Determination of the R/S configurations of the Newman projection formulas:

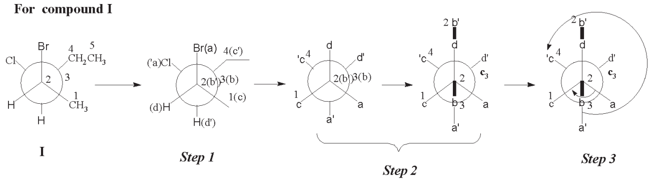
Step 1. Draw the Newman projection formula of a molecule in gauche conformation. Assign the priority sequence for the groups attached to stereogenic centers based on Cahn-Ingold-Prelog sequence rules, and express the sequence by a, b, c and d (where a represents the highest priority group). Represent a, b, c and d as groups attached to a stereogenic center, such as C_x that is nearer to you, and a', b', c' and d' as groups attached to stereogenic center that is more distant from you, such as C_y

Step 2. Represent d and a' as vertical lines (in the same direction). If d and a' are the stereogenic center and the highest priority group, respectively, c and b' are represented in the case of d and a', respectively. Place the stereogenic center Cx that is nearer to you and the stereogenic center Cy that is more distant from you between Cx-d (c) and Cy-a'(b') and the end of d (c) as a bold line in the structure 8.

Step 3. Now mentally move from (a) to (b) to (c) and (a') to (b') to (c'). Ignore groups (d) and (d'). If the direction of your motion is clockwise, the configuration is R. If the direction of your motion is counterclockwise, the configuration is S. If Cx attached to Cy is d', the configuration of Cy is opposite (such as R in case S) of that found from 8. Name the original molecule.

Examples, for determination of the R/S configurations of a molecule with Newman projection formula:

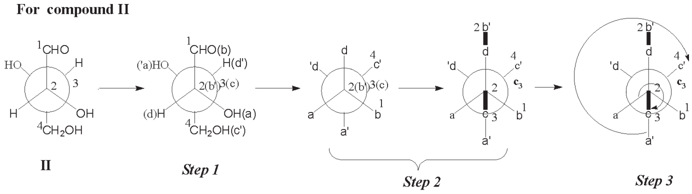
For compound I



Scheme 3

The name of compound I is (2R,3S)-2-bromo-3-choloropentane.

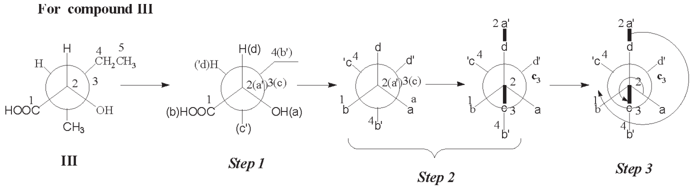
For compound II



Scheme 4

The name of compound II is (2R,3R)-2,3,4-trihydroxybutanal.

For compound III



Scheme 5

The name of compound III is (2S,3R)-2-hydroxy-3-methylpentanoic acid.

The above steps may be shortened and the configurations of Newman projection formulas may be more rapidly determined.

CONCLUSIONS

The R/S configurations of Newman projection formulas may be determined by this method. This method is new and includes different steps. The R/S configurations of stereogenic centers are determined on one model. There is no mental orientation of the molecule and transformation of the molecule with 3D structure into Fischer projection formulas, using this method. Therefore, students may fall into less error in the determination of the R/S configuration of a chiral molecule with the Newman projection formula.

BIBLIOGRAPHY

AYORINDE, F.O., A new gimmick for assigning absolute-configuration, J. Chem. Educ., 60, 928-929, 1983.

DIETZEL, R.A., Determination of chiral molecule configuration using the +/- 1,2,5 rule, J. Chem. Educ., 56, 451, 1979.

ELIEL, E.L., The R/S system-a method for assignment and some recent modifications, J. Chem. Educ., 62, 223-224, 1985.

