

Teaching of the Integrated Morphology

Enseñanza de la Morfología Integrada

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SUMMARY: The changes in the university curriculum have made necessary the vertical and horizontal integration of contents that are taught in morphology sciences. In this study, students of the Morphology and Human Development Module of the cohorts 2006 and 2007 participated. In 2006 the students (n=83) developed the thematic unit of locomotive apparatus in a chronologically and sequentially integrated way. In 2007 (n=102) this same unit was developed in a totally integrated way, in form of learning object from the macroscopic, microscopic and embryology perspectives. A theoretical instrument was designed to evaluate the content of the unit, the approaches of validity and reliability were determined ($\alpha=0.79$), and then, it was applied to the 2006 and 2007 students. Higher and significant results ($p=0.02$) were obtained in the group that developed the content by means of integration under the form of learning object, belonging to the cohort 2007. The results indicate that the integration of contents in morphology improves the theoretical learning of them.

KEY WORDS: Integrated morphology; Teaching of Anatomy; Learning; Learning object.

INTRODUCTION

In the last time, the teaching of morphology sciences have advanced towards a bigger integration of their contents.

For Bucarey & Alvarez (2006) the creation of integrated subjects has begun to extend in Chilean Universities, impelled by the accreditation processes to which some of these institutions are undergoing (Rossetot, 2001).

The Gross Anatomy, Microscopy and Embriology, are basic disciplines that have great importance and clinical application, for what their understanding and retention should be viewed making use of all available resources (Guiraldes *et al.*, 2001).

For Rosell *et al.* (2004) the integrated teaching is a historical necessity of the education that has originated the explosion of the knowledge, and morphology is not away of this necessity.

It is indispensable to establish a work in coordination with the different disciplines that are imparted (Segura *et al.*, 2001), this coordination is favorable in the area of

morphology sciences, where the contents can be grouped in learning objects, which are an approach to the development of the mature structure view, in the macroscopic and microscopic level.

From the process of curricular transformation to a model of professional formation competence-based undertaken by the Universidad de Talca, Chile in 2004 and in implementation phase in 2006, the new formative necessities impelled the vertical and horizontal integration of the subjects, of the School of Dentistry of the Faculty of Sciences of Health, modules are being built that they respond in way but they are efficient to the new model of the professional formation of surgeon dentists.

In 2006, when the implementation of the curricular model competences-based in the module of morphology and human development, the students began the revision of the corresponding contents of the gross Anatomy, Microscopy and Embriology in a sequential way and chronologically integrated, but with independent theoretical and practical sessions for each one of the areas of Morphology.

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For the year 2007, once the stage of the implementation of the model has already advanced, the integration of the content were proceeded to carry out, so that the practical and theoretical activities developed by the students referred to a learning object, according to the description by Bucarey & Alvarez. In this way, the learning object corresponded to the study of the axial skeleton, which is it was treated from the macroscopy, the microscopy and the development of these ones in an integrated way.

The objective of this study is to analyze if there are differences in the students academic performances when developing the contents in an integrated way.

SUBJECTS AND METHOD

This study was developed in students of Dental School of Universidad de Talca, in which a cohort of students of 2006 class (n = 83) and the cohort of 2007 class (n=102), of the module of Morphology and Human Development took part.

A multiple choice theoretical evaluation instrument of 60 questions was built. Each of the questions presented statements of at least two areas of morphology referred to the thematic unit of locomotive apparatus that included the following contents:

- * Osteology (Gross Anatomy)
- * Skeletal tissues (Microscopy)
- * Arthrology (Gross Anatomy)
- * Arthrologic tissues (Microscopy)
- * Miology (Gross Anatomy)
- * Muscle tissue (Microscopy)
- * Locomotive apparatus development.

The thematic unit of locomotive apparatus looks to develop the competence: "To understand the organization of locomotive apparatus of the healthy human body from macroscopy, microscopy and its development perspective, in a level that allows the students to communicate with the members of the team of health in this topic, reinforcing the vision of the dental patient as an integral being."

Starting from this competence, two domains can be analyzed that serve as base for the evaluation:

1. General knowledge of the morphology of the locomotive apparatus.
2. Relationship of the locomotive apparatus with the other systems and the patients in their group.

Validity and reliability analysis of the instrument. A validation of the content of the instrument was carried out by judges for the corresponding adaptation, to be applied to a controlled group of assistant students, with the purpose of establishing the internal consistency of the instrument by means of the reliability alpha of Cronbach analysis ($\alpha=0.79$).

Data analysis. The scores obtained by the students allowed the calculation of the qualification by means of the application of a scale that related obtained score with a grade, establishing the 4.0 (60%), as a passing grade, that is to say, the students should have 36 points.

The data was processed with the SPSS 14.0 program and the statistical ones were descriptively calculated. To determine if the observed differences were significant the Mann-Whitney U test was applied, with an interval of trust of 95%.

RESULTS

The academic performance is expressed in terms of grades with a 1.00 to 7.00 scale. The main values of the average marks of the applied test in 2006 were of 4.00, while in 2007 were of 4.33. The descriptive statistical of the results of the applied instrument can be shown in the Table I.

In Fig. 1, the box plot shows that the results of the years 2006 and 2007 present a relatively symmetrical distribution, concentrating most around the 4.00.

