FUNDAEC and Fragmentation

Thaddeus Benjamin Herman

University of Illinois at Urbana-Champaign

Abstract

This literature review covers the major articles which make up the body of knowledge surrounding The Foundation for the Application and Teaching of the Sciences (FUNDAEC). It considers the conceptual framework in which it works, offers a brief description of one of its more well-known programs the Tutorial Learning System (SAT), and reports what systematic research is starting to learn about the program. In undergoing this exercise, it employs the metaphor of a tree as way to conceptualize the structure of the literature. The trunk of the tree is described as early literature defining the conceptual framework, the branches are seen as literature which described an educational system crystalizing into decipherable forms, and the fruits are conceptualized as systematic research corroborating the efficacy of the program through quantitative and qualitative studies. As part of FUNDAEC's conceptual framework, this review also explores the definitions of fragmentation and theory as a form of insight.

Keywords: fragmentation, FUNDAEC, Arbab, SAT, Bohm

FUNDAEC and Fragmentation

This review will examine the literature surrounding the actions of FUNDAEC (Fundación para la Aplicación y Enseñanza de las Ciencias, or in English, The Foundation for the Application and Teaching of the Sciences), a non-profit, non-governmental organization created in Columbia in 1974 by "a group of scientists and professionals who were trying to find a more appropriate role for science, technology, and education in the development of rural areas". The founders perceived development in a much different light than major thoughts and ideas which were around at the time; projects designed as a package which should be "delivered to the 'underdeveloped' by the 'developed countries'". This contrasted with their own understanding that any serious attempt for a people to undertake their own development required a process of systematic learning and knowledge generation that came from within the population (Arbab, Correa, & Valcarcel, 1988 p. 1-3). Arbab (2000) defines development as "the building of capacity of individuals, communities, and institutions to participate effectively in weaving the fabric of a materially and spiritually prosperous world civilization" (p. 197). In particular this review will define fragmentation and look at the aspects of the literature that help clarify how FUNDAEC has perceived this problem and what they have done in their attempts to work towards integration.

Literature as a Tree

It may be helpful to think of the literature written on FUNDAEC in the shape of a tree. The trunk can be seen to consist of the articles written and published in the first few decades after its inception in 1974; just as the trunk of the tree, these articles support its endeavours through giving it a firm base by lucidly explaining the conceptual framework in which FUNDAEC acts (Arbab, Stifel, 1982; Arbab, 1984; Arbab et al., 1988). As the organization matured and expanded into other areas beyond Columbia, more individuals began to study

FUNDAEC and publish their findings, mostly in the posture of describing what the program entailed, thus constituting the branches of the tree (Rural learning, 1996; Richards, 1999; Perfetti, Lela, Arango, 2002). It is only within the last decade that we have begun to see the fruits of systematic quantitative and qualitative research begin to appear (Honeyman, 2010; Leggett, 2006; Alas, Hernandez, Moncada, Umanksy, 2007; VanderDussen, 2009; Murphy-Graham, 2012; Murphy-Graham, Lample, 2014). This research is beginning to suggest the ability of one of the programs of FUNDAEC (SAT) to stem the tide of urban migration, improve "students' sense of social responsibility", "the empowerment of female students", and to build the capacity in students to learn how to trust (Rural learning, 1996; Honeyman, 2010; Murphy-Graham, Lample, 2014).

While the metaphor of a tree is useful to a certain point, it is not meant to imply that the literature all fits neatly into categories. The qualitative studies contain their own descriptions of the program (Honeyman, 2010; Murphy-Graham, 2012) and often explain to a certain depth the conceptual framework in which the actions are undertaken. The structure of the review itself tries hard not to fall into the trap of fragmentation and strives to integrate the insights of the authors into a coherent whole.

There is a small body of literature which could best be described as a discourse surrounding the conceptual framework in which FUNDAEC acts, or the trunk of our tree. In 1982, eight years after FUNDAEC was initiated as a project, Farzam Arbab, one of the programs founders, published for the first time a paper in the Journal of Developing Areas. This was the first of many papers which would clarify the conceptual framework in which FUNDAEC would conduct its activities..

