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# Towards the process of designing an architecture of e-learning activities according to the kolb cycle

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## Abstract

In the context of experiential learning, the Kolb Cycle offers a dynamic approach to learning that associatively integrates the concrete and the abstract by allowing learners to engage in concrete experiences, reflect, conceptualize and actively experience their learning. This article aims to contribute to the development of an architecture of learning activities corresponding to the transition from concrete to abstract in the kolb cycle, through an inductive approach in online teaching. The study explores how Kolb's four learning styles can be integrated into online learning activities aimed at meeting the needs and preferences of learners. Our work highlights the importance of considering learning style of each learner when designing and delivering online learning activities and addresses the perception dimension (concrete and abstract) at the method and practice level that the other dimension will be presented in a future article.

**Keywords:** Kolb's learning styles; Concrete; Abstract; Inductive approach; Conceptualization scenario; Architecture of activities

## 1. Introduction

Learners differ in the way they think and express themselves. According to research, these differences focus on personality-related behavior, information processing and organization, learner preferences and social environment, .... In order to account for its difference's individual, it is important to consider these factors to choose activities that can accommodate a variety of learning styles of each learner, [1,2,3]. In the context of experiential learning according to Kolb which highlights the importance of concrete experiences, reflection, conceptualization and active experimentation. This model allows learners to develop knowledge and skills in an iterative and cyclical manner, continually transforming concrete experiences into abstract concepts. "Knowledge results from the combination of grasping experience and transforming it" [4]. Our work highlights the importance of considering the learner's learning style when designing and delivering online learning activities. In order to take this issue into account, we will explore online teaching by proposing an architecture of learning activities and how to move from concrete to abstract in Kolb's environment, following an inductive approach. The authors suggest that when designing online education, adapting learning activities to Kolb's experiential learning theory is necessary to meet the needs and preferences of learners with different styles, such as using simulations for the divergent and help in creating theoretical models for the assimilators, case studies for the converges and interactive multimedia for the accommodators. In the following sections, we will further walk through each stage of the Kolb cycle and its impact on learning.

### 1.1. Theoretical frame

Our theoretical framework proposes the course of the kolb cycle presented in figure 1, [5], and styles derived from a model widely used in experiential learning. This article explores the two key concepts in learning by experience, the

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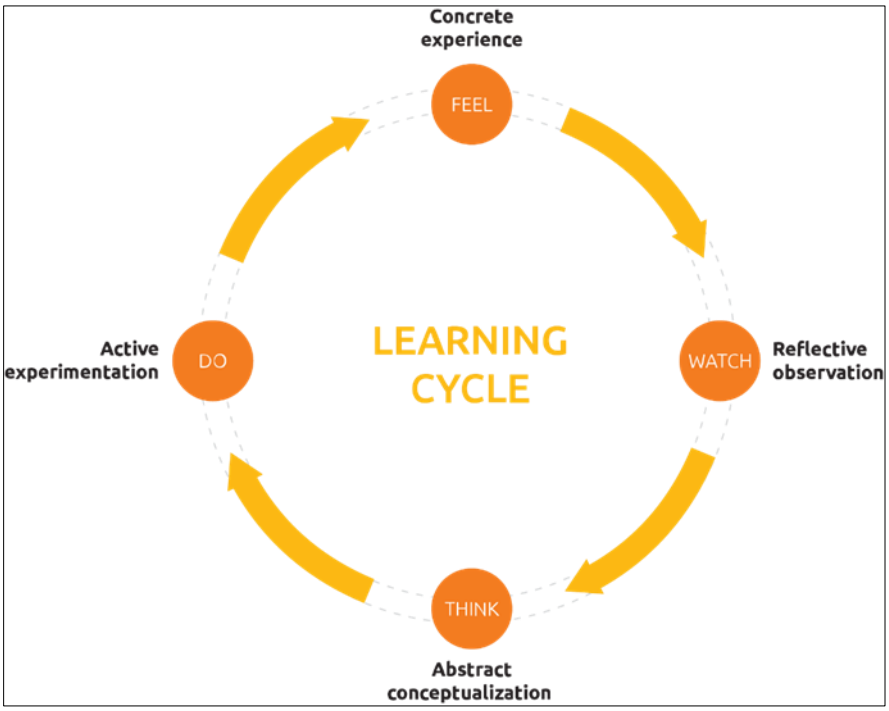
concrete and the abstract, and the approach used for the passage from the concrete to the abstract using the inductive approach which facilitates this passage by allowing the learner to gradually build more general knowledge and skills from of practical experience.

