

ONLINE FIRST: **Teacher's Notes**

SHOULD BIOLOGY CURRICULA INCLUDE 'ORGANISMAL THEORY'?

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Abstract

This Teacher's Notes presents studies on the arguments of existence of organismal theory as an alternative to cell theory with the end in mind of encouraging the integration of the organismal theory to various curricula in Biology Education in the Philippines. Further, this Teacher's Notes has revealed, in the perspective of the author, that the organismal theory did not have any curricular space in the curricula for high schools, bachelor's, master's and doctoral degree programs in the Philippines. Furthermore, the amount of disruption of integrating this organismal theory in the science curricula is well noted, but the belief that Science should be a liberating, non-restrictive, non-prescriptive, not book-based, and not repetitive discipline should overwhelm any idea of stressful curricular disruptions.

Keywords: Biology, Curriculum Integration, Organismal Theory

INTRODUCTION

The topic for this Teacher's Notes is 'Organismal Theory' which I have encountered in April 2012. During that time, I was preparing my lecture notes as I have been invited to serve as reviewer (for Licensure Examination for Teachers, formerly LET, now BLEPT) in a University in Cabanatuan City, Philippines. Back then, I was a private secondary teacher in Biology in Mother Goose Special Science School System, Inc, in Dagupan City, Philippines. After reading the postulates of the Organismal Theory, I hurriedly reviewed my files in college to verify whether this was taken up in our curriculum and I just missed it that is why I did not know anything about it or it was not covered in our curricula at all, and I found none. Further, I looked it up in my Biology Syllabus in my master's class that time if ever this topic was taken up in the master's program, and still found none. I now hold a PhD in Science Education, and I must say none of our curricula covered the Organismal Theory. Whether the Organismal Theory is an important perspective in Biology Education or not, no space is allotted to it in both the bachelor's program up to post-graduate programs, at least in the Philippine setting. Should Biology curricula include the Organismal Theory?

LITERATURE

Organismal Theory is a theory which is an alternative to Cell Theory. The Cell Theory states that the 'cell' is the smallest unit of structure and function of life, i.e. life is cellular, and this belief is held true to all life forms on Earth. On the contrary, the organismal theory postulates that the whole organism is the basic unit of organism. This means that an entire plant (Moore et al., 2003) is like a large cell that is compartmentalized into many parts and that the whole plant constitutes the same level of organization as a single-celled green algae, for instance. Further, the cell theory is best represented in slime molds and certain algae, but observations and experiments supporting the organismal theory come from plants and animals. For the organismal theory, this includes the work of Kutschera (1995) when they concluded that the axial organs of the plants in their experiment (sunflower, zucchini, pea, oat, and maize) consist of a unified, turgid protoplast that is chambered into individual cells (inner tissues) and a thick, growth-controlling, supracellular organ wall that bears longitudinal wall stressed of the internal cells, which, according to the researchers support the organismal concept of multicellularity in plants.

Very interestingly, the study (a brief review) of Kaplan (1992) concluded for the validity of the organismal model for plant multicellularity and this, in fact, even provided a holistic framework in which to carry out future studies of plant morphogenesis. Their study aimed to examine the implications of the organismal concept of plant multicellularity for a variety of structural phenomena, including root contraction, cuticular differentiation, ring cell development, and embryo sac divergence. Since then, a new link between cell and organismal theories came when Tsukaya (2002) examined the validity of these theories with particular emphasis on the phenotypes of mutant or transgenic *Arabidopsis* plants with altered leaf morphology which is genetically shown that a compensatory system is involved in leaf morphogenesis which means that an increase in cell volume might be triggered by a decrease in cell number. During this time, studies (Fromhage & Jennions, 2019) are already in the mathematical perspective by using gene to explain organismal theory of inclusive fitness. These studies, and others more not cited, provide convincing number of studies to merit a 'curricular space' of organismal theory in Biology Education.

INSIGHTS

It is my belief that Science as a content subject in the curriculum should be liberalizing, not restrictive, not prescriptive, not book-based, not repetitive. It is supposed to be a subject that integrates all knowledge, regardless of structure and form, into one that discusses which works and which does not, i.e. evidence-based. When Science loses this empirical attribute, it loses power. When it loses power, no student who enters a science classroom feels empowered, and leaves the classroom clueless about the real world. My belief is that organismal theory, no matter how much disruption this topic could bring to the content standards of subject or course curricula developed, for instance, by the Department of Education or the Commission on Higher Education, it needs to be integrated. Filipinos must be allowed to think and re-think what they know once they enter a science classroom. Gone are the days when the Earth is believed to be the center of the universe when in reality it is not; many years have passed since we rejected the idea that the Earth is flat; years have been enjoyed to realize that there are smaller units beyond the atom... all of these things were realized because Science allowed for inclusion what needs to be included so that these inclusions will be rejected or accepted based on progressive and constructive sets of evidence. If my insight is correct, how will the teaching of Biology impact the Science teacher in the future?



About the Author

Jun S. Camara holds a PhD in Science Education, with bachelor's specialization in Biological Science. He has co-authored a reference book in Cytogenetics in 2012, among his 5 other books. Presently, he serves as Dean of the College of Teacher Education of Pangasinan State University (PSU), Lingayen Campus, as well as a University Research Center Head on topics including history, culture, arts, languages and innovative education. Presently, he teaches EdD 312 – Molecular Biology and Biotechnology in PSU's School of Advanced Studies among his doctoral students specializing in Science Education

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