

APPLYING WEB ANIMATION IN THE ICT FRAME IN TEACHING CONTENTS OF NATURAL SCIENCES AT PEDAGOGICAL FACULTIES

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Abstract

Teaching and acquiring competences requires changes in manners and methods of teaching that have great influence on learning teaching contents from the area of natural sciences at Pedagogical faculties. Therefore, the need for frequent thorough training of teachers often appears. Digital literacy is needed among other teacher's competences when using e-materials in school. The goal of this subject is not merely acquiring basic facts about the world around us; it is rather more important for students to gain specific and general competences for lifelong learning. Competences consist of different kinds of knowledge, skills and abilities, as well as personality attributes (character, behavior, convictions, etc.). They can be trained only by appropriate didactic methods which force students' activity. Teachers must themselves possess required competences in order to guide children in right direction.

How much has the education of teachers so far helped in shaping competences of future teachers teaching contents from the area of natural sciences, and in respecting these during forming new study programs for teachers' education?

The teaching subject “Nature studies” has been introduced at department at the Faculty of Educational Sciences in Shtip, Macedonia – Elementary school teaching–with the introduction of the European Credit Transfer System. If the teacher's personality is the key factor for the success or failure of a school, of course we must consider the fact that other factors also influence the working efficacy of a school, one of which is the material factor. Thus, in accordance with the conditions and possibilities at Pedagogical faculties, and aiming to learn some basic contents from the field of natural sciences, this paper will present the usage of web animation for learning the teaching content “cell division” of the subject “Natural studies”

Key words: web animation, ICT, natural sciences, natural studies, cell division.

INTRODUCTION

Natural and social sciences, technics and complexity of everyday life are nowadays developing too quickly to be followed in education in all their integrity and diversity. In order to solve this problem, the most important topics have to be selected and appropriate didactic strategies are necessary. Aspects of social and natural sciences are introduced to students as early as in the first years of regular education.

On the other hand, science brings new findings about the surrounding world and new technological achievements, which are difficult to follow even for experts, not just for teachers. However, it is obvious that the children are fairly susceptible to

acquiring experimental and other skills as well as learning from ICT (Information Communication Technology) sources, such as computer web pages, Gerlič, 1991. Various specific competences that should be trained and developed within individual topics (for instance, simple systematic observation and measurement in physics topics) are prescribed in the national curriculum. Here, we list the 8 key competences from the European legislation (Key Competences, 2011) which every citizen should acquire during regular education:

- 1) Communication in the mother tongue
- 2) Communication in foreign languages
- 3) Mathematical competence and basic competences in science and technology
- 4) Digital competence
- 5) Learning to learn
- 6) Social and civic competences
- 7) Sense of initiative and entrepreneurship
- 8) Cultural awareness and expression

There exist several other lists of competences which are either more subject specialized (for instance, nature science competences for individual sciences) or have a narrower meaning than competences from above list.

THE ROLE OF ICT IN ENHANCING THE DEVELOPMENT OF BASIC EDUCATION

The question is on longer if the Internet can be used to transform learning in new and powerful ways. The question should we invest the time, the energy and the money necessary to fulfill its promise in defining and shaping new learning opportunity. It is time we collectively move the power of the Internet for learning from promise to practice.

E-learning has the following advantages:

1. Access to the learning program any time convenient to the learner.
2. Learners can be at any place to log on.
3. Enhanced group collaboration creating shared electronic conversations which can be more thoughtful and permanent than voice conversation. Aided by group coordinators, these can be powerful for learning and problem solving.
4. New educational approaches can be used. For example, faculty from anywhere in the world, faculty teams, with different specialties can be put together and innovation of teachers can be shared along themselves for improvement and adaptation.

However, these advantages are out of reach of most developing countries, where power and telecommunication facilities are poor, where resources and well trained teacher are scarce and where television and other forms of distance education cost less. One has to look for alternatives while being watchful not to 'miss the bus' with the new ICT. We shall examine below how and where ICT, both new and old, can enhance education for all in developing countries.

