

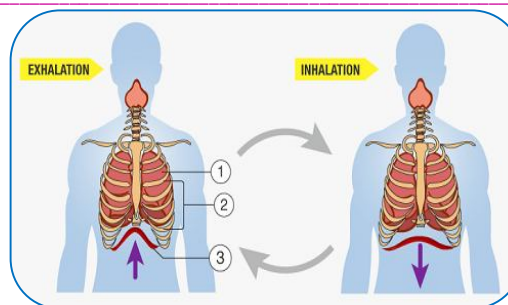


AN INVESTIGATION OF UNDERGRADUATE STUDENTS MISCONCEPTIONS IN RESPIRATION

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ABSTRACT :

Education is an active and dynamic process helps in individuals' all round development throughout life. It is also considered as a process and product as well. Various theories are developing in the field of Education and they are in practice for the betterment of educational process. Constructivism is an example of these theories. The students construct their new concept based on their previous knowledge. Science is the subject where previous basic concepts act as the bricks of developing new concept. Respiration is one of the basic chapters in the subject of life sciences. Students start to learn this chapter from the early years of schooling but because of the abstract nature of content the students feel difficulty in understanding the whole concept and memorize or skip without understanding and develop misconceptions regarding respiration. The undergraduate students of life science branches must have appropriate knowledge of respiration as many other chapters are closely related. In this paper the researchers investigated the undergraduate students' misconceptions in respiration. Total 30 undergraduate students of B.Sc. first, second and third year were selected as samples by using purposive sampling technique. A self developed questionnaire was administered for collecting data and were analyzed qualitatively. From the investigation, it is found that the undergraduate students of each year having misconception that respiration and breathing are same process. They also have less understanding about Glycolysis process and the functions of the enzymes used for this process.

KEYWORDS : Misconception, Respiration, Undergraduate Students.

INTRODUCTION

Education is an active process of developing individual's potentialities to an optimum level helps in deepen the insights and refines the reactions as well. It is considered as a product of certain inputs which we experience from our daily routines. It is also known as a process of developing the skills, intelligence, critical thinking abilities and understanding of self which continues throughout the life. Knowledge, which is a cyclic process also considered as a reality viewed from various angles and context depends upon the thinking ability of a particular individual. Education primarily depends upon theories and their practices in real field. Emphasis is mainly given to the all-round development of the learners. With this, constructivism mainly focuses on observation and scientific study. This theory also states that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on these experiences. According to constructivism, learning is an active process of constructing information. New information are linked with the previous one which acts as a fundamental block of stone gained from the personal experiences and because of this the

students cannot be considered as blank slates. As their experiences are collected from their local communication and daily life so it may not be matched with the scientifically accepted theories and results into conflict with the concepts and considered as misconceptions.

The term **Misconception** is the fact or concept present within the child not matched with the scientifically accepted fact or concept. It may be different with the scientific interpretation as well. It corresponds to the concept that has particular interpretations and meaning in students' articulations that are not scientifically accurate (Bahar, 2003). Susanti (2016) defined misconceptions i.e. the discrepancies refers to the scientific understanding or definition accepted by the experts.

As we know that energy is required for doing any work and living beings get energy by the process of respiration. This biological process happens within the cells of every living being (both animal and plant). The knowledge of respiration is acquired by learning science. It is a cellular process that occurs in cytoplasm and mitochondria and mainly breakdown of glucose or complex molecules to yield energy. Biology is a subject which is taught for understanding the living beings present in the world and Respiration which is a basic chapter should have clear concept but students feel difficulty to understand (Haslam & Treagust, 1987). Previous researches like; Svandova, (2014) showed Czech students carry many misconceptions about Photosynthesis and Plant Respiration. In particular they took misconception that plants produce oxygen throughout the day, respiration only takes place in leaves of the plants, and the most important source of food for plants is water with dissolved minerals. Keles and Kefeli (2010) found the misconceptions that plants cannot do respiration, plants cannot use oxygen, respiration in plants only takes place at night when there is no light and also concluded that CAI materials are effective in removing pre-determined misconceptions. Ameyaw (2016) found in their study that 31.5 % of students don't know that glucose is the raw material of cellular respiration and water is produced as a by-product in aerobic respiration. Some also think that ATPs are not released at the end of aerobic respiration and aerobic respiration does not occur in plants and animals as well. Bajd, Praprotnik & Matyasek (2010) found misconceptions present among the students of Slovene and Czech and found misconceptions that respiration is exchange of gases and not a cellular process. This is important for breathing and plants respire only at night.