Fragmentation

Although FUNDAEC's conceptual framework is informed by many different sources, particularly influential in the development of the thought of the institution was the well-

known physicist David Bohm. In 1980 Bohm published a book in which he discussed the concept of fragmentation. His major argument in this seminal work is that "fragmentation is now very widespread, not only throughout society, but also in each individual". Fragmentation can best be conceptualized as the act of breaking what Bohm (1980) refers to as the "whole" into tiny separate elements which he calls fragments. "Society as a whole has developed in such a way that it is broken up into separate nations and different religious, political, economic, racial groups, etc." (p. 1).

While this fragmentation of the wholeness of reality can be useful in certain circumstances, such as "practical, technical and functional areas", Bohm claims when this fragmentation begins to define reality it causes problems (p. 3). Farzam Arbab (1984), one of the founders of FUNDAEC , compliments this description of Bohm by agreeing that "knowledge is a whole" and that its fragmentation into tiny pieces is simply due to what he describes as the "finiteness of the human mind" (p. 26). Researcher Erin Murphy-Graham (2012) states that it is the belief of FUNDAEC that knowledge is the only power which has the capacity to help humanity solve the current problems which plague its existence and, drawing on the thoughts of Haleh Arbab a close collaborator working with FUNDAEC, makes the observation that the current knowledge system "propelling the development of the world" is itself fragmented, and thus incapable of solving problems which themselves are "highly complex and interrelated" (p. 40).

Bohm (1980) furthers his exploration of fragmentation by clarifying how we should approach theory which comes from a Greek word meaning "to view" or "to make a spectacle"; "thus, it might be said that a theory is primarily a form of *insight*…and not a form of *knowledge* of how the world is" (p. 4). Haleh Arbab, says that insistence of viewing theories as descriptions of reality as it is instead of "manageable models of limited sets of phenomena occurring within an objective reality that is infinitely complex" results in us

missing the "interconnectedness of all things"; we start to believe that reality is actually fragmented. Arbab explains that "as Bohm suggests, instead of assuming that our 'older theories are falsified at a certain point of time', we should accept that we are 'continually developing new forms of insight, which are clear up to a point and then tend to become unclear'". This definition of the concept of theory, specifically one of "theory as insight" became a major source of help to the team at FUNDAEC in relation to how they would approach development. FUNDAEC became free from having to adhere to any one theory in particular, allowing them rather to gain insight from many without becoming entangled within the "trap of undue theoretical debate" (Arbab, 2000, as cited in Lample, 2009, p. 137).

The literature surrounding the issue of fragmentation in relation to education is large, voluminous, and will not be treated in detail here. One could refer to Irene Dabrowski's 1995 article *David Bohm's Theory of the Implicate Order – Implications for Holistic Thought Processes* for a great overview of not only Bohm's impact on the discourse surrounding academic fragmentation, but also an expanded discussion on other theorists' attempts at understanding this issue.

Fragmentation of Identity

The trunk of the FUNDAEC tree conceptualizes fragmentation as affecting not only the entire body of knowledge, but also the very foundation of the identity of a human being; Bohm (1980) states that a fragmented "self-world view" has slowly been pervading human society for ages and has been accepted as a general description of "the way everything really is" (p. 19. There are two metaphors which are employed in the literature which are used instead. One is that of a drop of water which is but one of many which form part of a wave or an ocean (Leggett, 2006), and the other that of a single cell among many in a human body (Arbab, 2000; Leiker, 2001; Murphy-Graham, 2012). Both of these analogies allow the individual to have their own identity – characteristics which are unique from the whole –

while at the same time being part of a dynamic that works in complete harmony, not defined

by competition, which is defined by cooperation and solidarity (Arbab, 2000, p. 199).

At the heart of the crisis of the identity of the individual is the overwhelming force

pervading society, which strips humanity of its spiritual heritage (Murphy-Graham, 2012, p.

32) and tends to describe the condition of humanity in terms of its material characteristics

which are included in the development literature in the form of "indicators" such as the

condition of living, status of wage, or birth and death rates (Arbab et al., 1988, p. 15).