As in the case of higher education mentioned in the previous section, there are four ways ICT can support basic education:

1. Supporting education in schools;
2. Providing non-formal education for out-of-school children and adults;
3. Supporting pre-service distance education of teachers and their in-service professional development and

4. Enhancing the management of schools.

NATURAL SCIENCES (The cell, “cell division”)

Program description

Examine the structure of cells to see how carry out everything from energy production to waste disposal to the storage of genetic material.

Lesson summary

Onscreen questions

Part 1, “The cell”

- What are the characteristics of prokaryotic cells?
- What are some differences between plant and animal cells?

Part 2, “Cell division”, “Mitosis”, “meiosis”

- **Which cells divide by means of mitosis and which by means of meiosis?**
- **What are the differences between mitosis and meiosis?**

Lesson plan

Student objectives

- Explain the cell structure.
- Explain the build and the structure of the core.
- Determine a viewpoint on this topic and support the position with research.

Materials

- Internal script “Elements of nature“
- Computer with internet access
- Paper and pencils

Procedures

- Begin the lesson with questions for students.
- Which is the biggest and most striking structure in the cell’s cytoplasm?
 - What happens when a cell divides?
 - Why do the cells in our organism divide?
 - What types of division do you know?
 - What is mitosis and what is meiosis?

In developing their positions, students should consider the following issues:

- The practicality of executing this research
- The long-term benefits of this research
- The long-term risks
- An assessment of the long-term prospects for this research.

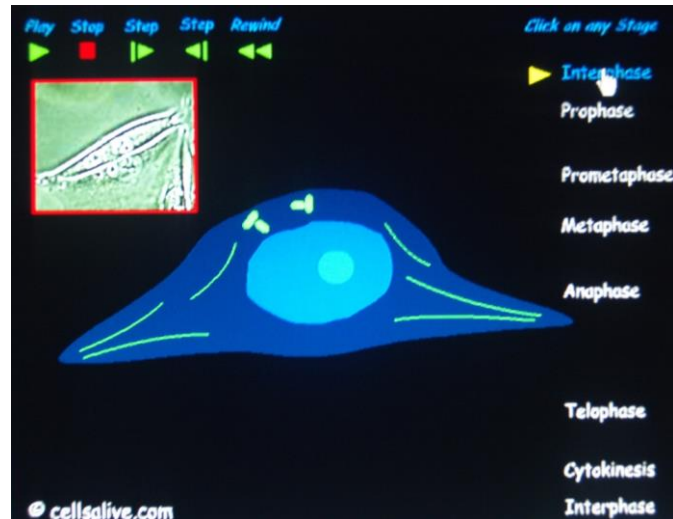
Give students time in class to work on their projects. The Web sites below have information on tissue engineering.

- [Http://en.wikipedia.org](http://en.wikipedia.org)
- [Http://www.cellsalive.com](http://www.cellsalive.com)

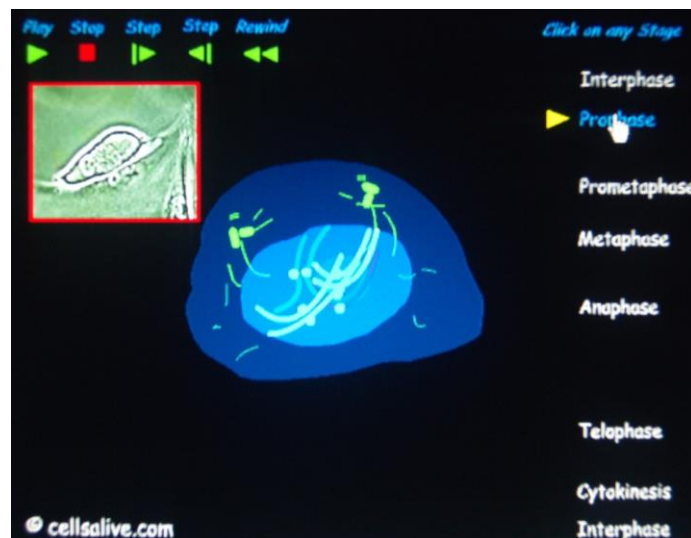
For your information, below is some background material on this topic.

