Design and Development of a Computer System for Managing Learning Activities According to the Kolb Learner Profile

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ARTICLE INFO	ABSTRACT
Published Online: 30 April 2022	Learning activities play an essential role in the act of teaching/learning. They highlight the nature of the learners and their ability to perform the tasks easily and make it possible to give meaning to the learning. The idea developed in our article lies in the design and development of a computer system for managing learning activities according to the experiential model of Kolb. For this, we evoke after having defined our problem and our research questions, our theoretical framework, which includes the learning styles, the styles of Kolb, and the bases of the experiential activity of Kolb, our methodology of research, which is articulated on a case study through a survey whose purpose is to define the learning styles of our sample. Then, we suggest learning activities according to the style of each learner, to experiment with them on our sample and make an evaluation to analyze the results obtained which allow us the transition to a model in the form of a pedagogical scenario.
Corresponding Author: **Kemouss Hassane**	Finally, our model will be managed by a learning management computer system adapted to each learner according to his learning style according to Kolb.
KEYWORDS: Learning styles, Kolb's experiential style, learning activities, pedagogical scenario, model, management information system.	

I. INTRODUCTION

According to Psychomédia, 2014 "Learning style refers to preferences in the ways of acquiring and processing new information. It is a set of theories that people learn best when teaching is congruent with their learning style. [1]

Therefore, knowledge of different learner styles is a tool that helps teachers foster learner preferences and motivation to plan their teaching to achieve learner-learning success.

Our research is based on the experiential model according to David Kolb's theory and the learning styles resulting from this model to determine the learning style specific to each learner and assign him the activity that promotes the development of his skills in addition, to values their learning.

The problem of this work is to propose learning activities for learners based on their learning styles according to Kolb. For it, we are specifically interested in:

1- How to conduct a survey within a group and choose the instrument to measure its different learning styles.

2- How to adapt educational activities according to the learning styles of each learner.

3- How to script these activities to make them adequate, at the service of the learning actors through a well-structured pedagogical scenario.

The objective of this work is to develop a system to support learners in their learning tasks effectively through personalized activities, adapted to the needs and preferences of learners, and the reuse of style to make learning meaningful, motivating, and profitable.

II. THEORETICAL FRAMEWORK

The plurality and diversity of existing styles, in the sense of structure or content, prevent their easy use in different contexts and by different actors. Our theoretical framework proposes:

- A brief description of some styles encountered in education,

- To treat the experiential style of David Kolb as the object of our research.

- To overcome the basis of learning activities

A. Basic concept definitions

According to Coffield et al. "Learning styles constitute a range of theories which from a common concept that learners differ in the way they acquire, process their knowledge, these theories suggest that all learners could be labeled according to a particular learning style.[2], it is important to situate the different styles encountered in pedagogy in their context.

1) The notion of educational style: This is a type of educational relationship that occur unconsciously in the family and at school. The educational style that is according to Edu.Academy. , 2015.

Authoritarian, lenient, democratic, or negligent. [3], It is a set of educational measures prized by future learners, which influences: - The development of the child's personality.
- The expression of his feelings.
- His method of communication.
- The development of autonomous, social, and emotional characteristics.

Each style refers to the attitudes, behavior patterns, and goals on which education is based. Therefore, respect for the educational style is essential for the favorable development of children.

2) The notion of pedagogical style: Each teacher has his style which can vary according to the situation, becoming aware of his style makes it possible to modify and improve the learning conditions. It is interesting for a teacher to establish contact with his learners to help them achieve relational autonomy and their motivation, According to Marguerite Alter "the teaching style qualifies the teaching practices: instructor style, class questioner style, class questioner style. 'Student, mixed style, monitor/guide style'. (Altet, 2009). [4]

The pedagogical style is made up of four dimensions:
- The personal dimension (the personal style: it is the personality of the teacher)
- The relational dimension (the relational style: corresponds to the creation of a class climate and the perception of the reality of the class group)
- The didactic dimension (the didactic style: the teaching can be centered on the content or the learner)
- The environmental dimension: the influence of the environment in creating a climate conducive to learning.

3) *The notion of cognitive style:* According to Chevrier and his collaborators, "Cognitive styles constitute personal invariants relating to the form of the activity rather than its content. They take into account both the inter-situational coherence and the inter-individual variability of the cognitive functioning of the individual" (Chevrier et al. 2000). [5]

Cognitive style is therefore the way of perceiving, processing, storing, and using recordings. It is a set of cognitive factors, that react to the way of learning and being motivated whatever the content. We base ourselves on the personality of the learner, their potential, and the studies they have done throughout their life.

