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HOW GENETIC DETERMINISM AND GENETIC DISEASES ARE PRESENTED IN TEXTBOOKS OF 14 COUNTRIES

SILVA, C. (1); FERRERIRA SOARES, C. (2) y SIMOES CARVALHO, G. (3)
(1) LIBEC/CIFPEC. Minho University bioclaudif@yahoo.com
(2) Minho University. claudiaferreira@iec.uminho.pt
(3) Minho University. graca@iec.uminho.pt

Resumen

The purpose of the present study was to analyse whether "Genetic Determinism" and "Genetic anomalies" are present in the textbooks of 14 countries and, being present, how these issues are addresses, for the age group of 14 to 18 years old. These countries are involved in the international project "Biohead-citzen"(European Project FP6 STREP Biohead-Citizen; CIT2-CT2004-506015) in which one of the topics is "Human Genetics" Results show that both terms "Genetic program" and "Genetic information", carrying different meanings, are expressed in textbooks with no clear association to the countries culture. Some of the genetic anomalies referred in textbooks are consistently present in all textbooks whereas others vary a lot from country to country. The association of the socio-cultural influences with this issue is now a matter of research.

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1. Introduction

In 1865, Gregor Mendel laid for the first time, the patterns of heredity. The term genetic determinism was formulated in the 1960s, it is currently used in biomedicine and conveys the notion that the person's physical and psychological characteristics are established by the genes only. This reductionist view pustules that for any biological phenomenon there is always a required genetic structure determining it. Following this ideology, the term "genetic program" has been used for pedagogical purposes in textbooks. Nowadays it is well acepted that a person is born with a

biological/genetical potencial but that metabolic and environmental factors may influence the expression of such genetic potential (Penchaszadeh, 2002). In this perspective, Atlan (1999) has suggested the use of the expression "genetic information" to replace the previous one. Another relevant question concerns the genetic anomalies that result from defects in genetic characteristics resulting from genes that pass from generation to generation.

The KVP model has been proposed by Pierre Clément for the analysis of person's conceptions, and can be applied to the various phases of didactical transposition. In this context, the construction of curriculum and the selection of the subjects to be integrated depend on conceptions of educational policy-makers. A good way to analyse the KVP interactions is to compare the contents of different textbooks, with diferent possibilities (Carvalho & Clément, 2007):

- **In the present days, in a certain country, comparing the content of textbooks (for the same topic, and the same level of teaching), from different publishers.**

- **Comparing the same topic, in the same country, at different historical periods. It varyies with the evolution of the scientific knowledge.**

- **In the present days, in different countries different in their culture, their history, their geographical situation, their economical level.**

This study analyses "Genetic Determinism" and "Genetic anomalies" in school textbooks of the 14 countries involved in the international project (European Project FP6 STREP Biohead-Citizen; CIT2-CT2004-506015). Attention was paid to textbooks for the age group of 14 to 18 years old pupils. The 14 countries involved in this study are: five of the "old" European Union (from west to east: Portugal, France, Germany, Italy, Finland), six who recently joined the EU (Cyprus, Estonia, Hungary, Lithuania, Poland and Romania) and three countries outside the EU (Morocco, Tunisia and Lebanon).

2- Methodology

In this study we used the grids designed within the European FP6 project STREP Biohead-Citizen (CIT2-CT2004-506015) for the analysis of the theme "Human Genetics", which procedure has been described elsewhere (Castéra et al., 2008). In short, the construction of grids resulted of successive discussions carried out in Biohead-Citizen general meetings. For the design of the grids, the partners of the countries involved prepared remarks and called attention to achieve an agreement acceptable in the formulation of some issues, taking into account cultural differences among countries. The initial grids were applied in several countries. After this pilot study, conducted in some school textbooks chosen in each country for this initial phase, meetings followed for the representatives of each country present the difficulties that came from the first application of the grids. The grids were then modified and improved in order to have a semi-final version. This version was used by all partners in several countries and was agreed that this version of the grids would be applied in, at least, one textbook for each school year.

Grids were applied at least to one textbook per school year where the topic is taught. In this study we carried out our analysis about two specific issues: Occurrences of the term "genetic program" and/or "genetic information"; and genetic anomalies.