EVENTS DURING MITOSIS

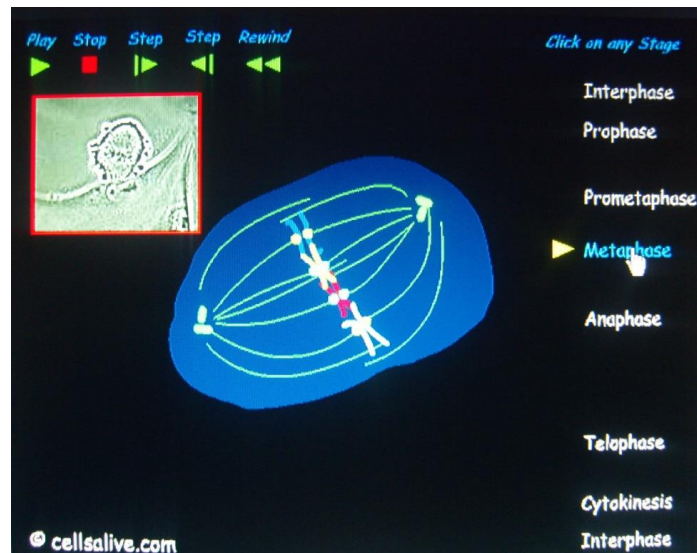
Interphase: Cells may appear inactive during this stage, but they are quite the opposite. This is the longest period of the complete cell cycle during which DNA replicates, the centrioles divide, and proteins are actively produced.



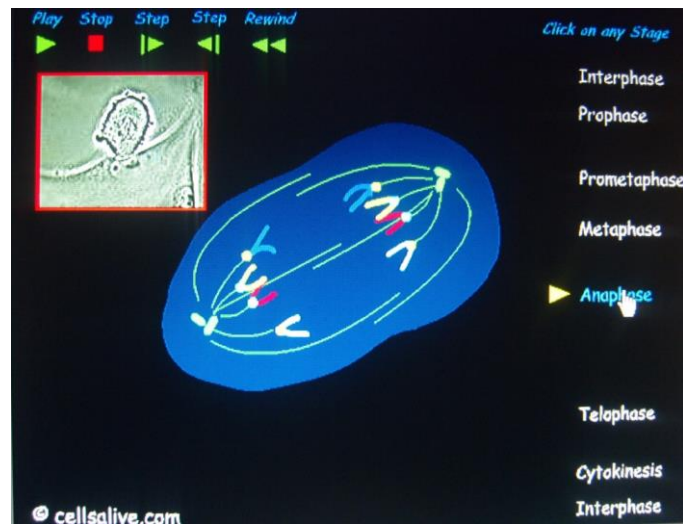
Prophase: The nucleolus fades and chromatin (replicated DNA and associated proteins) condenses into chromosomes. Each replicated chromosome comprises two chromatids, both with the same genetic information. Microtubules of the cytoskeleton, responsible for cell shape, motility and attachment to other during interphase, disassemble.



Metaphase: tension applied by the spindle fibers aligns all chromosomes in one plane at the center of the cell.



