

## The Impact of Darwin's Evolutionism in Building Platforms for Collaborative Learning

**Luis Garcia**

Universidade Portucalense  
Porto, Portugal  
luisgarcia@marcadagua.com

**Maria João Ferreira**

Univeridade Portucalense  
Porto, Portugal  
mjoao@uportu.pt

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**Abstract:** *The verb to evolve has its origin in the Latin word evolutione, which means progressive development, be it of an idea, event or action. According to Darwin the species of living beings are transformed over time as they undergo a process of natural selection, which prioritizes beings more adapted to their surroundings, this seems to indicate that the force that brings about the transformation of species over time is natural selection. In the same sense, and in the context of our research, we intend to analyze the LMS (Learning Management System) in the perspective of the theory of Darwin, with the goal of building an environment in which collaboration is real and effective.*

**Keywords:** *Evolutionism, Collaboration, Learning, Teaching, Learning Management System.*

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### 1. INTRODUCTION

Considering the present state of evolution of LMS (Learning Management System) it seems likely that any of these practices should cover conceptions and learning practices according to the structure and dynamics of a society increasingly immersed in a circuit design, or network [1]. However, in general, this does not happen, because hardly LMS contextualize the reality of teaching/learning, aiming really just teaching. This happens because it does not favor an interactive and effective vision for collaboration [2]. The LMS's rarely include a connectionist vision [3] of the teaching/learning process: the ability to make connections, recognize and interpret patterns and open up new paths of apprehension and knowledge sharing [4].

The attendance factor, enriched with the capabilities of the distance factor, can offer teachers and students an added value in the teaching/learning process [3]. Relying on this premise it seems pertinent to consider an appropriation of Darwin's Theory of Evolution and its application to collaborative/cooperative learning with LMS support. In this context, we intend to analyze the characteristics of the current LMS relating these with the pillars of Darwin's thought: Evolution; Common ancestor; multiplication; Gradualism and Selection.

The combination of the possibilities offered by both scenarios, in the classroom and at distance [5], can lead us to consider a mixed learning environment supported by a LMS (Learning Management System). However, using a computer in a classroom apart from not being an innovation, also conveys the idea of a bilateral relationship between student and machine which might not be assumed as any sort of collaboration. We think it is exactly at this point that Darwin's Theory can be a positive contribution towards the goal of building an alternative environment to the current LMS.

Although the LMS try transposing the bureaucracy of the school building and the transfer of content that comes up often unidirectional from an emitter, the teacher, to a recipient, the student [6], these cannot effectively offer the possibility of teachers and students making connections [3] and from there getting added value to the teaching/learning process. So the connections made by teacher and student, drive us to a process of teaching/learning that arises from the research and the ability to perform correctly as opposed to teaching that is just a reproduction not being a separation between assimilation and production [2]. To sum up within the existing LMS, conditions for an effective collaboration are not created [2].

This paper is organized as follows: section 2 presents and discusses the concept of collaboration in LMS; Section 3 makes an approach to the Darwin's Theory; Section 4 analyzes the

implications of Darwin's Theory in creating a collaborative environment; finally Section 5 presents the conclusions and future work.

## **2. DIGITAL EVOLUTIONISM**

Digital Evolutionism [7] is based on Darwin's Theory. This theory postulates that an individual developing a certain ability, for example physical, does not necessarily mean that it will be transmitted to a direct descendant since the changes produced represent a physiological level and no change at the genetic level. On the other hand, and still according to Darwin [8] it seems obvious that there are characteristics which are in fact inherited through a transmission of the individual's ascendant and descendant [9].

The evolution at digital level appears to be due to a huge growth of the Internet with particular focus on the emergence of social networks and the widespread access to these [10]. This change in the access to information for many different types of users came to emphasize even more the issue of the credibility of online content available. Such a scenario should consider the reliable content as opposed to unreliable contributing to the LMS being considered privileged spaces for the operationalization of teaching under a b-Learning regime [5].