Thus, each of the 14 teams of the project Biohead-Citizen analysed their textbooks of Life Sciences, biology and psychology addressing the theme "Human Genetics" in the ages of 14/15, 16/17 and 17/18 years. The 38 textbooks examined were distributed by several countries as follows: 8 in France, 4 in Italy, 4 in Lebanon, 4 in Portugal, 3 in Germany, 3 in Hungary, 3 in Tunisia, 2 in Estonia, 2 in Lithuania 1 in Cyprus, 1 in Finland, 1 in Morocco, 1 in Poland and 1 in Romania.

3- Results and Discussion

France was the country that contributed with a larger number of pages of all textbooks examined (2336 pages) whereas Cyprus was the one with the lowest number of pages (90 pages). The textbooks of the Maghreb countries, Tunisia and Morocco, give little emphasis to the topic "Human Genetics" since this issue is only 7% and 5%, respectively.

3.1- Ocourences of Genetic Program and Genetic Information

Most of the countries textbooks use only one of the terms “genetic program” (GP) or “genetic information” (GI), except France and Lebanon that use both, giving both more emphasis to GI. Finland and Morocco (as well as Portugal, Italy and Hungary, at smaller extent) refer only to GP whereas Romania (as well as Germany, Poland and Tunisia) to GI. Cyprus and Estonia do not refer any of these terms.

Figure 1: **Ocurrences of Genetic Program (GP) and Genetic Information (GI) by textbook, in each country.**

3.2- Genetic anomalies in the 14 countries textbooks

We classified the diseases present in the genetic chapters as “strictly genetic anomalies” (SGA) when they result from pure genetic causes and “not strictly genetic anomalies” (N-SGA) when they result from a complex interaction between genetic and environmental factors, or which origin is still unclear in science today (Figure 2). Romania, Germany, and Morocco are the countries presenting more occurrences of both SGD and N-SGD.

Of the SGD, the Down syndrome is included in all the countries textbooks examined, and both Turner syndrome and Klinefelter syndrome are referred with high frequency. Other situations will be presented in more detail at the conference.

Figure 2: Number of ocurrences (x100) of Stricktly genetic Anomalies (SGA) and Not Stricktly genetic Anomalies (N-SGA) per chapter of genetics.

4- Conclusions and Implications

The terms “Genetic program" and "Genetic information", carrying different meanings (Atlan, 1999; Castéra *et al.*, 2008), are expressed in textbooks with no clear association to the countries culture, *i.e.* it was not possible to associate the term chosen for pedagogical purposes in each country with the socio-cultural influences (for example Western European countries *versus* Eastern European countries, or European countries *versus* non-European countries) with. Further studies are required to understand why in some countries/languages one term or the other are selected. Some of the genetic anomalies referred in textbooks are consistently present in all textbooks whereas others vary a lot from country to country. The association of the socio-cultural influences with this issue is now a matter of research.

Independently of the terms used, it is important that textbooks refer explicitly the influence of the environment on the phenotypic expression of the genetic potential. In addition, only within this wide framework, programmes of health education and health promotion have a significant role, contributing to change healthier behaviours, and so allowing minimising genetic defaults.

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References

Atlan, H. (1999) *La fin du “tout génétique”.* Paris: INRA.

Carvalho, G. & Clément, P. (2007). Construction and validation of the instruments to compare teachers’ conceptions and school textbooks of 19 countries – The European Biohead-Citizen project. *In*: Actes du Congrès AREF 2007 - Actualité de la Recherche en Education et en Formation, Strasbourg, 28-31.08.2007. (CD).

Castéra J., Clément P., Abrougui M., Aouina F., Khalil I., Yammine N., Nisiforou O., Turcinaviciene J., Agorram B., Elabboudi T., Calado, F., Bogner, F. & Carvalho G.S. (2008) Genetic determinism in school textbooks: A comparative study conducted among sixteen countries. *Science Education International,* 19 (2) 163-184.

Clément P. (2006). Didactic Transposition and KVP Model: Conceptions the Interactions Between Scientific Knowledge, Values and Social Practices, ESER Summer School. IEC- Univ. of Minho, Braga (Portugal), pp. 9-18.

Penchaszadeh, V. (2002) Ethical Issues of genetic determinism. VI International Congress of Bioethics, Brasilia, Brazil - November 1.

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