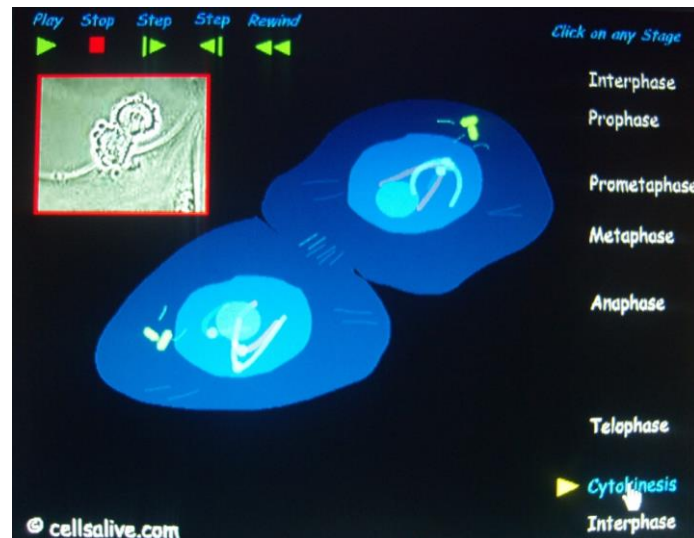
Anaphase: Spindle fibers shorten, the kinetochores separate, and the chromatids are pulled apart and begin moving to the cell poles.



Telophase: The daughter chromosomes arrive at the poles and the spindle fibers that have pulled them apart disappear.



Cytokinesis: The spindle fibers not attached to chromosomes begin breaking down until only portion of overlap is left. It is in this region that a contractile ring cleaves the cell into two daughter cells. Microtubules then reorganize into a new cytoskeleton for the return to interphase.



Need a video of mitosis for classroom use? One is available for immediate download.

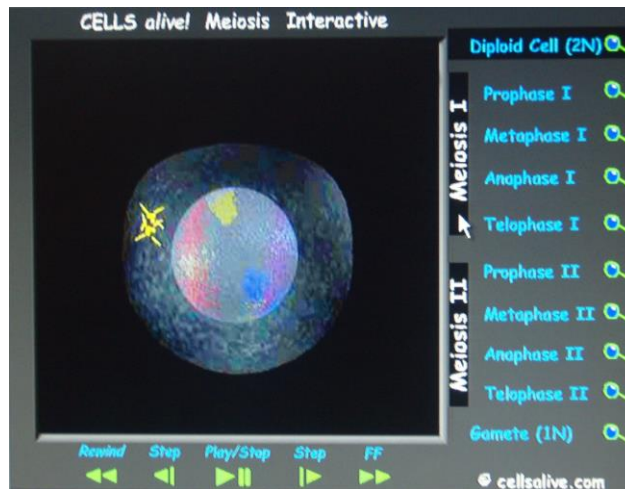
Some key words: cell cycle, mitotic spindle, DNA replication, kinetochore, microtubule.

Meiosis

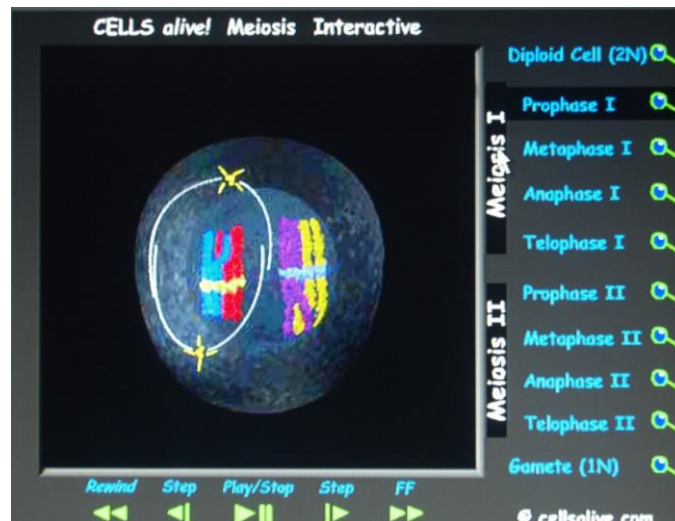
Meiosis is important in assuring genetic diversity in sexual reproduction. Use this interactive animation to follow Meiosis I (reduction division) and Meiosis II in a continuous sequence or stop at any stage and review critical events. This animation is also available for offline use in single user and multi-user version and on the CELLS alive! CDROM.

