A Sight of the Life Molecule

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Abstract

We describe a workshop entitled "Una Mirada a la Molécula de la Vida" (A Sight of the Life Molecule) in which different aspects related to human heritage are put forward trough touch sense using pedagogical materials developed by the "Cascabel" divulgation group of the Facultad de Ciencias of the Universidad Nacional Autónoma de México. The main objective of the workshop is to sensitize society about the blindness and to make available to the blind people scientific information through the proposed activities. The participants in the workshop are shortsightedness and general people. In the activity, each participant gets a box containing 20 pairs of chromosome models and three single ones. All the 20 pairs are different so by touching them the can be differentiated. The eyes of the normal seeing participants are covered with a mask so they can to know the

situation of the blond people; at the same time we said about the history and some important aspects about the human heritage.

Along human history there have been a lot of efforts to elucidate the way we reproduce. How biological information is inherit to our sons. For example, Greeks believe that we reproduce through the intrusion of a Little man (homunculus) into the woman uterus, wherein he finds a way to live and grow giving origin to what we know as a baby.

With the Discovery of microscope, was finally determined that living organisms were made of cells and one cell can only be produce by another cell.

It was until middle twenty century that nucleic acids DNA and RNA (deoxyribonucleic acid and ribonucleic acid respectively) were define as the molecules responsible of inheritance, these molecules are found at cell's nucleus and every specie presents a steady amount of genetic information.

Observing that there is a stage on the cell cycle when cell division occurs (mitosis and meiosis) that this DNA aggregates forming superstructures known as chromosomes, which are the carriers of most of genetic material and condition life organization and inheritance of every specie.

It is denominate as every staff-like body in which chromatin is organized. Every cell in human beings contains 46 chromosomes, 22 autosomic pairs and a couple of sexual chromosomes. With the exception of reproductive cells which contains only half of the information 23 chromosomes.

Some species presents different chromosomes number for example: rabbit 44 chromosomes, tobacco 96 chromosomes, mouse 40 chromosomes, radiolarian 1600 chromosomes.

Every chromosome of the same pair has similar shape, size and functions but different genetic coding and centromere localization (narrowest chromosome region formed by 80 proteins that play crucial roll on cell division providing the necessary support for pulling apart chromatides that will result on new cells).

The whole set of human chromosomes contain 40,000 genes approximately. Nevertheless the amount of genetic information has no relation with complexity or organism size.

There exist alterations as on genetic information amount as on disposition, that restricts normal physiological development of organisms (mutations, chromosomic aberration) and has a lot of impact on individual life expectative.

Some syndromes associated with chromosomes abnormalities causing pathology have been identified, the most frequents in humans are: Down syndrome 21 trisomy, 18 trisomy Edwards syndrome, 13 trisomy Patau syndrome, X monosomy Turner syndrome and gonosomic trisomy of Klinefelter syndrome: men with 47 cariotype XXY.

Figure 1

Thinking on vulnerable society sectors, on scientific communication, on necessity of inclusion and on those sectors to account with didactic material (on science areas), to let them know that there are some activities for them, in addition to the interesting knowledge about human inheritance. A series of workshops were made to allow blind people to sense through objects with specific textures, objects that they can not see and can not be described. “A Sight of the Life Molecule”, “A Sight of the Life Molecule for Children” and “Sensing Nitrogen Base Pairs”. The second workshop designed for children between five and eight years old based on the first one.

Those workshops have been developed by normal viewers; so there have been a lot of difficulties in respect to what is better and more perceptible for blind people, different chromosome models were created using diverse materials and techniques, 25 models approximately which were set into probe with blind people and normal viewers, leading to the final model.

Another important aspect is that with those workshops people sensitize about the situation that lives blind people.

The material (chromosome models, containers, bags, masks and Braille informative pamphlet) were developed by scientific communication group “Cascabel” from Facultad de Ciencias of the Universidad Nacional Autónoma de México, some members of Faculty community, some plastic artists and young people in a social re-adaptation program to which in addition of chromosome models elaboration, a lecture about science relation to some aspects of common life was provided. This collaboration also looked for those young people to met better and healthy ways to help or contribute to cultural development of they community.

