

Towards a Model for Evaluating the E-learner's Behavior

Benaceur Outtaj^{1,2}
²Groupe EREC
FSJES Souissi Rabat
BP.6430 Rabat Instituts
Maroc
b.outtaj@mail.fdes.ac.ma

Rachida Ajhoun¹
Youness Bouzekri Idrissi¹
¹Laboratoire Alkhawarizmi
de Génie Informatique
ENSIAS, BP 713 Agdal
Rabat Maroc
ajhoun@ensias.ma

Mohamed Sidir
Laboratoire Savoirs et
Socialisation, Université
d'Amiens 10, rue Frédéric
Petit, 80048 Amiens Cedex
sidir@u-picardie.fr

Abstract

With the aim of evaluating and/or analyzing the e-learner's behavior in an on-line learning situation, we propose in this paper a set of criteria which permits to facilitate this task. Following the learner's behavior during his learning process means also that we must analyze all his interactions both with the pedagogic content and the e-learning platform and then we define a set of criteria that characterize these interactions. After having justified and demonstrated the interest for each criterion, we give the method or the calculation formulae to determine it and propose some suggestions which help different actors such as authors, tutors, monitors, learners and administrators to improve the e-learning quality.

1. Introduction

The different actors implied in the e-learning process (authors, tutors, monitors, administrators) are often confronted with the problem to measure strictly or "correctly" the quality of the formation that they proposed and to know if it satisfies the requirements and the objectives for which it was conceived. Consequently, the need to analyze and evaluate the e-learner's behavior will have surely a great impact on the learning quality.

Considering the e-learning characteristics, the way of analyzing the learner's behavior will be certainly different from that adopted in the classical learning. In e-learning systems, some ones prefer to evaluate the formation by taking into account only the learner's final success results (or the final number of validated tests/exams) where others are interested to know if the pedagogic scenario of the different activities was respected [9]. In certain cases, it's very interesting to know also the entire learner's interactions with the

platform and with all the different actors (learners, monitors, tutors...) or even to analyze the movement of lips, eyes and clicks of the mouse on the space reserved to the learner [10].

Many works were realized in this domain [1] [2] [3] [4] [7] [8] [9] and propose technical criteria which are often related and extracted from log files. Furthermore, actual standards which formalize the learner's behavior present a reduced and incomplete set of information and are often complementary [5] [6].

Our contribution in this field through the present work is to propose a set of criteria for following and analyzing the learner's behavior analysis during or after the learning process. It's a generic approach because it is completely independent of any learning system, any pedagogic content or any technical characteristic of the learning system. It can be considered both as a synchronous and asynchronous evaluation.

For organizational reasons, we distinguish that the learner's behavior is due even to

- The interactions with the pedagogic content
- Or with the e-learning platform

And consequently we define two kinds of criteria: those related to the pedagogic content, and others related to the platform.

For each criterion, we present the interest or the reason to be, how can it contribute to the improvement of the formation, and give the method or the calculation formulae to determine it.

Let us finally note that these criteria are currently implemented in a generic tool called TOLBA (a Tool Of Learner's Behavior Analysis) which extracts different criteria defined above and provide the results to the concerned persons in an ergonomic way after

eventual treatments (Datamining...) in order to take adequate measurements.

2. Criteria of learner's behavior analysis

2.1. Why evaluating Learner's behavior?

E-learning, as well as traditional learning is interested by the evaluation and analysis of the learner's behavior which is an inescapable stage in the evaluation process of the learning quality. There are however important differences between these two learning modes. Indeed; in addition to technical tools offered to the learner, the e-learning is a concept which is strongly concentrated on the learner and then the need to follow and analyze his behavior in order to improve the learning quality by the different actors. To highlight the role taken by the learner in such a process, let us underline for example that is the e-learner which constructs his knowledge and defines his learning rhythm himself and can also choose the suitable schedules for his learning.

Furthermore, besides the principal role of the tutor which is assisting the learner and being available to present the fast and adapted answers, the analysis of the learner's behavior can also help the tutor for example:

- To better determine the gaps and lacks in the pedagogic contents in order to improve it,
- To propose only the adequate learning dedicated tools (chat, forum, email, phone, videoconference, shared applications ...) and necessary for the e-learning in order to not overload the platform,
- To study the impact of certain technical, sociological or geographical characters on the quality, results or objectives of the learning process.

We then noticed that the learner's behavior is due to the interactions with the pedagogic contents or with the e-learning platform.