EVENTS DURING MEIOSIS

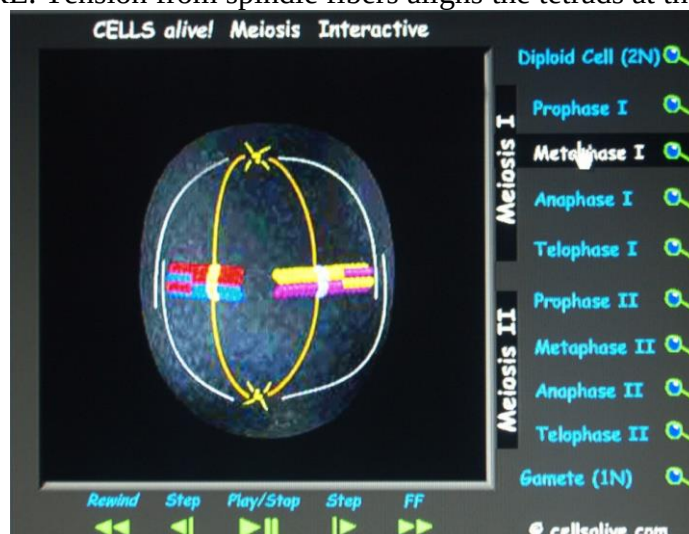
Diploid Cell (2N): From a preceding mitotic division, the Oogonium (Spermatogonium) enters meiosis with DIPLOID (2N) chromosomes but TETRAPLOID (4N) DNA. Chromosomes then duplicate to produce sister chromatids (or homologous dyads).



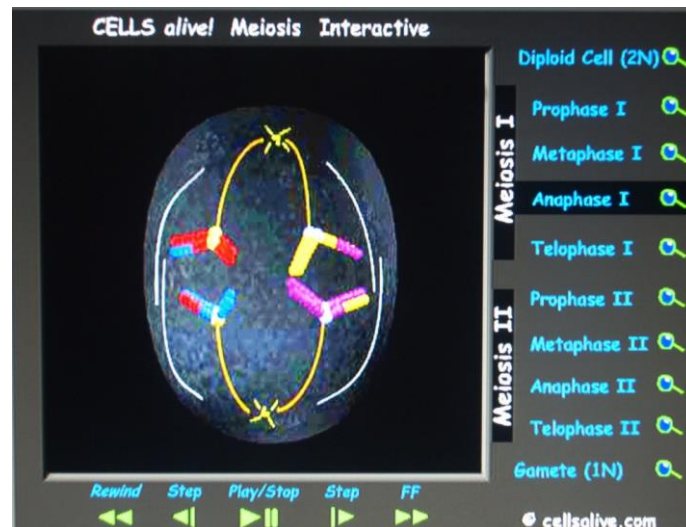
Prophase I: Dyad pairs align to create “TETRADS”, non-sister chromatids connect and trade sections at a “CHIASMA”, a process called “CROSSING OVER”.



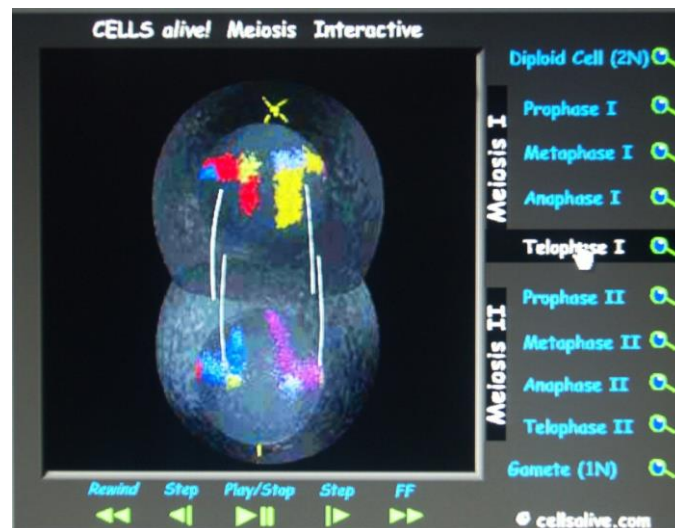
Metaphase I: SPINDLE FIBERS attach to each dyad at the KINETOCHORE. Tension from spindle fibers aligns the tetrads at the cell equator.



