

ICT Impact on Learning and Teaching Practices: Concept of Phagocytosis in Biology

El FatehiYassine¹, Boulghallat Mustapha², Eloutassi Nouredine³

^{1,2}Laboratory of Sustainable Development.Faculty of Sciences and Techniques- BeniMellal, University Sultan MoulaySlimane, BeniMellal
y.elfatehi[at]gmail.com, msboulghallat[at]gmail.com

³Didactic Laboratory of Science and Technological Innovation. Regional Centre for Education and Training Professions, Fez
eloutassinouredine[at]gmail.com

Abstract: *Everyone is aware of the considerable pedagogical interest and the important role of information and communication technologies for education (ICT). They have a transversal and generalized use for teaching / learning processes. Therefore, it is important for Morocco to integrate them into a pedagogical system to become didactic tools. In order to carry out this research, we have developed a pedagogical scenario integrating a digital resource called "RN.Yes16" to evaluate the impact and degree of acquisition of the notion of phagocytosis in biology and, for this, we have implemented an anonymous questionnaire survey and observations as investigative tools for data collection. The samples of this work are students of experimental science department, 2nd year Baccalaureate degree Students. The main results of the questionnaire related to the use of the digital resource "RN.Yes16" on learning showed that: 95%, 85% and 70% of the pupils have correctly answered respectively the questions related to the characteristics, stages of phagocytosis and the types of cells mainly participating in this phenomenon; 90% of students find that the use of ICT in the classroom increases their motivation for learning as well as concentration; 80% of the students have constructed their knowledge and know-how individually after the session through using "RN.Yes16" and therefore facilitated their storage and recall of learning; 20% of students find that the use of ICT by their teachers disrupts the learning acquisition process; 25% of students could not hand back the copies on time given to this questionnaire, which reveals their mismanagement of time and the inability to concentrate for some. In conclusion, the integrated digital resource has been able to improve the teaching-learning conditions and has allowed students to acquire the notion of phagocytosis in a well-illustrated way.*

Keywords: TICE, RN. Yes16, Phagocytosis, Life and Earth Science

1. Introduction

Information and Communication Technology is a set of technologies based on computer sciences, microelectronics, telecommunication (especially networks), the multimedia and the audiovisual which, when combined and interconnected all together, allow searching, storing, processing and transmitting information in the shape of data of various types (text, sound, still images, video images)[1].

The data related to texts, sounds, fixed images, motion pictures, videos, software's and other information and communication technologies (ICT) are phenomenal tools and Digital Resources "DR" mostly used in teaching and learning. They can enable us to search, store, process and transmit information and facilitate interactivity between people and between people and machines [2]-[3].

Tools are defined as a set of equipment designed and used to produce, process, store, exchange, classify, retrieve and read digital documents for teaching and learning purposes [4]. The ICT has a transversal and generalized use in the teaching/learning process. Therefore, it is important to integrate ICT in the pedagogical system to become a didactic tool in education (ICT IN EDUCATION)

The profound changes that the international education field has known made it necessary for the Moroccan educational system to seek the integration within the information and knowledge society, throughout the generalization of information and communication technologies in the learning/teaching process[5].

In this sense, Morocco, like other developing and western countries, has understood the importance of the use and the integration of ICT in its educational system. For this, the Moroccan government has adopted, since 2005, a program named « GENIE » [6], this program aims at generalizing these technologies in order to integrate them in the educational and training system.

ICT then become, on the one hand, a reality as well as a tool that enables to develop teacher's pedagogical and methodological practices, also a vector that modernizes and accelerates human and economic development on the other hand. Major national projects were launched in Morocco to disseminate, facilitate and showcase an educational culture that promotes ICT within the Moroccan educational system.

Using ICT for educational purposes does not mean that technological devices replace the teacher [3] – [7]. The observations made on this subject have shown that ICT never replaces the teacher. Thus, it is a matter of new tools, and of additional didactic tools that are available for the teachers to facilitate their students' learning. The pedagogical use of ICT can be summed up into the following fields:

Searching for useful information for institutions, installing and developing a teaching/learning skill.

Acquiring ICT concepts and methodologies associated with daily lessons.