To prove the interest of defining these criteria, here are some examples of actions that we recommended to the actors when the learner's behavior presents certain properties:

- If the majority of learner's duration of an activity is higher than that recommended by the author, then the author will be able to adjust his recommended duration to another (for example, the average or the maximum according to the goals of the formation).

- If the Rate of the formative evaluation of one (or several) activity (s) is weak, that means quite simply that learner (s) did not assimilate this activity; and the author will have consequently to re-examine it.

- When a learning dedicated tool offered by the platform (for example a simulator or a forum) is rarely used by learners during all the activities, then the administrator will be able act in order it not overload the platform and load it only on-demand.

To guarantee the genericity of our criteria, we defined then disregarding any platform, any standard or any existing e-learning system. Nevertheless, we checked that the majority of these criteria can be deduced from certain fields or records of most widespread actual standards of description of learner's information such as LIP [5] and PAPI [6].

2.2. Criteria related to the pedagogic content

We define this set of criteria due to the learner's interactions with the pedagogic content. By pedagogic content, we intend all the individual activities programmed in the learning process (Activity: course or part of course, simulations, test, exams...) So, to exploit this information, the LMS (Learning Manager System), a special Database or a log file must keep a trace of such information every time the learner has been logged. Otherwise, this criterion will not be available.

These criteria are:

- **Duration of an activity**

Definition: the total duration which the learner spends in achieving all the activity

Interest: It informs about the respect of the activity duration recommended by the author of the activity

Formulate calculation: Sum of various connection durations effected during the achievement of the activity

- **Number of activity's consultations**

Definition: the number of consultations of the activity in its totality

Interest: When an activity is consulted beyond a threshold, it must be re-examined

Formulate calculation: Number which is incremented each time the learner repeats the activity

- **Rate of respect of the pedagogic scenario**

Definition: Indicate the rate of respect of the recommended pedagogic scenario which is theoretically the best scenario

Interest: If the scenario is not respected by the majority of learners, then it means that it is badly conceived and must be re-examined

Formulate calculation: Ratio of activities jumped in the pedagogic scenario recommended by the author

- **Rate of the formative evaluation**

Definition: It is the rate of succeeded evaluations during the formative evaluation

Interest: It informs about the comprehension degree during the e-learning process

Formulate calculation: Rate of the successful among all the evaluations envisaged at the formative evaluation

- **Total rate of validation**

Definition: It is the percentage of evaluations succeeded among all programmed evaluations (formative and summative)

Interest: It sanctions the formation goal

Formulate calculation: It can be the final result or the rate of successful evaluations of all the activity of the entire formation

- **Ratio of preferred resources**

Definition: It is the ratio of the preferred resources among other available resources

Interest: Permits to know if learners prefer particular resources among others: type of preferred media, video, audio, text, PDF or other?

Formulate calculation: Information given by the platform

2.3. Criteria related to the platform

It includes all the criteria deduced through the learner's interactions with the e-learning platform. Like precedent criteria, the information which aid to determine these criteria must be available and stocked somewhere in the platform, log files or a special Learning Management Database. There are:

- **Connection debit**

Definition: connection debit of the learner

Interest: It must be taken into account to make difference between the fast answers and the slow ones: a right and late answer due to a low debit should not inevitably be the bad

Formulate calculation:

The e-learning platform can give constantly the learner's connection debit

- **IP address and domain name**

Definition: IP address and domain name from where the learner connects during the activity

Interest: Are often influential when the evaluation is dependent of the domain

Formulate calculation: Information available on the platform in a dedicated Database, special records or in log files

- **Connection hours**

Definition: Hours at which the learner connects

Interest: finding for example the connection hours of the majority of learners to strengthen the number of tutors

Formulate calculation: idem

- **Rate of learning dedicated tools**

Definition: Rate of using tools integrated into the platform and offered to learners (forum, chat, email, white board, simulator...)

Interest: If we notice that a tool is never used by learners during an activity then it is recommended to not overload the platform with it?

Formulate calculation: idem

- **Technical criteria of the learner's post**

Definition: Configuration of learner's post (browser, technical characteristics, operating system...)

Interest: This information related to the learner's post can sometimes influence the e-learning process

Formulate calculation: Information provided by learner or deduced from dedicated diagnosis tools

- **Preferences**

Definition: Learner's preferences: Interface (background, colors...)