The main types of cognitive styles that represent a concrete way of looking at the facts have been described as bipolar, we find:
- Dependence vs. independence of the field
- Reflexivity vs. impulsiveness

- Sensory vs. intuitive
- Verbal vs. visual vs. hepatic
- Convergent vs. Divergent
- Leveler vs. Sharper
- Tolerant or intolerant
- Global vs. Analytical
- Holistic vs. serial

4) The notion of teaching style: According to Legendre: "The teaching style as being the configuration of behaviors and attitudes that characterize a teacher about the components and various relationships of the pedagogical situation". (Legend, 2005) [6]

In this regard, the teaching style is how the teacher organizes the teacher-learner relationship in a learning situation.

Inspired by the work of Blake and Mouton (1964) in management, there and Willemart attempted to describe and identify four styles that represent observable teaching practices.

These styles are defined from a two-dimensional model that combines two attitudes of the teacher Attitude towards the subject and Attitude toward the learners. Each of these attitudes is expressed in varying degrees, weak or strong, disinterest or interest. The combination of these two attitudes makes it possible to identify four basic styles: (René Cahay et al, 2016)
- Transmissive style centered more on the material;
- Incentive style centered both on the subject and on the learners;
- Associative style centered more on the learners;
- Permissive style, very little centered on either the learners or the subject. [7]

5) The concept of learning style: Represents the specific way of learning for each learner. The Learning style is defined according to Keefe as "the set of cognitive, affective and physiological factors that act as relatively stable indicators of how the learner perceives his learning environment, interacts with this environment, and responds to it». (Keefe, 1987) [8]

Conceptual frameworks are presented in six frames of reference:
- The educational environment,
- The methods of encoding and representation of learning,
- The methods of processing information,
- The theory of personality,
- Experiential learning,
- Mixed models.

Based on these conceptual frameworks, the learner can continue learning according to a specific and unique style according to him, his energy, and his ability to absorb and learn, in addition to previous experiences and skills. Therefore, it is necessary to consider learning styles to

maximize learner satisfaction in face-to-face and online learning situations.

B. The Learning style according to KOLB

Our vision is based on the experiential model according to (David Kolb, 1984) "Learning is a process, in which knowledge is created through the transformation of experience". [9], through this experiential learning theory, Kolb suggests that learners develop preferences through four activities: Feeling, Thinking, Thinking, and Doing. Also four learning capacities: Are concrete Experience (CE), Reflective Observation (OR), Abstract Conceptualization (AC), and Active Experimentation (EA).

At the end of the cycle, the learner has had an experience where his ideas, knowledge, his skills, his values, his attitudes, and his habits will be changed, which implies a reorganization at the level of his personality.
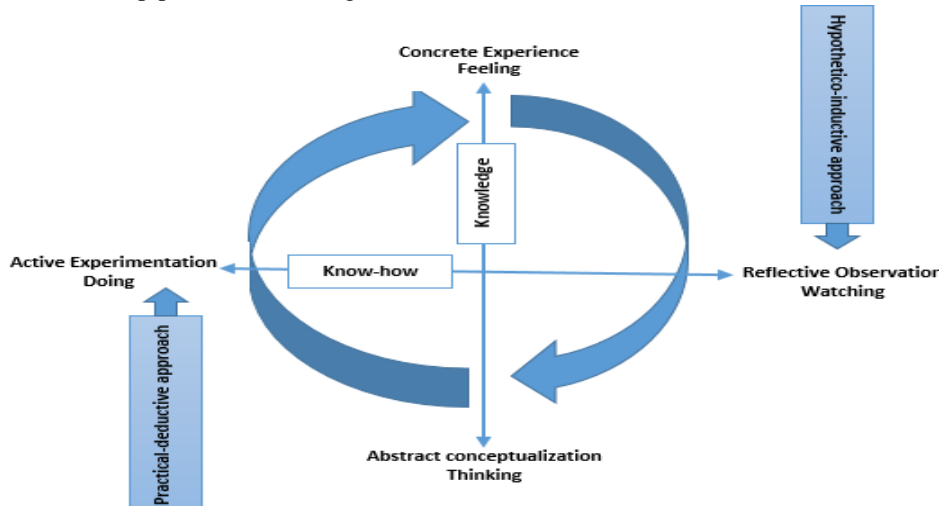