EPLING, G.A., Determination of chiral molecule configuration in Fischer projections, J. Chem. Educ., 59, 650, 1982.

HALKIDES, C.J., Assigning and using oxidation numbers in biochemistry lecture courses, J. Chem. Educ., 77, 1428-1432, 2000.

IDOUX, J.P., A simple method for specifying the R/S configuration about a chiral center, J. Chem. Educ., 59, 553-554, 1982.

MANDAL, D.K., The R/S system: A new and simple approach to determining ligand priority and a unified method for the assignment and correlation of stereogenic center configuration in diverse stereoformulas, J. Chem. Educ., 77, 866-869, 2000.

MATTERN, D.L., Fingertip assignment of absolute configuration, J. Chem. Educ., 62, 191, 1985.

MENZEK, A., A study for learning the orders of atomic orbitals, Energy Ed. Sci. Technol. 4 [1], 25-29, 1999.

MENZEK, A., A New Approach to Understanding Oxidation-Reduction of Compounds in Organic Chemistry, J. Chem. Educ., 79, 700-702, 2002.

MISLOW, K.; SIEGEL, J., Stereoisomerism and local chirality, J. Am. Chem. Soc., 106, 3319-3328, 1984.

MORRIS, D.G., Stereochemistry, Tutorial Chemistry Texts, RSC, University of Glasgow, Cambridge, UK. 37-59, 2001.

QUIGLEY, M.N., Performance enhancement through mnemonic training, J. Chem Educ., 69, 138-140, 1992.

RUEKBERG, B., An astonishingly easy method for determining R and S for Fisher projections, J. Chem. Educ., 64, 1034, 1987.

SILVERMAN, L.P.; BARNARO, J., Illustrating Newman projections by using overhead transparencies, J. Chem. Educ. 69, 630-630, 1999.

TAVERNIER, D., Stress the twofold axis of the threo isomer, J. Chem. Educ., 63, 511-513, 1986.

YONGSHENG, H.; CAILAN, W. The new method of rapid determination of chiral molecule configuration, J. Chem. Educ., 69, 273, 1992.

WANG, J.-X.; YANG, C., Determination of a chiral molecule's R/S configuration using the rule of multiplication, J. Chem. Educ., 69, 373-375, 1992.

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What content for biological education is in Sub-saharan Africa today?
¿Cuál es el contenido moderno de la educación biológica en África Subsahariana?

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Abstract

Nowadays Sub-saharan Africa is characterized by a lot of problems linked to under-development:

-Every year the size of the population grows significantly while food resources are not adequate; there is a large food deficit (malnutrition, famine, etc.).

-A major environmental deterioration, which is due to deforestation, resulting in a reduction of the biodiversity, desertification, and uncontrolled urbanization.

-Several endemic diseases like AIDS and malaria are causes of death in most of the countries. There is a low life expectancy (45-50 years) and a high maternal and infant mortality. To face this situation and set a sustainable rate of development, Sub-saharan Africa has to struggle first, against the high illiteracy of most of the population by defining new educational curricula in schools in areas related to knowledge, skills for the resolution of practical problems, and positive attitudes. In facing such a challenge, biological education has a large part to play in order to give to every citizen the minimum of scientific knowledge which is necessary to live in harmony with

his environment. In Sub-saharan Africa, the task will sometimes be very difficult because of certain traditional values like excision, polygamy, etc. Our hope is that, in the years to come, the didactics of biology will develop new approaches and strategies which will overcome most of these obstacles and move towards a better understanding of the objectives of biological education.