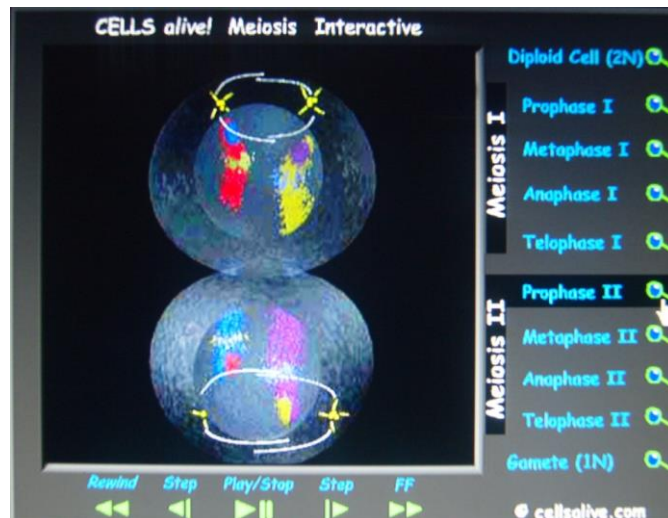
Anaphase I: Chiasmata break apart and sister chromatids begin migrating toward opposite poles.



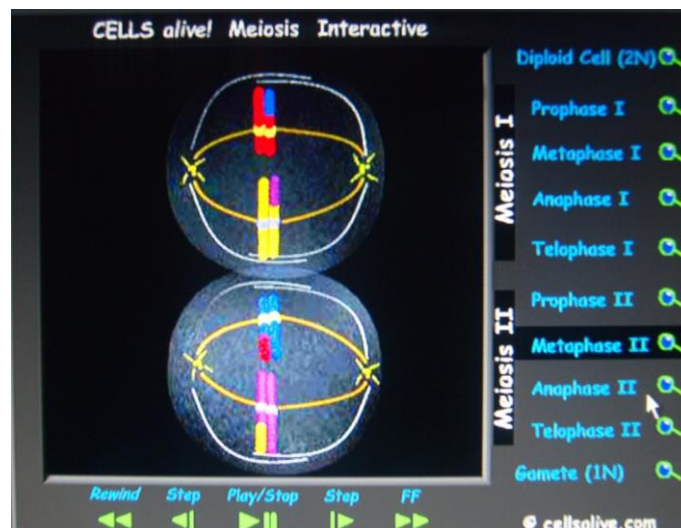
Telophase I: CLEAVAGE FURROW forms beginning the process of CYTOKINESIS (cell division). Resulting daughter cells are HAPLOID (1N).



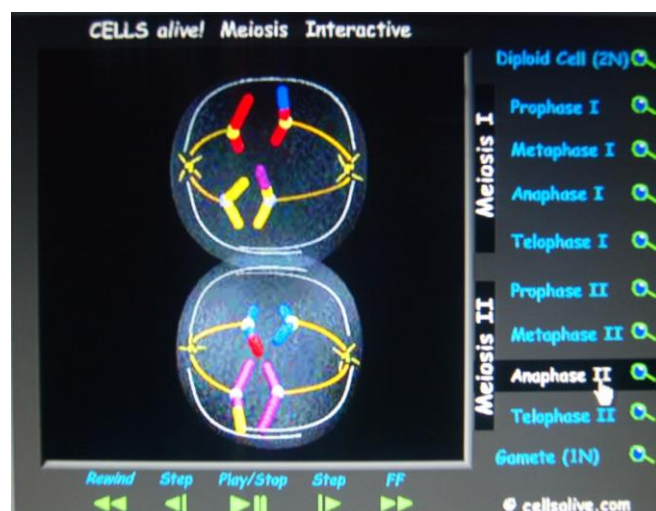
Prophase II: Spindle formation begins and centrosomes begin moving toward poles.