What is clearly perceived is a metaphorical concept of natural selection, more specifically digital, in which any application or LMS that doesn't show high quality patterns is eliminated with certain ease since users become more demanding Internet itself evolves to a more selective level. By analogy, this phenomenon generates a Digital Darwinist model in which gradually the only offers that survive are the ones which are more likely to provide a solution for the problems they seek to address [7].

Originally quoted by Joe Crump (2007) digital Darwinism in our investigation is not the relationship between companies and the Internet [7] as contextualized by the author, but in the relationship between users and content, between users and LMS. To consider Digital Evolutionism is to accept that there will be a natural (digital) evolution of the contents as well as of LMS, so that in a few years Internet can become not only a global and unique power of platforms and contents, as it is nowadays, but further increase the consistency of the available contents. These contents will potentially be validated and might become a reference as a means of mobilization (as already happens with social networks).

Education should consider capacitation, research and human development with all sort of contents in their more perfect synthesis with an adequate dynamic between individual and social according to the tendencies as for example Twitter or invisible to human eyes, who knows. In this context the teaching/learning process can value from the application of Darwin's Theory for the construction of a platform that is intended to potentiate cooperation between teacher and students.

## **3. COLLABORATION DEFICIT IN LMS**

The features available in current learning LMS provide a low level of interactivity [6]. In general, these are based on membership, in membership/participation and in participation; however they are not enough to deplete the possibilities of participation, not even moving towards a participation/interaction or to a free interaction [2]. In this regard they represent predominantly straight-taught systems, centralized, or more distributed than centralized and at most participatory but little interactive [2]. In the Connectivist context [4] these LMS cannot be good teaching/learning platforms since for a vision that privileges the concept of bonding [3] learning is the result of interaction. In this sense, good teaching/learning LMS will be b-Learning platforms built to enable and stimulate interactivity [6].

### **3.1. B-Learning Definition**

Blended learning, or b-Learning, is a derivative of E-Learning, and refers to a training system where most of the syllabus is transmitted in distance learning, usually over the Internet. However, it necessarily includes face-to-face sessions, hence the origin of the blended designation, mixed. B-Learning can be divided into synchronous activities, or asynchronous, just like e-learning, i.e. in situations where teachers and students work together in a pre-set time, or not, with each fulfilling its tasks at flexible hours [13].

Therefore, and according to MacDonald [13] b-Learning has advantages and disadvantages as a support resource for teaching:

### Advantages

- Best personal integration among participants, with consequent exchange of experiences;
- Ability to develop collective dynamics;
- Potential cost savings with the formation of groups, allowing the entire group to start the course and finish it in the same period;
- Improved capacity of assessment of students in classroom sessions, especially when the object of the training involves relationship of performance and attitude of the student in front of the public;
- Ability to perform field work and visits to places of interest;
- Humanization of the relationship between the institution and the students;
- Best learning outcomes within specified periods, with more diversified media and more intense collaboration between students.

### Disadvantages

- The need to organize classroom classes, to reduce costs, with set dates, can limit access to individual students who want to study programs independently with more flexible terms, as in the case of E-Learning;
- Limits the access of individual students wishing to study programs independently and with flexible hours;
- Online teacher devaluation and high appreciation of the classroom teacher. Often the online teacher has the function of tutor, i.e., it's not the main responsible for the contents but just for the relation between student and educational system.

To develop the LMS, the development of a multiple and converging epistemological basis is necessary, with the formation of an active subject, critical, reflective, deliberative, ethical and autonomous [14]. Trying to build an exhaustive list seems to us, in addition to an arduous task, to extrapolate the real purposes we want to achieve with our investigation, which led us to delimit from the available offer, the platforms which fit into the percussion of our research.