To determine if the differences observed in the cohorts 2006 and 2007 were significant, the non parametric Mann-Whitney U test was used, the observed ranges and the statistical of contrast for this test can be observed in the Tables II and III.

DISCUSSION

The development of integrated curriculum has begun to be a necessity in the medical education. The teaching of morphology presents characteristics that allow it to generate semantic linkings that relate contents seen from the perspectives of macroscopy, microscopy and embryology. In this integration, learning styles (Suazo, 2007) and the students motivation (Cabalin *et al.*, 2002) have an important role in this aspect.

The results analysis allows us to observe significant differences in the results obtained by the students of the cohorts 2006 and 2007, being higher in the students that developed

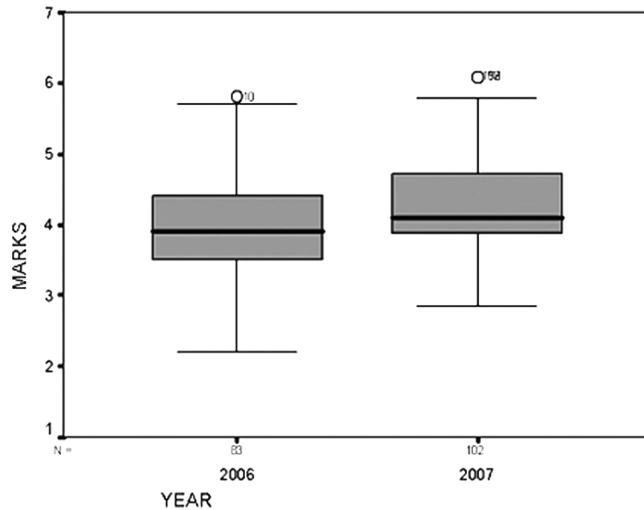


Fig. 1. Box Plot of marks in 2006 and 2007 class.

Table I. Descriptive statistical of the result of instrument implementation in 2006 and 2007.

Year	N	Minimun	Maximal	Mean	SD	Mean error
2006	83	2.20	5.80	4.001	0.71	0.0782
2007	102	2.52	6.09	4.331	0.68	0.0683

Table II. Range shown in Mann-Whitney U test.

	Year	N	Range Mean	Total Range
Marks	2006	83	79.65	6611.0
	2007	102	103.86	10594.0
Total		185		

Table III. Statistical contrast of Mann-Whitney U test, significance $p < 0.05$.

	Marks
Mann-Whitney U test	3125.00
Wilcoxon W Test	6611.00
Z	-3.061
Asintotic significance (bilateral)	0.002

the activities of the unit in a completely integrated way. This is related with that expressed by Kolb (1984) and Alonso *et al.* (1999) referring to the effect the multidimensional boarding of the experience has in the answer of the students in these different learnings atmospheres.

This experience shows us that the obtained results, after the real integration of the contents of a thematic unit, treated as learning objects overcome the chronological or sequential integration of contents treated independently, agreeing with Phye & Andre (1986) who referred to the prosecution of the information, for them, the human beings build and consolidate their learnings by means of the establishment of nets which are much more complex every time, for this, the development

of experiences about related semantical contains favor the construction of these nets and what is more relevant, allows the evocation of the contents learned from any of the components of the learning object, in this case, from embryologic, microscopic and macroscopic anatomy. The outlined pattern finds its neurobiological base in the neural networks formed by Hebb sinapsis (Hebb, 1949; Kandel *et al.*, 1991).

Diverses authors postulate that the learning should be significant, not only memory, and for this reason, the new knowledge should be related in a vertical way with the previous knowledge that the apprentice possesses and tranverses with other related contents (Ausubel, 1976; Novak & Gowin, 1988).

Lastly, it is necessary to mention that, as in the development of the courses of integrated morphology diverse methodological strategies will be used, the evaluation should also be multidimensional and multiinstrumental. The present study observes an apparent advantage of a real integration of the contents of morphology, in forms of learning objects, but referred to an evaluative dimension, being necessary the practical learnings and the development of competence analysis.

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RESUMEN: Los cambios en los currículos universitarios han hecho necesario la integración vertical y horizontal de los contenidos que se enseñan en ciencias morfológicas. En este estudio participaron estudiantes del Módulo de Morfología y Desarrollo Humano de las cohortes 2006 y 2007. El año 2006, los estudiantes (n=83) desarrollaron la unidad temática de L aparato locomotor, de manera integrada cronológica y secuencialmente; el año 2007, (n=102) esta misma Unidad se desarrolló de manera completamente integrada, en forma de objeto de aprendizaje desde las perspectivas macroscópica, microscópica y embriológica. Se diseñó un instrumento teórico para evaluar el contenido de la Unidad, se determinaron los criterios de validez y confiabilidad ($\alpha=0,79$), y luego fue aplicado a los estudiantes el año 2006 y luego el 2007. Se obtuvieron resultados superiores y significativos ($p=0,02$) en el grupo que desarrolló el contenido mediante la integración en forma de objeto de aprendizaje, perteneciente a la cohorte 2007. Los resultados indican que la integración de contenidos en morfología mejora el aprendizaje teórico de ellos.

PALABRAS CLAVE: Morfología integrada; Enseñanza de la Anatomía; Aprendizaje; Objeto de aprendizaje.

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