## 2. The kolb cycle

For David Kolb [6], in his book entitled 'Experiential learning' based on the work of John Dewey, Kurt Lewin and Piaget. Learning would be structured by a four-phase cycle, this approach confronts the idea that learning is developed through experience. The Kolb cycle is a learning model, which focuses on how individuals assimilate new knowledge and skills through a sequence of distinct phases.




(Source: "Experiential Learning Model", David Kolb, 1984).

**Figure 1** The experiential learning cycle and basic learning styles

Figure 1 presents the cycle based on four main stages, which follow one another in a cyclical manner. Each stage represents a different way of interacting with information and transforming it into meaningful knowledge. Kolb's work puts into perspective that the learning cycle integrates phases alternating the concrete and the abstract on the one hand and the action and reflection on the other hand, for this kolb explains that knowledge results from experiences which have been grasped and transformed, HE highlights two dialectically linked modes:

- Apprehension of experience: Concrete Experience (CE) and abstract conceptualization (AC).
- Transformation of experience: Reflective Observation (RO) and Active Experimentation (AE)

The result of these two dimensions, prehension and transformation, are four phases of different forms of knowledge: divergent, assimilative, accommodating and convergent (Figure 1), [7]. Each one of its stages is a situation to be experienced by the learner and presents skills to be developed:

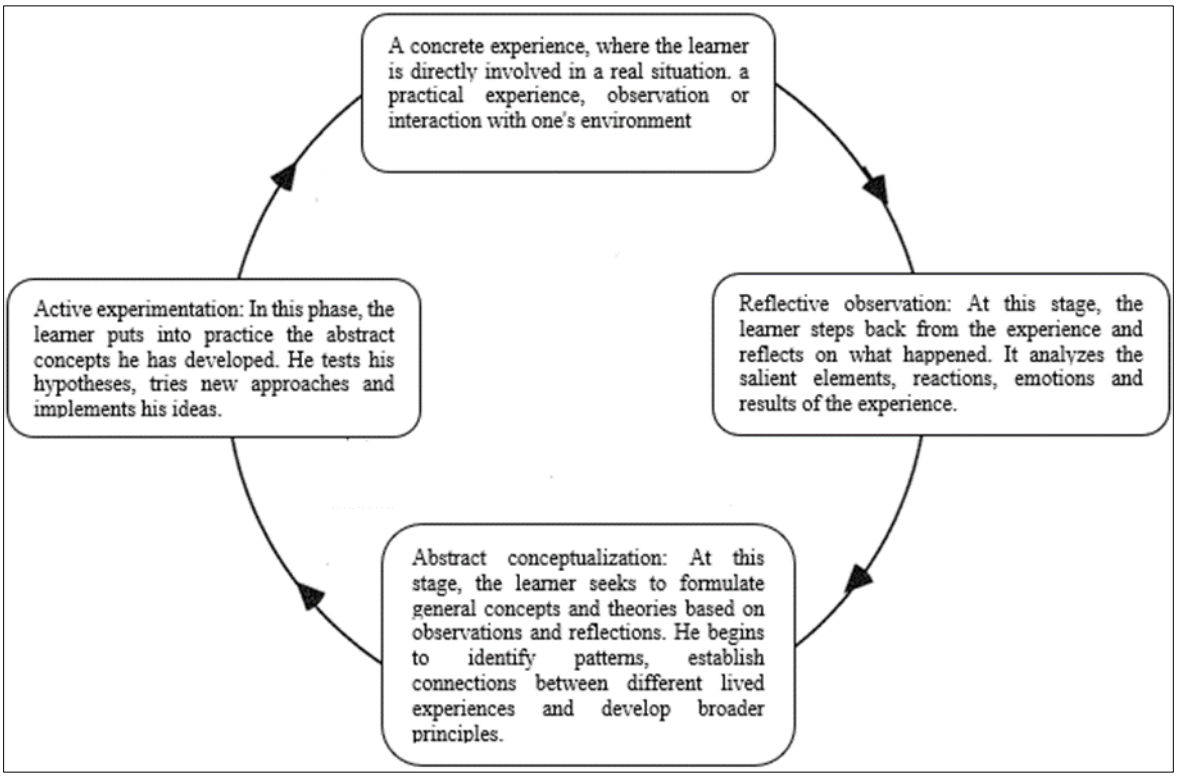



**Figure 2** The learning process according to Kolb

Figure 2 presents the learning process described as a learning cycle where the learner assumes each of the four domains: experiencing, reflecting, thinking and acting.