Concept formation in any subject needs to understand the concept but not to memorize that and due to the abstract nature of biology it becomes difficult to understand and to overcome from this situation students try to memorize without understanding the concept. The goal of learning Science is to better understand and develop appropriate concepts without any conflict and misunderstanding. If misconceptions are developed, there is a need to remove and reconstruct as it acts as a barrier of appropriate learning and if not removed or corrected it will be persisted up to undergraduate level (Canal, 1999). The undergraduate students of life science stream who have a wish to become teachers in their future should have also clear concept for particular subject and because of this reason their misconceptions should be tested and should try to correct them if found.

From the personal experiences of the researchers it is found that students feel difficulty in understanding the concept of respiration. Previous researches and the personal experiences of the researchers both found that the students are having many misconceptions in respiration. So it is important to know i) what kinds of misconceptions are present among the undergraduate students about respiration?

For getting answer of the research question following objectives are framed.

OBJECTIVE OF THE STUDY

- To study the misconceptions present among the undergraduate students about respiration.

METHODOLOGY

Looking towards the nature of the objective, **descriptive survey** method was applied for the present investigation. The undergraduate students of first, second and third year of Zoology Department of Guru Ghasidas Vishwavidyalaya, Bilaspur were considered as population of the study. Total 30 students (10 from each year) were selected as sample by using purposive sampling technique. A self-

developed questionnaire was used for collecting the necessary information. Two questions were included in the questionnaire, i) is respiration same as breathing? ii) the process of Glycolysis, if Hexokinase stops working then at what stage the process will be stopped.

ANALYSIS AND INTERPRETATION

The necessary data were collected by the researcher. After that, the collected data were categorized as per the similar responses of the students. These data were analyzed qualitatively and percentage analysis was also found out.

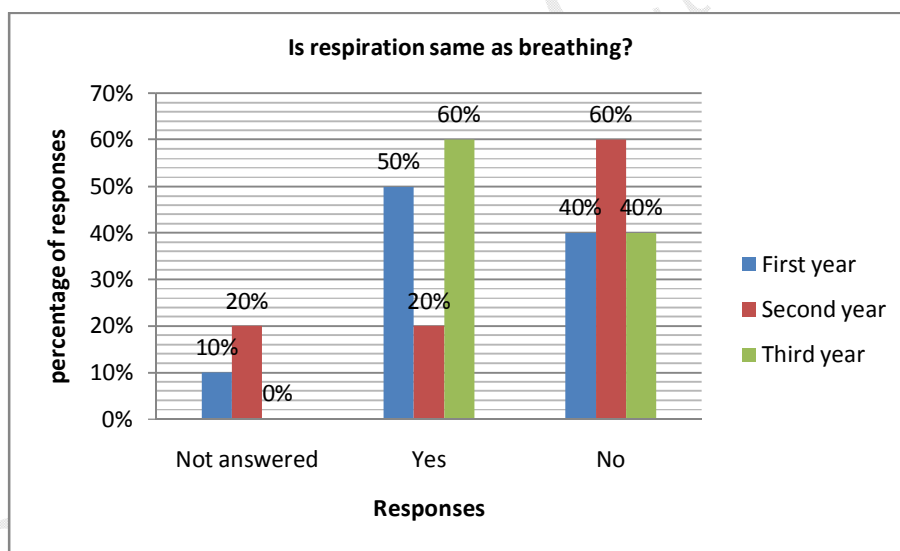
Analysis of First Question:

In the first question, it was asked; is Respiration same as breathing? Yes/No. Give scientific explanation of your response.

For analyzing the first part of the question, percentage analysis was done year wise i.e. first, second and third year respectively. The percentage analyses of the responses are shown in Table 1.

Table 1: Percentage Analysis of Item 1 i.e. 'is respiration same as breathing'

Academic Year	Not answered	Yes	No
First year	10%	50%	40%
Second year	20%	20%	60%
Third year	0%	60%	40%



Graph 1: response of the question, "Is respiration same as breathing"

The Table-1 & Graph-1, showing the responses of the statement i.e. **is respiration same as breathing**. The responses for this statement were categorized into three categories which are "not answered", "yes" and "no".

10% students from the first year, 20% from the second year did not give responses for this particular statement. But all the students from the third year gave responses for the particular.

50% first year students, 20% second year students and 60% students of third year have **misconceptions that respiration is same as breathing**.