Producing, creating and using knowledge and skills to produce educational outcomes and improve new skills;

Areas of communication and sharing that create an educational, participatory, and collaborative space for all the agents of education;

Areas of organization and planning for the teacher which enables him/her to better plan, organize his/her role in the classroom as well as the individual follow-up of the learners.

Our motivation for this research stems, on the one hand, from our awareness of the important role of ICT in the teaching practices in Life and Earth Science because it improves the teaching-learning process among both teachers and learners. On the other hand, because of many other reasons that we can state as follows:

A great shortage of experimental equipment in the schools' laboratories.

An impossibility to visualize certain real phenomena (duplication of DNA, protein synthesis, antigen, antibodies...);

A long duration of some phenomena that we cannot visualize at the real time (Subduction, life cycle of certain living beings, plant growth, immune system effect);

The risk or delicacy of certain experiments (chemical products, dissection equipment...);

The huge number of learners in the same class (the impossibility of conducting or handling the experiment with a crowded class,...).

For these reasons, our research revolves around the following question: what is the role of information and communication technologies in the comprehension of certain terms in biology?

This study aims at analyzing how ICT can contribute to the improvement of the comprehension of certain terms in biology, the human body as an example. The problematic of this study lies mainly in clarifying the role of ICT in drawing students' attention during the lesson and revealing its importance in improving students' comprehension.

2. Methodology

2.1 Targetedsamples

The target sample is made up of pupils (90 pupils) aged from 15 years to 20 years old majoring in experimental science, second year bachelor level, Life and Earth Science, and phagocytosis course. This survey took place from the beginning to the end of March 2017.

2.2 The Digital resource "RN. Phago16".

The "RN. Yes16" is a digital resource in the form of a 30-second animation, repeated over an interval of fifteen minutes for six groups with an equal number of fifteen students per group, in which we have described the successive stages of the phagocytosis of bacterial micro-organisms by a phagocyte (figure 1), this resource allows the student to acquire knowledge in relation to this notion as well as to understand and remember this phenomenon by heart.

The use of digital technology allows students to be active in the construction of their knowledge and know-how, unlike in the traditional course (figure 2) where the teacher exposes his knowledge in the form of a lecture and the student must integrate and apply the knowledge exposed by the teacher. Phagocytosis is the process by which a cell is able to absorb and then digest a foreign substance. This phenomenon plays a defensive role in cell function.

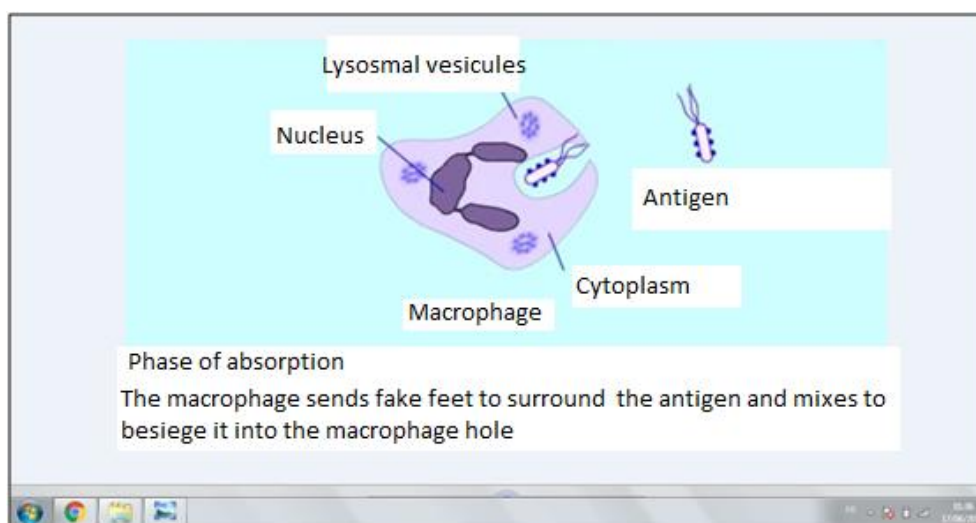


Figure 1: Digital resource "RN. Yes16" describing the steps of animated phagocytosis