Figure 1: David Kolb's experiential cycle. **[9]**

According to Figure 1, each learner can integrate the content to be discovered, without making an effort to adjust to how this content is presented, starting from concrete experience and following the secession of the stages of the cycle, or at any stage of the cycle. The learning styles identify from four styles of the combination of two bipolar dimensions (concrete-abstract) and (action-reflection), we find:

- The divergent style (EC-OR): Is characterized by the interpretation of concrete situations from different points of view,
- The Assimilator style (OR-CA): Is characterized by the appropriation of a wide range of information and by their concise and logical integration.
- The Converging style (CA-EA): Is characterized by the search for practical applications of concepts and theories

- The Accommodator style (EA-EC): Is characterized by the implementation of practical experiences and personal involvement in new experiences involving a challenge.

C. The basics of activities according to Kolb's experiential learning style

In 2011, Oxford adopted Reid's definition "Learning styles are not fixed modes of behavior and depending on different situations and tasks, styles can be extended and modified". [10] (Reid, 1987)

(David Kolb, R. Fry, 1975). David Kolb has published a model of a learning style that takes into account:
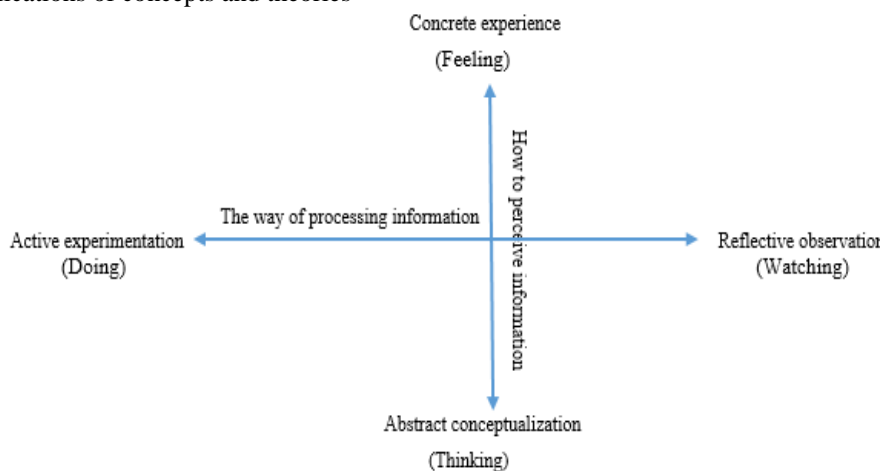

Figure 2: Kolb style design

1- According to figure 2 (horizontal axis); the way the learner processes information and experiences: when the learner embarks on a task, one can have two choices:

• The learner gets started immediately (active experimentation)

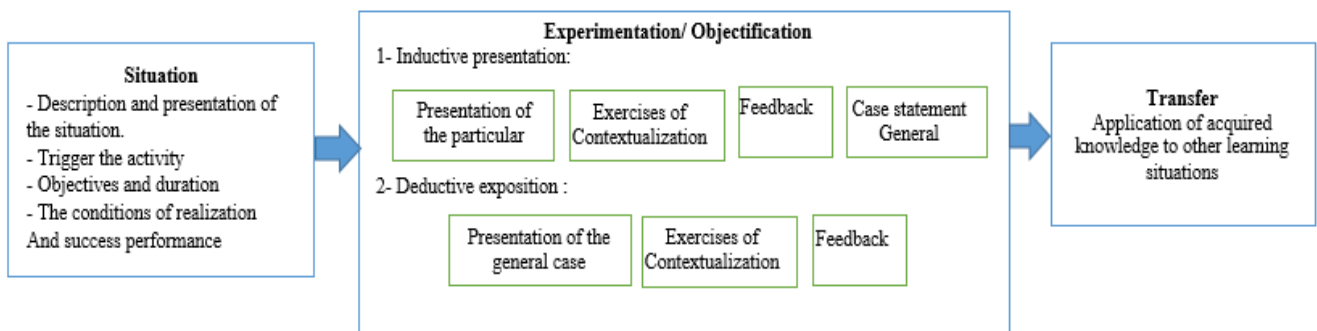• Or he takes a step back and observes (reflective observation)

2- According to figure 2 (vertical axis); how the learner perceives information and experience: When the learner experiences something new, there are two choices:

• The learner likes to know how he feels about it (concrete experience)

• Or he prefers to think about it (abstract conceptualization)

Depending on how he made the choice, he positions himself on the two axes of the Kolb cycle and identifies the dominant learning style quadrant in which they belong. [11]

D. The learning activity

To respect the learning process of the learner, we must propose structured learning activities adapted to the style of the learner. The structure of the learning activity is presented by taking into account how the learner learns according to a scenario based on: a scenario; Experimentation/ Objectification, Transfer

The learning activities generally include one or more tasks to be carried out, allowing the integration of all the objectives to be achieved, and are divided into four phases.