### 3.2. Technical Features of a LMS

We believe it essential that the teacher dominates correctly tools and resources to be able to assist students in any problems occurring [15]. Thus, given an LMS, we can identify as table analysis 1, two groups of technical features [16]:

**Table1.** *Technical features of a LMS*

Features	Designation	Description
Resources	Navigation model	It aims at facilitating movement of users within the environment.
	Advertisement area	Presented to the student immediately after login on the platform.
	Calendar	Assists the management of dates.
	Research	To optimize the search for information when the course structure reaches a considerable size.
	Metadata	Material information that is relevant to the categorization and content research.
	Favorites	Can reduce the required steps of navigation for frequent sites.
	Repository	Responsible for objects that can be accessed and stored in the file upload area that offers teachers and students the ability to send to the environment their own materials.
Tools	Synchronous	Enable communication and collaboration in real time. We can point to the example of the chat, conference call, the conference web, application sharing and more.
	Asynchronous	Enable communication and collaboration without simultaneous time. Users can interact according to their own pace and schedule. This is the case of email, forums,

		blogs, wikis and others that provide a means of involving the learning community in a collaborative exchange, for example, knowledge about a particular topic of discussion.
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The possibility of interaction between actors, allows new sociability to emerge. The way the communication system appears on the screen can have a significant impact in the dialogues and in participation levels [17] however, it is not the interface that will determine the level of interactions, nor its content, but the communicative dynamics that the community will develop. Synchronous communication promotes socialization and facilitates the proximity between the participants. We can list some of the advantages associated [18]:

- Allows the contact and the immediate feedback in the relationship teacher/student;
- Allows direct contact between students;
- Promotes spontaneity;
- Simulates classroom environment.

This tool doesn't only have advantages so it should also be considered that it may also [18]:

- Penalize users with lower writing skills and little skill in using the keyboard;
- RequireS the online presence in a set timetable;
- Become chaotic when involving large groups, which may lead to desynchronized contributions.

Synchronous communication should be understood as an important but complementary use of asynchronous communication, due to some limitations it has in pedagogical terms [19]. To be effective, it must meet a number of conditions, in particular as regards the number of students participating, which should be reduced, to the management of participation time and to the rules and guidelines for an equitable participation. This type of communication is useful for the construction of social links but may not be suitable for learning itself [19].

### 3.3. Potentially Collaborative Features of LMS's

The study by Rangin et al. (2013) "Comparison of Learning Management System accessibility" was written as part of CSUN in 2013 with the goal to evaluate mainly the usability and accessibility of four of the LMS's offers most widely used by educational institutions [20].

As main objectives of the study Rangi et al. (2013) point out: Identifying features that can enrich the user experience; informing interested parties in the operation of an LMS about the accessibility that should be inherent to one of these platforms; sensitizing the community to the fact that the concept of accessibility is more than just a label on the construction of a LMS's platform and identifying approaches to effective collaboration in these learning environments.

The selected LMS Blackboard, Moodle, Sakai and D2L provide support for innovative ways in which learning concerns, although some educational and socio-cultural aspects have not been adequately addressed. In part, this gap is due to the complexity and difficulty in translating the social and pedagogical issues in flexible solutions that enable the application of technology without delaying the the pedagogical implementation of the teaching/learning process.

The features presented play a mediating role between the students and the goals set by the teacher. They can match any means conducive to achieving the targets set, for example, a discussion forum, e-mail or mediating units as language itself, which helps the process of carrying out the proposed activity [21]. We underline the importance of each functionality presented.

**Table2.** Description of the features of a LMS (adapted from [20])

Features	Description
Login configuration and compatibility	It represents the first point of contact / interaction with the LMS; It depends on external software / plug-ins, browser settings. Users should be informed of the required / optional software and optimal configuration before attempting to login. Users should be able to download and install the required / optional software and change any settings independently.