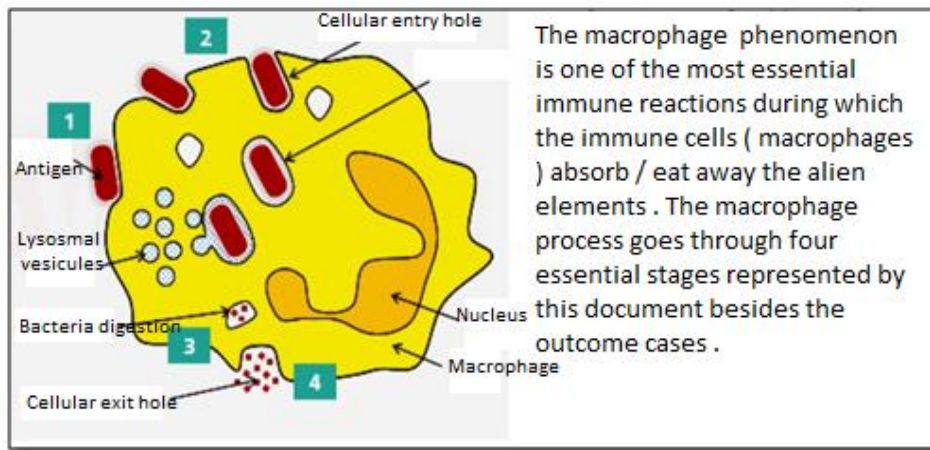


Figure 2: Excerpt from a document used in a traditional course of study

2.3 Collection and processing of statistical data:

Students were surveyed through the implementation of two questionnaires [8]:

- The first questionnaire is related to the knowledge of the phenomenon of phagocytosis which contains 9 items (open, closed and of multiple choice).
- The Second questionnaire regarding the integrated digital resource "RN.Phago16 " that contains 10 items (open, specific and general).

The questionnaires developed were validated before their administration; Figure 3 summarizes the questionnaires used during this task [9]. Also, the observations allowed us to gather information on the non-verbal behaviors of the subjects [10], we used:

Participant observation: This represents intense interactions between the researcher and the subjects, in the environment of the latter. During this period, data is systematically collected [11].

- Observation grid: This is a grid containing the degree of motivation, time management for each student as well as individual work [12] – [13].



Figure 3: Questionnaires implemented in this work (knowledge about phagocytosis and integrated digitalresource "RN.Phago16") with different items.

3. Results and discussion

The whole of the data collected during the observations and the directionof the questionnaires are processed and analyzed by the computer software (Excel) that is the easiest and most common computer software among most Moroccan teachers. The main results obtained are shown in Figures 4, 5 and 6 below.

3.1 Knowledge questionnaire

Based on the results obtained from the knowledge questionnaire shown in Figure 4, we found that 95%, 85% and 70% of the students answered correctly and respectively the questions related to the characteristics, stages of phagocytosis and types of cells that are mainly involved in this phenomenon.

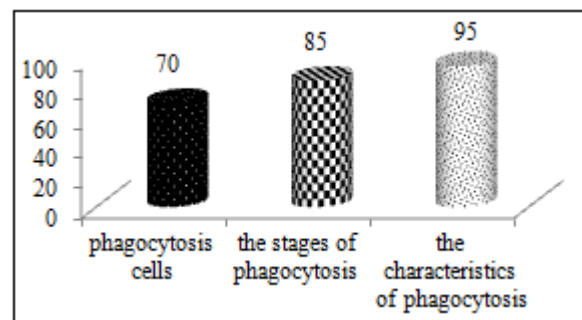


Figure 4: Results obtained from the Knowledge Questionnaire

Moreover, similar studies that have been done on the effectiveness of integrating ICT into the teaching of SVTs, such as the teaching of concepts related to the nervous system in the second class [14] have shown that for 72.22% of the surveyed students, ICT improves analysis and for 44.44% of them ICT improves interpretation. In contrast to 22.22% of students whose scientific reasoning was not improved by ICT.

3.2 Questionnaire of the "RN.Phago16"

For the results obtained from the questionnaire of the "RN.phago16 " represented in Figure 5, we also noted that 90% of students find that the use of ICT in the classroom

increases their motivation to learn and their concentration, moreover, 80% of students have built their knowledge and know-how skills individually after the session through the use of "RN.phago16" and therefore allows them to facilitate the storage and recall of what they have learned for some, this is affirmed by several studies [14] that have showed that 38.89% of students work autonomously (do the research by themselves) and 27.78% of students work at their own pace.