***Key words:** Africa, education, biology, culture, society.*

Resumen

Hoy día África subsahariana se caracteriza por muchos problemas unidos al bajo desarrollo: - Todos los años el tamaño de la población crece significativamente mientras los recursos de comida no son adecuados; hay un déficit grande de comida (la desnutrición, el hambre, etc.). - Una deterioración medioambiental mayor, debida a la deforestación mientras produce una reducción de la biodiversidad, desertificación, y urbanización desenfrenada. - Varias enfermedades endémicas como el sida y la malaria son causas de muerte en la mayoría de los países. Hay una esperanza de vida baja (45-50 años) y una mortalidad maternal e infantil alta. Para enfrentar esta situación y poner una proporción sustentable de desarrollo, África subsahariana tiene que esforzarse primero, contra el alto analfabetismo de la mayoría de la población definiendo los nuevos planes de estudios educativos en las escuelas en las áreas relacionadas con el conocimiento, habilidades para la resolución de problemas prácticos, y las actitudes positivas. Enfrentando tal desafío, la educación biológica tiene una parte grande para jugar, para dar a cada ciudadano el mínimo conocimiento científico necesario para vivir en armonía con su ambiente. En África subsahariana, la tarea es a veces muy difícil debido a ciertos valores tradicionales como la excisión, poligamia, etc. Nuestra esperanza es que en el futuro la didáctica de la biología desarrollará nuevos enfoques y estrategias para superar la mayoría de estos obstáculos y promover la mejor comprensión de la educación biológica.

***Palabras clave:** África, educación, biología, cultura, sociedad.*

INTRODUCTION

The population of Africa today is about 720 million inhabitants, while it was only 350 million in 1970.Estimates are that it will reach 1.4 billion in 2025.

In Senegal, the fecundity index is still 6 children per woman. In many areas, children are still regarded as a source of income, of social prestige that may be a support to parents in their old age.

For obvious reasons, this demographic explosion is a source of many problems whose solutions indeed require scientific education inside and outside the school framework.

The main environmental concerns are:

-desertification

-deforestation

-soil exhaustion

-various forms of pollution

-continued loss of biodiversity

-overexploitation of non renewable resources

-quick and uncontrolled urbanization

On a health level, there is a high morbidity rate related to the many endemic diseases (aids, malaria etc), as well as the constant problems of *undernourishment* and malnutrition.

All this is made worse by very profound scientific and technical illiteracy, which explains the hard work awaiting the educators in charge of reinforcing the population's skills, so as to improve their living conditions permanently.

It is often said that all the poverty and underdevelopment problems cannot be solved by education, which is probably a fact, but it is also true that without education these problems will not be solved (Obanya, 1999).

In this education, the place of biology will be more and more important in relation to the present situation of Sub-saharan Africa.

After a historical survey of the scientific curriculum in Sub-saharan Africa, I will describe the present socio-economic context, before identifying its implications for education in general and for the biology curriculum in particular.

A historical survey of the scientific curriculum in Sub-saharan Africa

In most Sub-saharan African countries, curricula have for a long time been a mere blueprint of the former colonizer's system, be it Belgian, French or English.

However, since the 1960's, UNESCO has repeatedly organized international conferences, so as to lead the various countries to adapt curricula to their socio-economic and also local cultural realities.

What is curriculum? In the literature of educational sciences (Whitfield, R.C., 1971; African Curriculum Organization, 1979; Millar R. and Osborne, J.F. (Eds.); 1998), the curriculum concept may be understood in two ways:

For some, the curriculum is the set of contents (knowledge, know-how, behavior) that must be taught, whereas for the others it encompasses both the contents and the whole educational process, including teachers´ education, teaching materials, methods and learning activities.

In the framework of this paper, I intend to limit myself to the first definition.

What about UNESCO interventions? The first conference on the curriculum in Sub-saharan Africa was held in 1961 at Addis Ababa in Ethiopia. One of its recommendations was the implementation of the scientific and technical syllabus meant to favor the training of highly qualified researchers, engineers and teachers.

In 1964, at the conference in Abidjan (Ivory Coast), emphasis was laid on the unavoidable readaptation of educational contents in order to ensure the emergence of individuals having a balanced relationship with their environment.

For the first time during that conference, it was requested that natural sciences be included in the curriculum. The subsequent conferences: Nairobi (1968), Lagos (1976) and Harare (1982) made it a point to stress that educating does not mean only transmitting knowledge , but also preparing learners to live as adult citizens and the different members of society to take responsibility for their way of living.