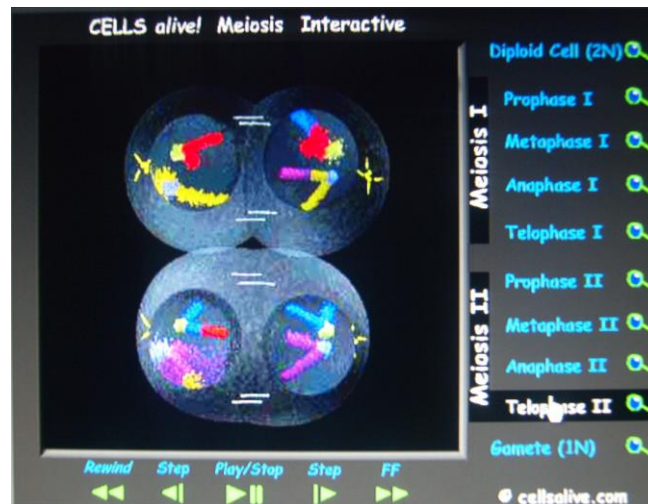
Metaphase II: Tension from spindle fibers aligns chromosomes at the metaphase plate.



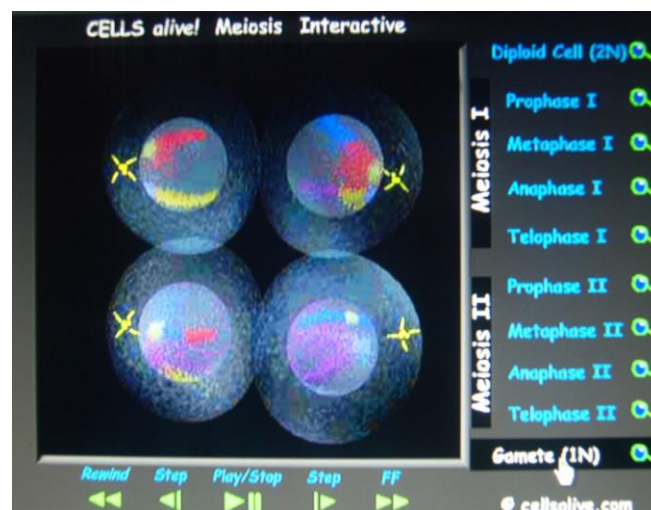
Anaphase II: CHROMATIDS separate and begin moving to the poles.



Telophase II: CLEAVAGE FURROW forms beginning CYTOKINESIS.



Gamete (1N): NUKLEAR ENVELOPES form and chromosomes disperse as CHROMATIN. Meiosis has produced 4 DAUGHTER CELLS, each with 1N chromosomes and 1N DNA. Later, in fertilization, male and female 1N gametes will fuse to form a 2N ZYGOTE.



Some keywords: sexual reproduction, reduction division, crossing over, kinetochore, microtubule.

Meiosis is important in assuring genetic diversity in sexual reproduction. Use this interactive animation to follow Meiosis I (reduction division) and Meiosis II in a continuous sequence or stop at any stage and review critical events. This animation is also available for offline use in single user and multi-user and on the CEELS alive 1 CDROM.

Conclusion

Basic knowledge of biology plays an important role in the education of pupils in the first four grades of primary school. In each new grade, they learn and add to the teaching contents in a spiral manner.

The benefit of knowing basic biological concepts also has an important place in ecological education and building of the pupils' ecological culture. In this sense, this is highly important for future teachers in the early grades of primary school not

only for teaching methods but also for the area of biology as a science. Biology as the science about life has a significant place in the personality's development from the earliest age of a child to its full development as a person living in a particular society.

The application of web animation as well as many other techniques offered by ICT as techniques that can be applied in teaching are extremely important for pedagogical faculties.

References

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http://europa.eu/legislation_summaries/education_training_youth/lifelong_learning/c11090_en.htm (25. May 2011).

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