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Personalization	Users have different needs and ways to view and interact with applications. Users can tailor the system to their needs, rather than having to adapt the application. Personalization improves the user experience.
Navigation	Navigation is the most important element for accessibility. Often, there is no visual indication or description of the layout. Users need to obtain the necessary information to make navigation decisions. Users should be able to navigate effectively and safely.
Forms	The real interaction begins with forms. Users must enter data easily and safely. The data format should be easy to understand. The instructions must be clear and understandable. Users should be notified of possible errors, as well as possess the ability to solve them. Users should be notified of a successful submission.
Documentation	LMS applications are complex and require learning in their use. The main functions of the tools should be clearly explained and easily visible. Step-by-step instructions must be provided. The supported accessibility features must be documented and made available.
Advertisement	Tool that allows to inform students of events or activities to be undertaken.
Discussion	Spaces to share opinions usually in the form of forums.
Email	Tool that allows for operational communication between students, and between them and the teacher.
Chat	Space that allows for operational communication between students, and between them and the teacher in real time.
Activities	Proposed tasks within the classes that are generally but not necessarily, conducted at a distance.
Assessment	Tool to help teacher and student to understand and operationalize the evaluation process in the best way.
Tests	Tool to check the acquired knowledge.

### 4. IMPLICATIONS OF THE ABSENCE OF EFFECTIVE COLLABORATION IN LMS'S

In addition to a view of the teaching/learning process that fosters collaboration, there are other variables to consider in building a platform for learning, they are: the nature of the proposed pedagogy, the degree distribution of the learning environment created and interactivity and collaboration levels that such an environment provides [2].

#### 4.1. Nature of Pedagogy

Existing learning platforms are mostly, online education systems, often a virtual school, a repository, organized educational processes and objects, that the students cannot easily modify to suit their personal needs or adapt particular circumstances they find [2].

The pedagogical nature of these platforms is that of a straight-pedagogical system, sometimes with traces of a strategy that encourages students to learn alone, but that, in general, does not have any traces of alter-pedagogy, i.e. learning in relation to the other, the so-called friend in the context of social network. In this sense these platforms are not built to allow the operationalization of the process of the storing of knowledge in friends, which could lead to the creation of new knowledge [4].

#### 4.2. Distribution Degrees

The LMS are based, in general, in oneflow systems. Entrance to the flow takes place from pre designed disjunctions and not from the will of the students. Every feature is designed from the point of view of what the platform creators want to provide and not from what the students want to learn [2]. It seems there is a clear reversal of the principle from which the LMS platform should be considered, based on what the student wishes and needs for a process in which, together with the teacher, the teaching/learning in fact occurs.

In the context of pre-concept in the design and construction of LMS platforms interaction and collaboration are limited and may not break new ground, which, it seems, will withdraw, in large part, the freedom to create new proposals for the students [6].

### **4.3. Interactivity Levels**

The features available in existing learning platforms provide a low level of cooperation, since they do not consider the connections between students, teachers and others, in a teaching/learning process that should characterize essentially to be more than decentralized, distributed [33]. In general, they are based on membership, membership/participation and participation not using up all the possibilities of participation nor moving to a participation/interaction or an interaction characterized by an inherent freedom to connections that should be exploited [6].

Systems predominantly based on straight pedagogy, centralized, and at most with a low participation rate, cannot be good learning platforms. If, for a connectivist view, learning is the result of the interaction, then good platforms are interactive platforms [3].

### **4.4. How to Improve Collaboration in LMS's**

To build a LMS platform where effective collaboration can actually happen, it seems that this should be multistream and that there are simultaneously features in the platform that allow the configuration of a more distributed than centralized topology, enabling the hastiness of a new phenomenology of collaboration, in other words that learning is effectively a network platform. In this sense the user experience involved in the platform design should be based on what the person connected to the platform would want to do, not what the platform can offer. The platform design should also include mechanisms and features that comprise the membership and participation, but that can get to the interaction, allowing mutual adaptation, imitation and collaboration leading to the manifestation of phenomena capable of generating self-organization, such as clustering and the swarming [33]. Ideally, these mechanisms and features are based on a type iteration gradient: Accession -> follow-on participation -> involvement-> participation-interaction -> interaction [2].

The user experience should be drawn mainly from the user's point of view and what it plans to do and not only in what the platform creators want to offer. This means that the main question is: what is the desire of the user who connects? A person who binds to a learning platform may wish to do a search, look for a personalized knowledge it needs at a given time and cannot be obtained easily by the search. The user may still want a course for know-how of ownership, for example, share some educational process, or learning object or solve a problem for which there is no answer, or discover or invent something new together with others [1].