Interest: The goal is to satisfy the majority of learner's preferences and do not overload the platform

Formulate calculation: Information provided by learning and often stored in system data base or learner's profile

2.4. Other criteria

We present here some additional criteria that can influence the e-learning process in its different aspects such as goals and results. Here is an example:

- **Other criteria**

Definition: A set of different characteristics that can influence results or objectives of e-learning

Example: Social, Nationality, Religion, Political Tendency...

As mentioned above, this list of the criteria is not exhaustive; it can be regarded as the prelude of a standardization model of criteria to analyze learner's behavior. Basing on our research, we had not met all these criteria in an alone model or standard. Some of them are present in some systems or standards according to their importance in the evaluation of the formation and are often stored in a structure called learner's profile.

Let us re-underline that our objective is to present these learner's behavior criteria to the various e-learning actors (authors, tutors, monitors, and administrators...) to take adequate measurements in

order to improve the quality of the formation (product). This presentation could be rough, i.e. only the quantification of the criteria is presented, or after had being treated by Datamining techniques and presented in an ergonomic way. Note the Datamining techniques can be profitable to the e-learning actors to study relations between different criteria and orient and help them to take the adequate measurements.

3. Implementation

To implement these various criteria, we conceived and realized a generic tool which has as a functionality to determine these criteria (TOLBA: Tool Of Learner's Behavior Analysis). It is generic because it is not only independent of any e-learning system, but also independent of any e-learning platform, any pedagogic content, any population or any technical characteristic. It is quite simply used to present these criteria at the different actors of the e-learning process; each one according to its prerogatives as shown in Figure 1. The Tool TOLBA was successfully tested on criteria stocked in data base containing similar information. Complementary Modules such as log files analyzer or pedagogic scenario analyzer (using the graph theory) is currently under development and will be tested and integrated to the INES Platform [11].

4. Conclusion

We have defined a set of learner's behavior analysis criteria which can help the different actors in an e-learning situation. We plan thereafter to extend this set to all the characters which can contribute to the improvement of the e-formation quality and test the TOLBA tool on a great number of platforms to evaluate their effectiveness. Basing on our pedagogic experience, we can also suggest some trivial measurements to take when some criteria presents certain properties. We are also convinced that analyzing these criteria by the Datamining techniques will be of a great contribution for the persons in charge of e-learning process.

5. References

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6. Annexes

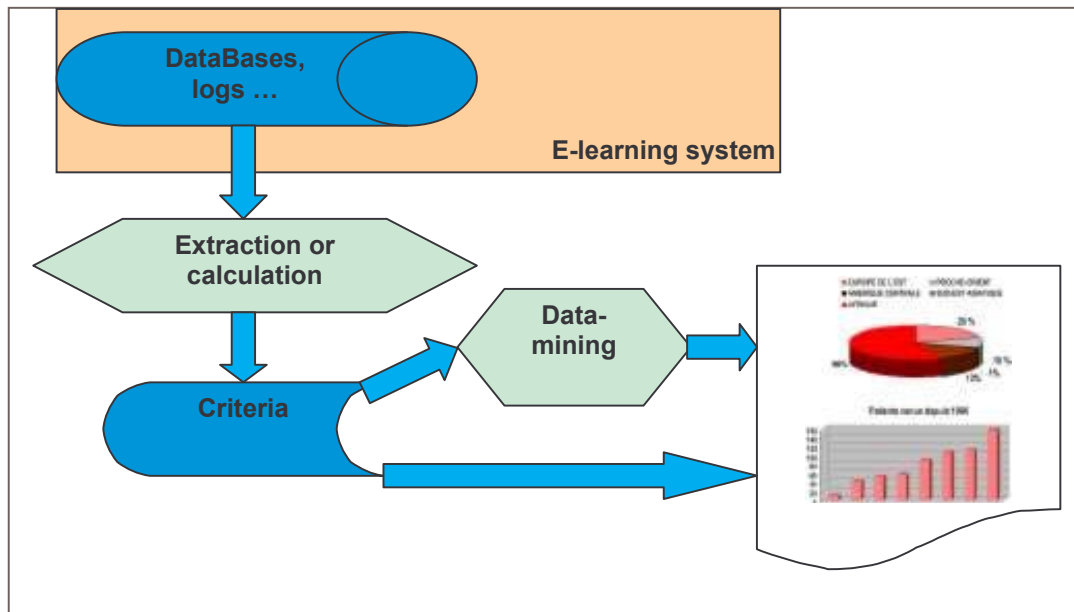


Figure 1. TOLBA (Tool Of Learner's Behavior Analysis) : The Architecture