

# FROM CLASSROOM TEACHING TO E-LEARNING: THE WAY FOR A STRONG DEFINITION

Amaral L.,<sup>1</sup> Leal D.<sup>1</sup>

<sup>1</sup>Universidade do Minho, Braga, Portugal

## ABSTRACT

In any process of adoption of e-learning is important to understand his elements and the way they interrelate. This work tries to achieve the e-Learning definition using a graphical interpretation supported by mathematical language that helps the understanding, step-by-step, of the transition from “Classroom Learning” to “e-Learning”. In the last step, the obtained graphic and formula is used in order to reach what we call the strong e-Learning definition.

## KEYWORDS

e-Learning, e-Learning concepts.

## 1. INTRODUCTION

To obtain the e-learning definition we use the following method: first we describe the classroom teaching and com base in this scenario, we make the necessary changes, in successive iterations, in order to achieve the e-Learning model. With this purpose we have created a set of graphical pictures supported by the mathematic translation illustrating the successive steps from the initial state “Classroom teaching” until the final state “e-Learning”.

## 2. STEP ONE: THE CLASSROOM MODEL

The first step of our journey is to define the face-to-face teaching in a graphical form. Figure 1 shows the “entities” or “players” (Teacher, Content and Student) (Terry 2002) and the constrains (Place and Time) (Retalis, Makrakis et al. 1998) that as a whole represent the classroom teaching (CT):

- The Teacher (T)
- The Content (C)
- The Student (S)
- The Place (P)
- The Time (W)

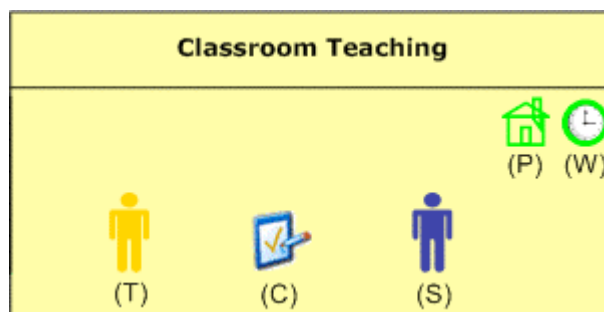


Figure 1 – Classroom teaching

The initial state (CT), Classroom Teaching, is translated to mathematical language thru this formula:

$$CT = T \cup C \cup S \cup P \cup W$$

From this initial state, we will make step-by-step, successive adaptations in order to reach the “electronic learning” stage.

### 3. STEP TWO: THE CONTENT

The content, or, the content format, location and type of electronic support, assumes much more importance in e-Learning (Anderson 2004). In this new paradigm the content is no longer “in the teacher”, in “is brief case” or in his “teaching support materials” to be in a “way” that make them accessible “24 hours a day, 7 days a week”. In e-Learning, the content (C), is placed (Zetterman and Lindblad 2003) at the internet (Ci), stored in a CD, or in an Internet-CD combination (Cdi). Therefore, electronic learning, implies that the (e-)Student needs a computer with CD-Rom reader (PC) and/or an internet connection (PCi). Graphically:
















e-Learning Content			
[1A] Content on Internet		 (Ci)	 (PCi)  
[1B] Content on CD		 (Cd)	 (PC)  
[1C] Content on Internet and CD		 (Cdi)	 (PCi)  

Figure 2 – e-Learning content

Mathematically the graphic specification origins 3 formulas:

$$\left\{ \begin{array}{l} def(1A) = T \cup Ci \cup S \cup PCi \cup (P = ?) \cup (W = ?) \\ def(1B) = T \cup Cd \cup S \cup PC \cup (P = ?) \cup (W = ?) \\ def(1C) = T \cup Cdi \cup S \cup PCi \cup (P = ?) \cup (W = ?) \end{array} \right.$$

The case 1C (the content is on the internet and CD) is a particular case of 1A, for this reason we have simplified the schema reducing it to the cases 1A and 1B:











e-Learning Content			
[1A] Content on Internet		 (Ci)	 (PCi)  
[1B] Content on CD		 (Cd)	 (PC)  

Figure 3 – e-Learning content (simplified)

Mathematically:

$$\begin{cases} def(1A) = T \cup Ci \cup S \cup PCi \cup (P = ?) \cup (W = ?) \\ def(1B) = T \cup Cd \cup S \cup PC \cup (P = ?) \cup (W = ?) \end{cases}$$

In this figure the clarification of the entities “Place” and “Time” is missing. As above-mentioned, the content is available “24 hours a day, 7 days a week”, or, at “anyplace anytime”, which means there’s no “Place” or “Time” constrains. What about the teacher? What’s the teacher influence in those question marks? That lead us the next step: the teacher-course relation.