A platform that allows to offer solutions to user needs should allow performing research, that is if one wants to search for information on any subject it should be able to benefit from simple and refined search engines, directing the person to a menu of processes or objects [2]. In the same sense before a particular request, the person wants to seek some knowledge via process or object. Platform possible answers, direct the person to a process or object, promote the meeting of the request with an already existing offer or exposing the request to collaboration [34].

Discovery or invention, one wants to sketch a creative or investigative desire or propose a partner research object for both, platform answers, display the desire or project to interaction or promote the formation of research-learning-creation community [35].

## **5. CONCLUSIONS**

The teaching/learning process should be the result of relationships between individuals and not the relationship of the student or teacher with a machine, software or algorithm. Students must have at their disposal educational and training routes already drawn but that also enable the creation of their own itineraries, independently and in interaction with other students [2]. In this sense, they must be able to interact in a favorable environment for the creation and not only the reproduction of knowledge, being positive to learn by creating, as active individuals in the construction of their own knowledge and not just passive objects of information transfer systems.

In the context of this study we developed a table in which each functionality of a LMS was tested according to usability criteria, potentially collaborative, as can be analyzed in Table 3.

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**Table3.** Comparative features of a LMS (adapted from [20])

Features	LMS			
	Blackboard	Moodle	Sakai	D2L
Login configuration and compatibility	4	3	3	5
Personalization	3	3	2	4
Navigation	3	4	4	5
Forms	4	5	4	5
Documentation	5	5	5	4
Advertisement	4	5	4	4
Discussion	2	4	4	4
Email	4	5	4	4
Chat	4	5	4	4
Activities	1	4	4	5
Assessment	4	5	5	5
Tests	3	4	3	3

Caption	
Punctuation	Designation
5	Very Simple
4	Simple
3	Acceptable
2	Complicated
1	Very Complicated

The key is that the environment is, in fact, teaching / learning, free and not just a platform that favors teaching [34]. In a broader sense, the environment must itself be capable of learning, or to be improved by the users, through the experience of their use, and to do so it should have the characteristics shown in Table 4.

**Table4.** Characteristics of teaching/learning interactive platform (adapted from [DE FRANCO & LESSA, 2012])

Characteristic	Description
Multistream facilitation	The platform should offer the user the selection of multiple paths.
Creating a distributed topology	The platform must have features that allow the configuration of a more distributed than centralized topology, enabling the hastiness of new phenomenology of interaction, namely the platform should effectively be a networked platform.
User-platform construction	The use of experience involved in the platform design is based on what the user connected to the platform may want to do rather than what it can offer.
Effective interaction on the platform	The platform design should include mechanisms and features that comprise the membership and participation, but that can sustain interaction, allowing for mutual adaptation, imitation and collaboration, enabling the manifestation of phenomena capable of generating self-organization, such as clustering or swarming.

### 5.1. Multistream Facilitation

It is necessary that a platform that claims to be teaching/learning is able to offer multiple paths i.e., first it is necessary that the platform is opened, in a triple meaning: open entry, anyone can come in and propose what thinks fit; software that can be customized and reproduced by anyone and opened outcome, that is the result of teaching experience/learning of a person can always be unpredictable.

### 5.2. Creating a distributed topology

It is necessary that the internal topology of multiple possible paths in the platform is distributed on the platform or at least more distributed than centralized. This means an apparent absence of hierarchy on the platform, the teacher's role remains extremely important but as an alternative,

that is, although the teacher can and should influence the process of teaching and learning, this role should be open to any user, student or third parties who want to participate.

### 5.3. User-Platform Construction

It is important that the platform environment is not limited to membership and participation, but propitious to expressions of interactive phenomena associated with collective intelligence as clustering or swarming that occur depending on the topology and dynamics of the network.