FUNDAEC views reality as fundamentally spiritual, and its conceptual framework is

"inspired by Bahá'í Principles" such as oneness of humanity, justice, equality and the

importance of knowledge (Murphy-Graham, 2012, p. 37). The texts which FUNDAEC

employs are inspired by spiritual principles, but make no mention of the Bahá'í Faith

explicitly (Richards, 1999, p. 5), and include quotes not only from the writings of the Bahá'í

Faith, but other poets, fables and proverbs from "various regions of the world" (Honeyman,

2010, p. 607). The conceptual framework of FUNDAEC sees religion and science as two

main sources of insight into the nature of the reality and draw upon both in order to inform its

curriculum development (Murphy-Graham, 2012, p. 40). Honeyman (2010), when

interviewing FUNDAEC, asked why quotes from the Bahá'í Faith are used when writing

their books and received this response: "[the quotations] are simply there in places where

they are needed in order to serve the purpose of more fully investigating whatever subject is

being studied….they are used as one source of knowledge in the process of investigating

reality…" Honeyman's final conclusion is that the quotations are not placed in the text to

emphasize "The Bahá'í Faith itself", but rather are there because of the "insight" they offer to

the reader (p. 607). Leggett (2006) suggests that educational literature which exhibits an

"unwillingness" to go beyond "superficial" treatments of spirituality and really engage with

religion as a system of knowledge which can provide insight into reality is a symptom of a

fragmented view of existence that dismisses religion "as an outworn and dogmatic apparatus of institutions" (2006, p. 13), when in reality it is religion's role to "throw light on the inner life of the individual", "touch the roots of motivation", and "engender a code of ethics and morality that can appropriately guide human behaviour [sic]" (Arbab, 2000, p. 186).

FUNDAEC's programs are implemented by institutions from many different backgrounds – Catholic, Protestant and Secular, and research has shown that the use of quotes of a more spiritual nature in the text have actually served to "make a connection" between the students and whatever "influential sources of moral authority" already existing in their own lives (Honeyman, 2010, p. 608). Honeyman (2010) found that although there are quotes of a religious nature in the text, students did not equate the study of FUNDAEC's programs with religious education, one student marking the distinction as such: "There (the church), they only give us doctrines, and here [it is different] because they teach us truly to share with everyone" (p. 608).

The Programs

Although FUNDAEC has many different programs, the one that has received the most attention, both in forms of description (the branches of our tree) and in systematic research (our fruit) is known by the acronym SAT, which in Spanish stands for El Sistema de Apredizaje Tutorial and translates into English as the Tutorial Learning System; it is most often referred to in the literature as SAT and will remain to be so from hereon after. The SAT system has been an object of study on many occasions and has been officially recommended by researchers in both Honduras (Alas et al., 2007) and Columbia (Arango et al., 2002), two countries where its program is recognized officially by the ministry of education, from which it also receives financial support. While there has been no research specifically designed around how the curriculum itself has been developed in an integrated fashion (as opposed to a fragmented approach), there are descriptions of elements of the program in much of the

existing literature. Conceptually, Arbab stated in 1984 that "for FUNDAEC, the issue of integration was…essential", integration, Arbab says, would be a "key" which would help them overcome conceptual problems. An initial question was how to design the curriculum, it is Murphy-Graham's (2012) observation that the curriculum is not designed around "traditional academic subjects" (p. 42), although conceptually it can be described as having five areas: mathematics, language, science, technology, and community service (Arbab, Stifel, 1982, p. 513). The SAT program is made up of nearly eighty books which FUNDAEC has written since its inception that are all organized around developing a particular capacity within the individual, drawing from multiple disciplines in order to achieve development of said capacity.

The texts themselves may contain elements from many different academic areas; for example, when trying to teach a student algebrag or other basic mathematical capabilities, vocabulary is built through the study of grammar and language and may include practical components, such as the calculation of the area of a piece of their land (VanderDussen, 2009, p. 65). This model of education stands in contrast to what the founders of FUNDAEC were exposed to in the form of the standard curriculum used in Columbia, which they saw as having been transplanted from a completely different social context. It became clear that they should instead develop a program, not from "sums of disciplines or professional programs designed for other social realities", but rather from knowledge generated from within the population they were working with (Arbab, 1984, p. 26).

The Fruit

For the first 30 years of FUNDAEC's existence, there was very little literature published which systematically studied the impact of its various activities and programs; it could be surmised that until a certain point the amount of acquired learning had not reached a level where conclusions could be drawn from the actions taken. In a 1988 publication

FUNDAEC states, "During the past fourteen years, the Rural University has been involved in a number of other learning processes, but none of them is advanced enough to deserve a separate discussion here" (Arbab et al., 1988 p. 13).