Recommendations were made to set up the intensive teaching of science from the primary level, so as to give the learner the basics that will enable him/her to fit into a world that is more and more dominated by science and technology.

At the Dakar conference in 1991, UNESCO, while restating the absolute necessity of a scientific education at all levels (primary, secondary and upper), recommended a thorough adaptation of the teaching of sciences and techniques to the learners´ environment, so as to provide them with the ability to contribute significantly to the development of society.

UNESCO had simply restated the unavoidable linkage between the curriculum and the needs of society where teaching takes place.

Today in Sub-saharan Africa, it is therefore high time to develop teaching that fits the natural and socio-economic conditions of the continent, specifically in biology, whose teaching contents need to be contextualised.

Implications of the present Sub-saharan African context for the biology curriculum

In spite of the efforts and progress exerted in the field of education for many years, problems still exist and are getting worse in some countries.

The solution of the above-mentioned problems is not only dependent on a wider dissemination of biological science and technology, but also on a re-adaptation of the educational content to the local contexts. Too often in the current programs, the atom and the molecule hide the living being and his environment, which condition indeed contributes to directing teaching away from the learner's everyday concerns.

The teacher who opens up his learner's eyes as to the main concerns prevailing in the country, and provides him with the knowledge and practical experience which allow him to take part in its development, is better than his colleague who sticks to a genuinely academic approach.

Now, the point is not only to take into consideration the knowledge at stake, but also to think over and analyze objects, instruments, problems, tasks, contexts and social roles, and the variance between school and practical activities taken as references (Martinand, 2001).

In the particular case of biology, it the suggestion can be made to teach the different ecosystems of Sub-saharan Africa, man's role in the degradation of his environment, and man's responsibilities in the transmission of diseases, and to lead populations to have a positive attitude toward the environment and to get rid of some negative values.

To reach such teaching objectives geared to solving problems in Sub-saharan Africa, I believe that problems should be tackled both at school and outside school. Therefore, the biology curriculum should be reshuffled into three major domains: population and environment; population and health; population and food production.

In each of the domains, crucial problems may be identified, which, depending on the country and period, appear in different forms.

The following table recapitulates some problems and their corresponding aspects in each of the domains.

For each problem, general objectives may be defined that will be reached

DOMAINS	PROBLEMS	ASPECTS
Population and Environment	Resource Management and Exploitation	• resources types and state • forms of exploitation and consumption • production modes • waste management
	Environmental Degradation	• deforestation • pollution • soil degradation • biodiversity loss
Population and Food Production	• Undernourishment • Malnutrition	• kitchen gardening • horticulture • arboriculture • stock farming
Population and Health	• Diseases • Reproductive Health • High Birth Rate • High Morbidity	• prevention • family planning • contraception • hygiene

in a longer or shorter term.

For example, in the environmental domain, the child must from a very early age be sensitized through observation and experience. The following objectives may be targeted:

Cognitive objectives

· understanding the natural laws that regulate ecosystems in Sub-saharan Africa
· knowing the preservation methods for natural resources
· knowing the recycling methods for wastes

Affective objectives

· being aware of the danger of overexploitation of resources
· having a positive attitude toward the preservation and improvement of environment

Know-how

· acquiring the technical means necessary for the protection and restoration of environment quality

For example, in order to help learners acquire gardening and arboricultural practices, gardens and orchards are irreplaceable learning contexts where concrete information and practice can be developed around the following questions: How can plants be multiplied? How do we plant them? How do we fight against parasites? How should we prune? How should we graft? How should we fertilize soils? How should we preserve crops and harvests? Etc.

