El 98% afirman que las prácticas realizadas em laboratórios ayudan la comprensión de conceptos bioquímicos y el 90% evaluan la exposición como siendo uma invitación al público para reflexionar sobre el espacio que ocupan las ciencias. Se concluye que la práctica ayuda en la comprensión de la teoria, facilitando el aprendizaje y la interacción con el contenido y que la exposición de las actividades y del histórico fotográfico es un momento para la integración interna y el intercambio de saberes en los períodos del curso de Educación Física.

Palabras-clave: Exposición de Bioquímica, Cambio de actitudes, Metabolismo energético.

ANÁLISE DA APRENDIZAGEM DE METABOLISMO ENERGÉTICO NO PROCESSO DE CONSTRUÇÃO DE UMA EXPOSIÇÃO DE BIOQUIMICA.

RESUMO

Este trabalho tem como objetivo mostrar as possibilidades dos alunos do 2º período do curso de Educação Física da Universidade Salgado de Oliveira-UNIVERSO, Campus Belo Horizonte possibilitando um contato direto com a química das moléculas relacionadas ao metabolismo, nos processos de construção de moldes; realização de práticas de laboratório envolvendo funções de carboidratos, lipídeos, enzimas e nucleotídeos; e análise de gráficos de Bioquímica do exercício e do treinamento. Esta é uma proposta metodológica prática para a disciplina Bioquímica Básica, que visa a mudanças de atitudes dos alunos, ao transformar os conhecimentos adquiridos, em compreensão das funções orgânicas direcionadas para a produção de energia. Utilizou-se o "Espaço Bioquímico", no hall do bloco B, da UNIVERSO, Campus Belo Horizonte, para exposição das moléculas, dos gráficos elaborados pelos alunos e das fotos das práticas realizadas em laboratório de 2006 a 2007. Os resultados foram baseados na análise de um questionário respondido, aleatoriamente, por 50 alunos, que fizeram a disciplina Bioquímica Básica, destes 94% concordam que o processo de montagem das moléculas favoreceu a aprendizagem dos componentes químicos celulares e sua ação metabólica, 98% afirmam que as práticas realizadas em laboratórios favoreceram a aprendizagem de conceitos Bioquímicos e 90% avaliam a exposição como sendo um convite ao público à reflexão do espaço ocupado pelas ciências. Conclui-se que, a prática auxilia a compreensão da teoria, facilita a aprendizagem e o envolvimento com o conteúdo, e que a exposição das atividades e do histórico fotográfico é um momento para a integração interna e troca de saberes, entre os vários períodos do curso de Educação Física.

Palavras-Chave: Exposição de Bioquímica, Mudança de atitudes, Metabolismo energético.