Each pedagogical sequence must consist of a contextualization defined by the scenario. It is organized around a medium or the issues raised.

By figure 1, each learner can integrate the content to be discovered, without trying to adapt to the offer of this content. From concrete experiences and following the secession of the levels of the cycle; or at any level of the cycle. Learning styles are identified from four bipolar dimensions (concrete-abstract) and (action-reflection), we find:

Figure 3: The proposed life cycle of a learning activity scenario

III. RESEARCH METHODOLOGY

The fundamental objective of this research is to define the different activities, according to the learning styles of the Kolb model. A survey in the form of questionnaires with Master IPM learners from (ENS Tetouan) will be conducted in two dimensions based on the Kolb inventory (LSI 2) translated, modified, and adapted in a constructivist form:

- The first dimension consists in measuring the degree (Concrete and Abstract) of the learners.

- The second dimension makes it possible to measure the degree (Reflexive-Active) of the learners

Each dimension is treated alone so as not to disturb the results.

According to Kolb, the questionnaire (LSI) proposes the style of the most probable learner, the diagram above presents the activities according to the corresponding learning style.
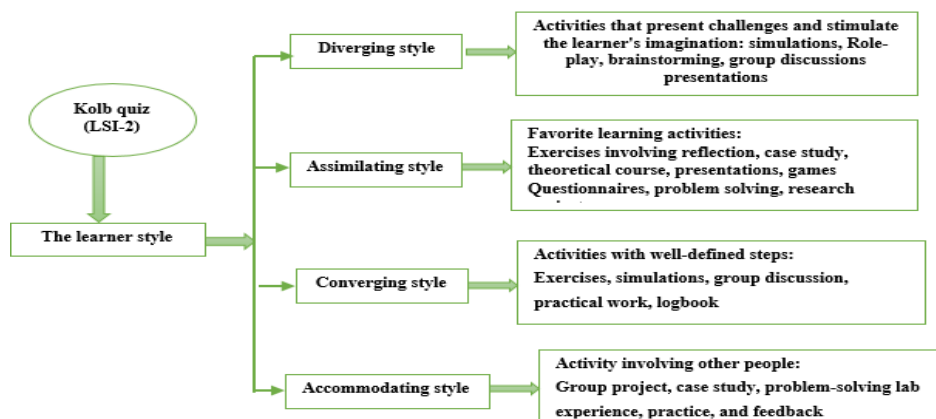
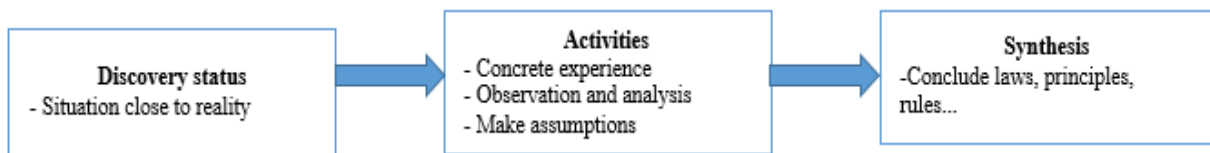**Figure 4:** Model of learning activities based on the style of Kolb.

The procedure is used to identify and analyze information about the research subject. A case study will be conducted to collect sufficient information about learners who are adults and responsible for their learning.