Models were elaborated having a little piece of wire as basis, over which, a plastic thread was knitted forming an spiral until the middle (varying on each chromosome model), at this height a second knitted piece of wire was joint with a double spiral knitting, representing the centromere, and proceed knitting the rest of both pieces with a single spiral. After model was complete some marks were made with French paste, representing different genetic densities. Chromosome model elaborations for “A Sight of the Life Molecule for children” workshop was different, after complete the piece, two pieces with the same texture were jointed together, all the pieces are the same size.

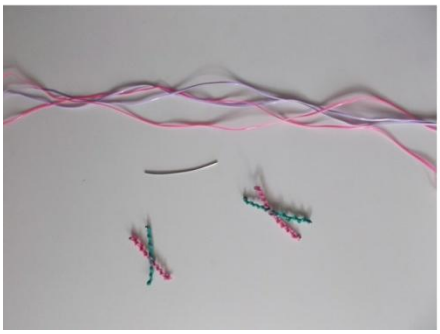

Figure 2

For chromosome model containers, thinking on the necessity of recycling and reusing materials, carton boxes with eight separations were used, each representing a different group of chromosomes and written in Braille; the group and chromosome type. Painted with acrylic paint and varnished with unicel varnish. But, because the low resistance of the material new boxes was done, of wood and removable for easy transportation, different techniques were used to settle the group and chromosome type in Braille on the boxes, thinking on different kind of shortsightedness, also the Constanz system was used for presenting colors. The boxes were painted with acrylic paint and varnished with unicel varnish made by the same scientific communication group "Cascabel"

Bags and masks were made of felt, as a collaboration of a primary professor interested on scientific communication and social inclusion.