### 5.4. Effective interaction on the platform

It is important to introduce the platform cross functions such as conversation, which has the goal of adding interaction elements to the features of membership and membership participation. A user connected to the platform must be able to issue an opinion and establish a dialogue with others about this same opinion or from it i.e. carry out the conversation. This will help increase the attractiveness and friendliness of the platform, preventing the user from feeling isolated or having to go through a bureaucratic procedure, such as filling out forms or reading tutorials, potential difficulties leading to frequent abandonment of beginners users on any system computerized.

In the context of Digital Evolutionism [7], a platform that cannot learn itself will not be a good learning platform [2]. This means that it should have sufficient opening so that users themselves can contribute to its improvement. These changes may create new features that improve the environment of the platform itself in what the ability to collaborate is concerned.

**Table5.** Comparative table of the characteristics of a teaching/learning interactive platform (adapted from [2])

LMS	Multistream facilitation	Creating a distributed topology	User-platform construction	Effective interaction on the platform
Blackboard	1	2	2	1
Moodle	1	2	3	1
Sakai	1	2	2	1
D2L	1	2	2	1
<b>Caption</b>				
Punctuation		Designation		
3		Fully implemented		
2		Partially implemented		
1		Not implemented		

With the emergence of platforms to suit the surrounding environment and teacher needs and students in the teaching/learning process, we can watch an evolution of the current offer for a set of platforms that favor the perspective of the user. In the same sense we can say that a school, for example, is not able to learn, since it emerged as a meritocratic corporation in the first millennium [36], in the twenty-first century to basically represent the same meritocratic corporation, meaning it does not have great capacity for change [6].

Collaboration is a factor that can lead to innovation and production of new knowledge [37], think of the example of Thomas Edison, whose success depended on a team, from the fifteen engineers who collaborated in the laboratory in Menlo Park to the financier JP Morgan, or even men like Samuel Insull, who created the products that have made electricity a profitable business [37]. The school space must have the necessary tools for those involved in the teaching/learning process can actually interact, and preferably cooperate.

Students and teachers should be able to interact in a favorable environment for knowledge creation, subordinating the reproduction of knowledge. It is positive that we can learn by creating, making students active subjects in the construction of their own knowledge and not just as passive objects of information transfer systems. However the Teacher in the present context tends to be characterized according to Table 6[37].

From the table analysis we can infer that the teacher must overcome the limits of its area of operation, and dare to teach through the use of spaces that enable a real interactivity between students and between students and teacher. Technology has influenced behavior and determined a



change in the school space paradigm. Television, for example, displays more than sixty characters per hour, with the most different personality characteristics [38]. These images are recorded in the memory of students and compete with the teacher's image [38]. The speed of thinking cannot be accelerated chronically, since this will contribute to a decrease in concentration [38], a fact that the teacher will attempt to circumvent making use of one of the several roles mentioned in table 10, probably with little or no success at all.

**Table 6.** *The roles of the Teacher in a LMS platform (adapted from [37])*

Designation	Subject	Result	Solution
Teacher/ Timer	Creates excessive dependence on himself. Uses his time and others in an inefficient way.	Can feel worn out. The dependence of students means that the knowledge at the network edge is not used.	Identifying tasks that may be reassigned so as to lessen the burden of the teacher.
Teacher/ Formalist	Inaccurate perception of the informal network that exists between students and between teachers and students, so it cannot take advantage of it as a working tool.	May suffer from personal frustration when things do not go the way he had planned.	Identify intermediaries, marginalized voices, people and overloaded functions and fragmentations in which networks may have come into misalignment.
Teacher/ Specialist off	Does not face the failures in the capabilities of promoting relationships between students and between these and the teacher.	Fails when a new phase requires undeveloped capabilities.	Develop a self knowledge and create links with those who can bridge failures.

In this sense and as future work we intend to develop a model that will allow for the effectiveness of cooperation/collaboration between teacher, student and third parties. In this model the image of the teacher/collaborator will emerge as an answer to the questions raised by table 10. We intend to build the model through the adaptation of platforms that allow for an effective interactivity and that function as a support for the operationalization of this same model, thus contributing for a digital evolution process that we hope to contribute for a more efficient and effective teaching/learning process.

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