Finally, the design of activity of four statements according to a scenario illustrating the behavior and characteristics of each learner according to the styles as indicated by Kolb will be implemented in a computerized learning management system.
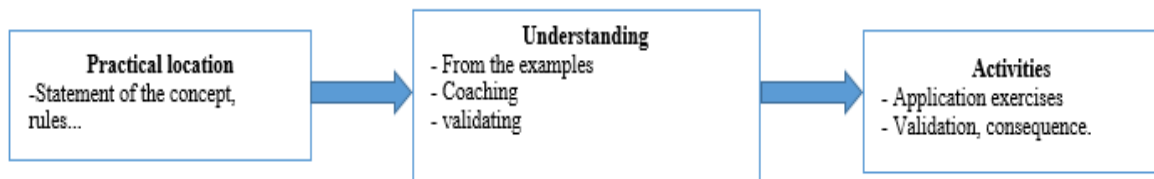
A. The procedure to follow

The choice of a strategy is based on the pedagogical approach to be developed during a pedagogical activity; according to figure 1, the Kolb cycle consists of putting the learner in a situation of discovery:

From the situation from which the general concept or principle can be introduced or constructed. [12]

Referring to the Kolb cycle in figure 1, we suggest two approaches:

• **The hypothetical-inductive approach (Concrete-hypothesis-abstract).**

The hypothetical-inductive approach consists of putting the learner in a situation of discovery to get out of the abstract context and go to the lived reality (realization, observation, analysis, experimentation, etc.); to make hypotheses from a concrete experience and to deduce observable consequences to build the concept or the general principle, according to figure 5.

Figure 5: Hypothetical-inductive approach.

• **The practical-deductive approach** (abstract-practical-concrete)

According to Figure 6, the practical-deductive approach consists of formulating a consequence through practice. We

We start from the statement of the concept or/and the rule, to ensure the understanding of the learners with a few examples and then propose application exercises to reinforce its memorization.



Figure 6: Practical-deductive approach.

B. Present an educational scenario

The pedagogical scenario can take several forms, as long as it explains in detail and clearly explains the course of the learning activities. It must contain the 4 phases below

1- Contextualization phase: Questioning/hypotheses / Simulation close to the reality experienced by the learners.

2- Phase of objectification, skills, or guided discovery.

3- Structuring and synthesis phase.

4- Phase of applications and Valorization of skills, by a transfer and reinvestment of acquired knowledge in another context.

The diagram in Figure 1 below shows the structure of all the blocks. We have adopted this configuration for several reasons, its simplicity and its block structure, and its sequences favoring the easy implementation of the blocks with a presentation of skills to acquire:
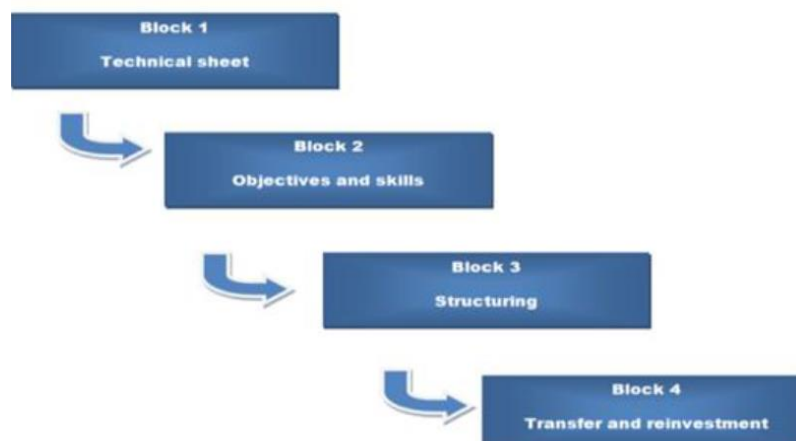
Figure 7: Structure of a pedagogical scenario of a learning situation

According to Pascale LAUBY and her collaborators 'PRACTICAL GUIDE FOR WRITING A PEDAGOGICAL SCENARIO', they proposed five criteria for a successful pedagogical scenario, which are:

1 - Well-defined, realistic and achievable objectives

2 - Short sequences

3 - Varied teaching methods

4 – A starting situation that satisfies the needs, expectations, and practices of the learners.

5 - A time for evaluations: at the beginning (prerequisite test), between the sequences (formative), and at the end of the training (summative)

Finally, the implementation of the work will be done in a learning management system.

CONCLUSION

Through our research, we tried to make a diagnosis of the research subject and the problem: "to offer learning activities to learners according to their learning styles according to Kolb". In this perspective and to bring elements of an answer to this question, we tried through this article to propose a methodology of our research, which was articulated in a case study through a survey whose goal was to define the styles of learning from our sample. Then we proposed learning activities according to the style of each learner, to experiment with them in our sample. The analysis of the results obtained allowed us to make an evaluation and move on to a model in the form of an educational scenario. Finally, our model is managed by a computerized learning management system adapted to each learner with his style according to Kolb. The stages of our research work will be published in another article following the progress of the research stages.

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