Though many students are having misconceptions but some students from each year are having correct conceptions regarding respiration and breathing. 40% students from first year, 60% from second year and 40% from the third year gave the right response that "**no**" **breathing is not same as respiration** and they also gave the correct explanations between differences in the processes.

From the above analysis of first question, where the students have written that respiration is same as breathing, from that, it can be said that the students hold inaccurate idea about the terms “respiration” and “breathing” which is present among the students of all years of undergraduate course. The students who said “yes” both are the same processes gave their scientific explanation and found what kinds of misconceptions are present among the first, second and third year students.

The misconceptions having among the first year students are like:

- In respiration we release CO_2 take O_2 and in breathing we also release CO_2 first and then intake O_2 . So **both are same** processes,
- Exchange of gases takes place here.
- It is the process of exchange of O_2 and CO_2 from environment.
- Breathing is inspire of O_2 and expire CO_2 and

The misconceptions found among the second year students are like:

- We can breathe with the process of respiration
- Breathing is done by human beings only and respiration is happened in plants only.

The misconceptions having third year students are like:

- In respiration stomata is work as like breathing lungs are working
- Breathing is the small term for inhaling and exhaling but respiration includes a whole process through which air is entered till it is released.
- In both the processes we intake oxygen and release carbon-di-oxide
- Respiration only releases gases and in breathing both intake and release of gases happens.

ANALYSIS OF SECOND QUESTION:

In the second question, the students were asked the about the function of Hexakinase in gGlycolysis process. In this question they were asked to write the process of Glycolysis and if Hexakinase stops working then at what stage the process will be stopped.

Analysis of responses of first year B.Sc. students: 60% of **first year** students **did not** give responses for this item. Remaining 40% students gave responses. But not single student gave correct scientific response.

The first year students who have given responses for this question have written that if hexakinase is absent in glycolysis process then the process will stop and will not be completed yet.

Analysis of responses of second year B.Sc. students: 60% students studying in **second year** also **did not** respond for this particular question. 30% students gave correct response with flow chart that in the first step if it is not secreted there will be no conversion of glucose to glucose-6-phosphate and remaining 10% said that the process of glycolysis is forgotten.

Analysis of responses of third year B.Sc. students: Here, 30% students of **third year** did not answer the question. 10% said don't know and 50% responded that further process of glycolysis will not continue and it will stop. And remaining 10% said that it will effect on fructose and glucose level.

DISCUSSION

From the analysis of first question, it can be said that though the students are in undergraduate classes of biology streams but still they have misconceptions in Respiration. Maximum misconception is seen among the third year students and the percentage is 60. Little less misconception is seen among the first year students which is 50% and very few percentage of students (i.e. 20%) shown misconception in respiration. It can also be concluded that students are very much confused about the concept of respiration and breathing. Maximum students think that inhalation and exhalation of gases are considered as both breathing and respiration. Kwen(2005) also found the same misconception that breathing and respiration are same process of gaseous exchange. They have no idea that both are the different processes. Svandova (2013) also stated that students are very much confused about the terms

of respiration and breathing. And also found that most frequent misconception is found among the girls rather than the boys.

In the second question when the students are asked about the role of hexokinase in the process of glycolysis. Here the students are unable to draw the accurate steps of glycolysis. This is the result of remembering the content at the time of examination only without understanding the concept.

The first and second year students unable to attend the question when they were asked about the reason of not attempting the question the responses were that: they forgot about the concept of glycolysis as this is a very difficult topic to remember and to understand as well. But the third year students gave responses about the question. As they are now in final year and they have repeated the concept so many times. So they are little aware about the steps and the function of the enzymes included in this process.

CONCLUSION

Respiration is the concept which is started to learn from the very basic classes and is continued upto higher classes. The difference is that the level of the concept is being deepened. So it can be presumed that the undergraduate students of life science branches could have clear concept about this basic concept of respiration. But from the above analysis it can be concluded that though they are undergraduate students and are going to take their bachelor degree in science but still they are having so many misconceptions about respiration. So there is a need to look after regarding the understanding of respiration which is one of the basic concepts of biology. As, some of them want to become teachers in future so they should not have misconceptions in biology otherwise it will be transferred to the next generation learners also. So, students, teachers as well as parents have to look after towards the understanding of concepts especially in the basic concepts in biology as they act as the bricks for the formation of better understanding of the other concepts and future learning of biology.

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