CONCLUSIONS

To make such objectives attainable, not only should present programs and teaching methods prevailing in the formal education sector be revised, but mainly a realistic policy should be set up using the local languages as much as possible, so as to reach the illiterate public at large, focusing on opinion leaders who are the traditional chiefs and religious leaders, who may serve as valuable relays in any popular undertaking in Africa. Contemporary society requires a populace who have a better understanding of science, enabling them to engage in a critical dialogue about the political and moral dilemmas posed by science (American Association for the Advancement of Science, 1989; Millar and Osborne, 1998).

Besides, owing to the complex nature of the problems, biology will have to tackle them through an interdisciplinary approach in coordination with social and family economics and geography, to arrive at a systematic method that may ensure the setting up of relevant and lasting solutions.

However, in the specific framework of Sub-saharan Africa some traditions and established social values can block the contextualized teaching of biology. These are age old ,deeply rooted practices such as excision, polygamy and early marriages, that should also be included in the new curricula in Sub-saharan Africa

BIBLIOGRAPHY

African Curriculum Organization. Basic Training Course in Systematic Curriculum Development. Nairobi, ACO, KIE; GTZ, 1979.

American Association for the Advancement of Science. *Project 2061 Science for Americans.* Washington, DC: AAAS, 1989.

Gueye, B. *Enjeux et difficultés d'une culture scientifique et technique en milieu rural africain* in Actes des xxivèmes journées internationales, Chamonix 18-22 mars 2002.

Martinand, J.L., *Pratiques de référence et problématique de la référence curriculaire* in A. Terisse (éd). Didactique des disciplines; les références au savoir; Bruxelles, De Boeck, 2001.

Millar, R. & Osborne, J.F. (Eds.). *Beyond 2000: Science Education for the Future.* London: King's College, 1998.

Obanya, P., *The Dilemma of Education in Africa*, Dakar, Unesco/Breda, 1999.

Okigbo, B.N., *Role of research and related activities in adaptation and improvement of science teaching in support of education and national development.* Journal of science teachers association of Nigeria, Ibadan, **16** [3], 18-30, 1978.

Schaefer, G. & Kattman, U. *A New Type of Biology Curriculum.* Journal of Biological Education, London, **10** [5], 242-248, 1976.

Science education program for Africa (1978). Handbook for teachers of science, Accra, Ghana, Sepa publication.

Whitfield, R.C., *Discipline of the Curriculum.* London, McGraw-Hill, 1971.

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Special section: Microscale Science / Sección especial: Ciencia en microescala

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Microscale experiments dealing with the history of making fire
Experimentos en microescala sobre la historia de producción de fuego

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The possibility to control and later to make fire was probably the most important technological advancement of the early mankind. For the hominids the controlling fire was useful for warmth, protection, cooking and hunting.

The different techniques for making fire and combustion are dealing with ignition energy, fuels and oxidizers. Therefore, on principle it was pure chemistry which allowed the hominids to spread out from Africa to less warm regions in Asia and Europe. The chemistry behind the techniques of making fire is a great chance for teaching and learning in cooperation with other subjects (Obendrauf, 2002, 2003a, 2003b).

Sparks from pyrite and sparks from steel are pure chemistry. Many concepts can be discussed. Upon striking pyrite or steel with a sharp piece of flint ($SiO_2.nH_20$) small pyrite or steel particles detach. In both methods friction energy is responsible for the ignition temperature. The energy provided by the friction from the strike is sufficient to heat the pyrite or the steel particles so that they burn with the oxygen in air:

$$4\,FeS_2 + 11\,O_2 \rightarrow 2\,Fe_2O_3 + 8\,SO_2 \quad \Delta H_R = -\,1672\ kJ/Mol\ Fe_2O_3 \quad (1)$$
$$4\,Fe + 3\,O_2 \rightarrow 2\,Fe_2O_3 \quad \Delta H_R = -\,822\ kJ/Mol\ Fe_2O_3 \quad (2)$$

Sparks produced from a fire steel are very bright and more hot compared to the sparks coming from a pyrite although the reaction enthalpy for the same amount of Fe_2O_3 in reaction (1) is much higher. The chance for the ignition of a tinder with the sparks generated from