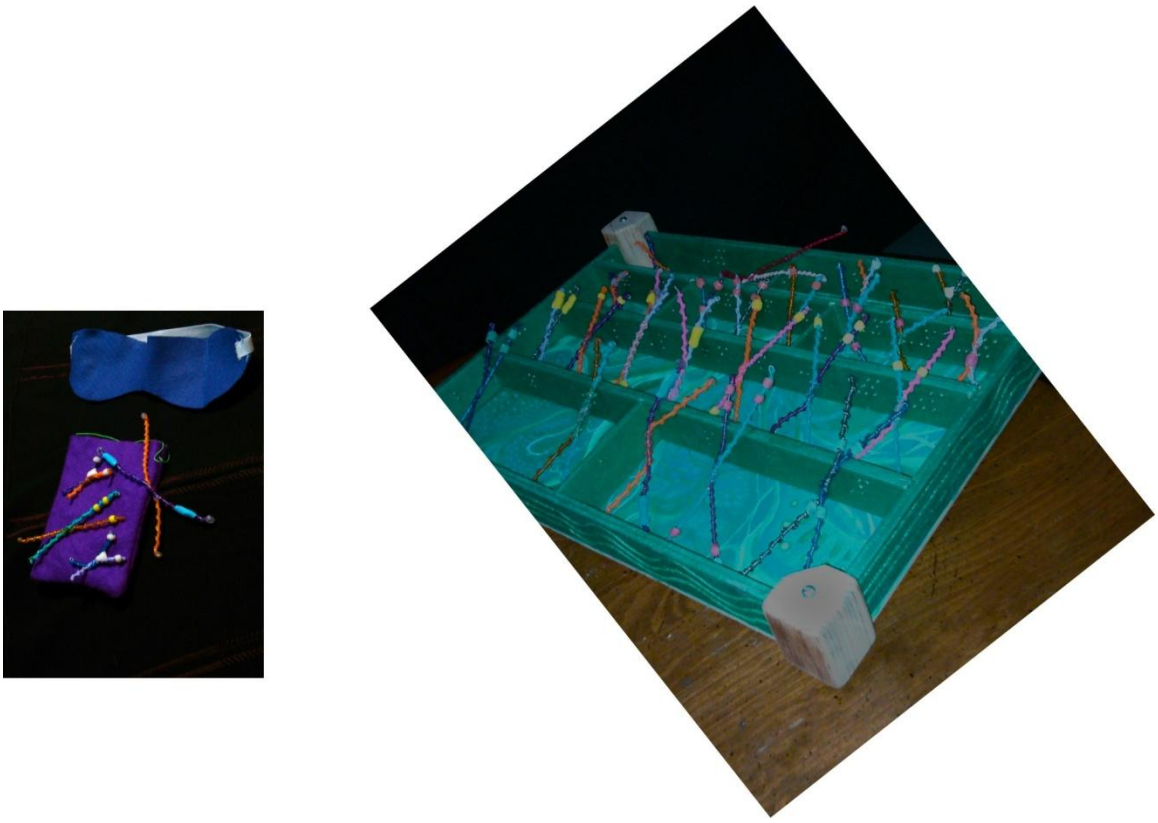

Figure 3

Pamphlets with information about certain aspects of human inheritance and some references for consulting, were made with ink as well as with Braille.

During workshop development each participant has in front of him the box with 20 pairs of chromosome model and three singles models, at one side of the box a bag with 3-5 chromosome models, over the box a mask and under the box, the informative Braille and ink printed pamphlet. Each pair of chromosomes possess a different texture that let you differentiates between them.

For normal viewers the mask is used to make them feel the experience of being blind people, for shortsighted people you indicate where the activity will take place, later on they are invited to touch the box and familiarize with chromosome models, meanwhile they are receiving information about box letters and what does it means, and what is a

chromosomic group, and that each pair of chromosomes are different from the other and are classified with numbers which are printed on every model site on the box.

In the next step they are invited to use the contain of the bag at one side of the box, they are asked for look upon its pair in the box, this with the objective of understand the structure by touching the model, looking for sensitizing normal viewers to the way blind people perceives they environment. In addition participants meet some aspects of the history of human inheritance and how a DNA molecule is structured and why is important.

At the end of the activity a survey is made to participants with the purpose of search for an opinion on textures, shapes of chromosomes models and they experience.

This workshop has been done at different scientific communication events, cultural centers and blind people rehabilitation associations, on them a great child response was observed, also child made activities quickly and even some adults did not finish the activity.

A great interest to the activity has been noticed and also generates interest for human inheritance, DNA molecule and chromosome importance, a lot of comments on how to improve the activity specially from blind people were received.

According to comments received and the experience obtained, look for being clear on localization of representing centromere, to make incomplete models to represent different kinds of pathologies, to make bigger models for children under 8 years old. Also make another workshop in which participants notice the difference between species according to chromosomes number will be the next step.

References

Books:

El Mundo de la Célula

Merchant Larios, Horacio (2005), Dirección General de Divulgación de la Ciencia, México, Universidad Nacional Autónoma de México.

Genes XII

Lewin, Benjamin (2000), U.S.A., Oxford University Press.

La Ingeniería Genética

Soberón Mainero, Francisco Xavier (1996), Fondo de Cultura Económica, México.

Niños ciegos

Fraiberg, S. (1981), INSERSO, Madrid.

Thesis

Arteaga Jiménez, Gabriela, Elizalde Ruíz, Cristina Berenice, *La creación de un taller de danza para niños ciegos*, Chap. 2 "Los niños ciegos y su educación" (2007), Universidad de Las Américas Puebla.

Scientific periodic article

Instituto Nacional de Estadística, Geografía e Informática (INEGI) (2004), "Las Personas con Discapacidad en México, una visión censual".

Mani M. N. (1998), "The role of integrated education for blind children", *Community Eye Health*, 11(27), pp. 41-42.

Odom, Samuel, Brantlinger, Ellen, Gersten, Russell, Horner, Robert, Thomson, Bruce y Harris, Karen (2005), "Research in special education: scientific methods and evidence-based practices", *Exceptional Children*, 71(2), pp. 137-148.

Internet article

Naranjo, Gabriela y Candela, Antonia (2006), "Ciencias Naturales en un grupo con un Alumno Ciego", *Investigación Temática*, 14Th March. Available at: http://sid.usal.es/idocs/F8/ART11410/ciencias_naturales_grupo_alumno_ciego.pdf