#### 4. STEP THREE: THE TEACHER

We start the teacher-course relation study, analyzing if the course has (T), or not ( $\neg T$ ), a teacher in charged:

e-Learning – The Teacher			
[1Ai] With Teacher	(T)		
[1Aii] Without Teacher	( $\neg T$ )		
[1Bi] With Teacher	(T)		
[1Bii] Without Teacher	( $\neg T$ )		

Figure 4 – The teacher

The mathematical translation:

$$\begin{cases} def(1Ai) = T \cup Ci \cup S \cup PCi \cup (P = ?) \cup (W = ?) \\ def(1Aii) = (T = 0) \cup Ci \cup A \cup PCi \cup (P = 0) \cup (W = 0) \\ def(1Bi) = T \cup Cd \cup S \cup PC \cup (P = ?) \cup (W = ?) \\ def(1Bii) = (T = 0) \cup Cd \cup S \cup PC \cup (P = 0) \cup (W = 0) \end{cases}$$

That is equivalent to:

$$\begin{cases} def(1Ai) = T \cup Ci \cup S \cup PCi \cup (P = ?) \cup (W = ?) \\ def(1Aii) = Ci \cup S \cup PCi \\ def(1Bi) = T \cup Cd \cup S \cup PC \cup (P = ?) \cup (W = ?) \\ def(1Bii) = Cd \cup S \cup PC \end{cases}$$

Easily we can conclude that the courses without teacher involved aren't time or place dependent (cases 1Aii and 1Bii). In those cases the course is totally learner-led. For the courses with a teacher, we have to study the kind of relation, or interaction that exists between teacher and students.

## 5. STEP FOUR: TEACHER-STUDENT INTERACTION

The teacher-student interaction (I) can be made using the following methods:

- e-mail support – which implies asynchronous interaction (Ia) moments;
- Chat or video sessions - which implies synchronous interaction (Is) moments;
- Face-to-face sessions - which implies the characteristics of classroom (Ic) teaching (at the same time in the same place).

Graphically:

e-Learning Teacher-Student Interaction			
[1Ai1] Asynchronous moments			
[1Ai2] Synchronous moments			
[1Ai3] Face-to-face moments			
[1Aii] Without Teacher			
[1Bii] Without Teacher			

Figure 5 – e-Learning

Mathematically we have:

$$\begin{cases} \text{def}(1Ai1) = T \cup Ia \cup Ci \cup S \cup PCi \cup (P = 0) \cup (W = 0) \\ \text{def}(1Ai2) = T \cup Is \cup Ci \cup S \cup PCi \cup (P = 0) \cup (W = 1) \\ \text{def}(1Ai3) = T \cup Ip \cup Ci \cup S \cup PCi \cup (P = 1) \cup (W = 1) \\ \text{def}(1Aii) = Ci \cup S \cup PCi \cup (P = 0) \cup (W = 0) \\ \text{def}(1Bii) = Cd \cup S \cup PC \end{cases}$$

Which, after simplification origins:

$$\left\{ \begin{array}{l} \text{def}(1Ai1) = T \cup Ia \cup Ci \cup S \cup PCi \\ \text{def}(1Ai2) = T \cup Is \cup Ci \cup S \cup PCi \cup W \\ \text{def}(1Ai3) = T \cup Ip \cup Ci \cup S \cup PCi \cup P \cup W \\ \text{def}(1Aii) = Ci \cup S \cup PCi \\ \text{def}(1Bii) = Cd \cup S \cup PC \end{array} \right.$$

With this scenario, we concluded the transition from the “traditional learning” to the “electronic learning”. Looking at the graphic, there are 5 types, or different ways, of e-Learning delivery:

- 1Ai1 – On-line synchronous learning;
- 1Ai2 - On-line learning with asynchronous moments;
- 1Ai3 – On-line and classroom learning;
- 1Aii – On-line learning;
- 1Bii – Computer based learning.

If there are five “e-Learning types”, should it be correct to consider only one e-Learning definition?

## 6. CONCLUSION

Is there any entity (with the same value) common to the five e-Learning types? Studying the figure 5, only two entities appear in the same form in all cases: The student and the computer.

$$\begin{aligned} eLearning &= (T \cup Ia \cup Ci \cup S \cup PCi) \cap (T \cup Is \cup Ci \cup S \cup PCi \cup W) \cap \\ &\cap (T \cup Ip \cup Ci \cup S \cup PCi \cup P \cup W) \cap (Ci \cup S \cup PCi) \cap (Cd \cup S \cup PC) \\ eLearning &= S \cup PC \end{aligned}$$

Then, we could conclude that “e-Learning” is “The act of learning through computer”. But, comparing the set of entities present in the five e-Learning types with those that the definition holds, can we refer to the above definition as correct? Let’s assume its correctness, but labeled as the “e-Learning weak definition”. Then, what should be the “strong definition”? Certainly, if the weak definition is obtained from the intersection of the entities present in the five e-Learning types, the strong definition should be based in the reunion of all the entities.

The entities not covered in the weak definition are:

- The Teacher
- The Interactivity
- The Time
- The Place
- The Internet

The strong definition has to hold all the entities (including the student and teacher, from the weak definition).

$$\begin{aligned} eLearning &= (T \cup Ia \cup Ci \cup S \cup PCi) \cup (T \cup Is \cup Ci \cup S \cup PCi \cup W) \cup \\ &\cup (T \cup Ip \cup Ci \cup S \cup PCi \cup P \cup W) \cup (Ci \cup S \cup PCi) \cup (Cd \cup S \cup PC) \\ eLearning &= T \cup (Ia \cup Is \cup Ip) \cup (Ci \cup Cd) \cup S \cup (PCi \cup PC) \cup P \cup W \end{aligned}$$

Then, the “strong e-Learning definition” is: “The process, by which the student learns through the content placed in the Internet and/or CD-Rom. The teacher, if exist, is at distance, using the internet to communicate (synchronously or asynchronously) with the students, possibly intermediated with some face-to-face moments.”

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