Moreover, in the same work [14], the authors also reported that 72.22% of students are motivated by the ICTE tool. 22.22% of the students consider that ICTE is entertaining compared to only 1 student among the 18 interviewed who considers ICTE as not motivating at all.

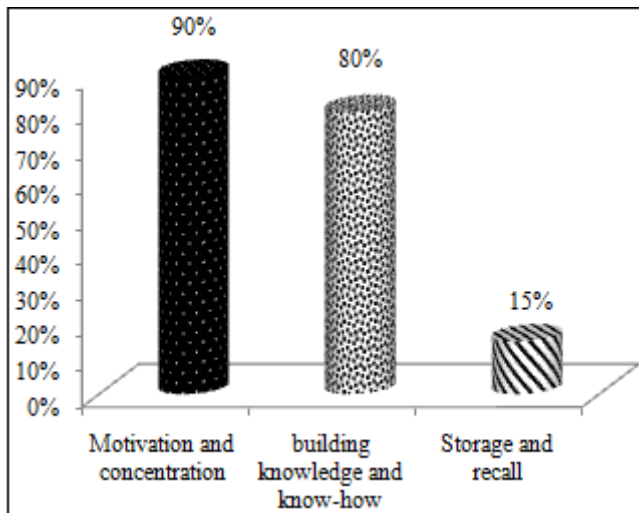


Figure 5: Results obtained from the "RN.Phago16" questionnaire (motivation and concentration, knowledge and know-how building, storage and recall).

Adding to this, other works [15] – [16] have tracked a strong motivation of the students, and a lot of interaction especially during the simulation discussion and promotes the construction of new scientific concepts (human digestion, plate tectonics...).

3.3 Observations of non-verbal behaviors

As regards the results obtained during the observations represented in Figure 6, all the students participating in this questionnaire have showed a high level of motivation to complete the work, furthermore, 75% of the students managed their time well, compared with only 25% of the students who were unable to hand back the copies in the time allotted to the questionnaire, which reveals a sense of poor time management and deconcentrating among a few. We have confirmed these results with similar works [14] – [15] – [16], in addition, the authors stated for example [14] that 73.8% of the students manage to finish on time and for 54.29% of the students, the time given for computer work is sufficient.

It should be pointed out that 90% of the students were able to answer the questionnaire individually, which minimizes the cases of cheating.

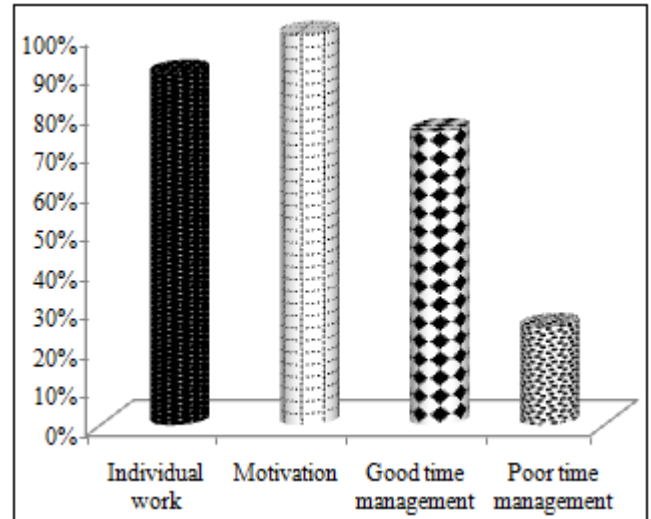


Figure 6: Results obtained from the observations (motivation, time management, attention, and individual work)

4. Conclusion and outlook

The integration of ICTE in the teaching of the phenomenon of phagocytosis has shown very promising results. However, there are still essential questions that education and training must answer today, namely the introduction of the new information and communication technologies throughout the educational field.

This is a recent, fragmented and rapidly evolving phenomenon, which raises several questions, both in terms of uses, technical and infrastructural aspects. This selection provides an overview and a perspective on these new tools that are essential for teaching.

This work could therefore be pursued from another angle because it is strictly limited to a single concept and a single level.

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