Since 2004, there have been an increasing number of studies which have looked at the impact of the SAT program and its offshoot, PSA (Preparation for Social Action). There are two authors that stand out: Catherine Honeyman and Erin Murphy-Graham. One of the first systematic efforts to study the impact of the SAT program was undertaken by Honeyman in 2003 when she compared 96 students of the SAT program to 88 students in a more conventional education system in Honduras. In contrast to later studies undertaken by Murphy-Graham which looked at the ability of the program to engender women's empowerment (2012) and develop the capability of trust (2014), this study focused on the ability of the SAT program to develop feelings of social responsibility within its participants. Honeyman (2010) stated her findings concisely while at the same time offering enlightened commentary. She defines social responsibility as "the personal investment in the well-being of others and society as a whole" (p. 600). In order to collect data, Honeyman used a written questionnaire which had 26 open and closed questions laid out with order in mind to prevent "suggestion bias" from influencing the answers. She concluded from the responses that "overall, students in the SAT program seem to hold a greater sense of social responsibility as extending not only to those with whom they already held direct ties, but also to a broader range of people living around them" (p. 604).

Murphy-Graham (2012, 2014) is arguably the most heavy contributor to the body of knowledge surrounding FUNDAEC, specifically in relation to the SAT and PSA programs. Murphy-Graham (2012) consolidated much of her previous research into a book which looked directly at the capacity of the SAT program in Honduras to contribute to the empowerment of women. It is a significant addition which not only draws greatly upon the

trunk of our tree in order to form a framework within which to study the FUNDAEC

phenomenon, but also gives compelling evidence to suggest that women who had studied

with the SAT program had achieved not only "concrete material differences" but actually had

developed a more "positive self-perception." She attributed this to an "altered worldview"

that serves as a "crucial first step" in the path towards empowerment (p. 90-91). Her review

of the literature surrounding the concept of empowerment and how education can help

achieve it plays a significant part in her methodology.

   Most recently, Murphy-Graham along with her research assistant Joseph Lample

(2014), have reported that both the SAT and PSA programs seem to help develop the capacity

of trust, which they state should be "an explicit goal of education. One of the major features

of FUNDAEC's programs which help engender trust within participants is the removal of a

sense of competition among students. Rather than a culture of contest, a "spirit of

collaboration" is fostered between individuals. One way this is achieved is that mistakes are

encouraged and are not disciplined, in the words of one tutor of the program from Uganda:

> We don't believe in the idea of the wrong and correct answers… if, as a tutor, I come
>
> out and say this is the correct answer, I have right away cut this one's path of walking
>
> toward discovering this answer by themselves…They just need guiding, that's why
>
> maybe they don't call us teachers but tutors, because we do guide we don't teach (p.
>
> 8).

The environment thus created is one in which the students feel comfortable trying out

answers. This element of the program was also described by Honeyman (2010) where in one

of her interviews with a student in Honduras she was told:

> in the colegios (traditional government schools), they don't give you the freedom to
>
> explain when you doesn't [sic] understand something…but here, they say that if you

doesn't understand, you should ask…this way, you learn a lot, because it gives you

more confidence – that one can ask (p. 607).

Thus through qualitative measures such as these, the tree of FUNDAEC has begun to produce

its first fruit.

Conclusion and Suggestions for Further Research

Overall, the literature related to FUNDAEC can best be understood as in the

beginning striving to clarify the conceptual framework which defined its actions. As practical

application of this framework was undertaken, over time the structure of its initiatives

crystalized to the point where their features could be described by third parties and compared

with other educational initiatives. The fruit of FUNDAEC's labour has only recently begun to

be manifested through the medium of quantitative and qualitative research suggesting various

merits of the program.

The literature itself is full of suggestions of areas where further research could, and

should, be undertaken. Arrango et al. (2002) say that there could be a financial comparative

analysis between the FUNDAEC model and more conventional education systems (p. 3-4).

Honeyman (2010) suggests there be a direct observation of students' relationships outside of

the classroom (p. 603). Murphy-Graham (2012) proposes that further research areas include

the "fidelity" with which the program is implemented (p. 38), the "connection between

women's empowerment and their religion" (p. 136), and the impact of the practical project

sites on the "collective empowerment" of the students (p. 141). There is also an observed gap

in empirical research on how the curriculum itself was developed in a way that avoided

fragmentation.

FUNDAEC has matured into an organization whose actions are just beginning to be

verified through systematic research and although "empirical evidence is scant, those who

visit the program… are often impressed by the students, tutors, pedagogy, and textbooks (Murphy-Graham, 2012, p. 49).

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