According to Kolb, [8]. The first stage of the kolb EC cycle is essential because it provides a tangible basis from which the learner can draw information and observations. Once the concrete experience has been had, the learner moves on to the next phase, that of OR, this reflection makes it possible to give meaning to concrete experience and to extract useful information from it. The third stage of the Kolb cycle is that of CA, this stage represents a progressive abstraction of concrete information towards more general concepts. Finally, the cycle ends with active experimentation which allows abstract concepts to be validated or adjusted, and creates new concrete experiences from which the cycle can start again.

## 3. Learning styles according to Kolb

Kolb,[5].Explained that an experience grasped by apprehension, then transformed by intention results in

divergent knowledge. An experience grasped by apprehension and transformed by extension is accommodating knowledge. An experience grasped by understanding and transformed by intention gives

assimilative knowledge. Finally, an experience captured by understanding and transformed by extension leads to knowledge convergence (Figure 3).

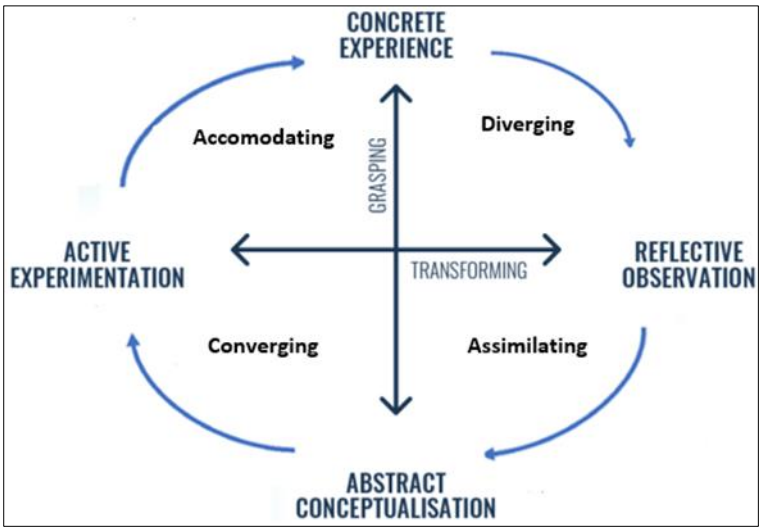



**Figure 3** Learning styles from the kolb cycle [9]

Figure 3 presents the Kolb learning cycle with its four stages, the association of the two successive stages gives rise to a style that each one presents a particularity and ability that the learner uses to engage in his learning such as :

- **The divergent** (concrete-reflection): concrete in approaching the situation, he proposes creative solutions, the diverger wants to think about all the possible results, observes and weighs the pros and cons, which allows him to form a very clear idea full picture of the situation, but he needs a lot of time to make decisions
- **The assimilator** (abstract-thinking): Assimilators are very analytical and autonomous, they are good at reasoning and always think logically. They are independent and learn best in a structured environment. They also like to analyze and look for connections and look at examples but cannot tolerate clutter
- **The convergent** (abstract-action): The convergent is good at making the link between theory and practice. This type looks for solutions in theory and prefers to apply them immediately, he works systematically and clearly, he is also good at planning, keeping an overview and making decisions and often takes the initiative but he can be impatient.
- **The accommodator** (concrete-action): He is a decisive adapter and learns by acting immediately and by trying things, the accommodator wants to experiment, live and see where things are going, knows how to cooperate well. They like new experiences and are therefore flexible in unexpected situations. They don't back down from any challenge, but sometimes it's too premature

In order to facilitate learning, not only must the experience be captured, but it must also be meaningful and relevant because learners remember knowledge longer when they have actively experienced it. [10]

## 4. The concrete and the abstract in the kolb cycle

In psychology, abstract thinking, also known as the capacity for abstraction, refers to the ability of the mind to create and use concepts in reasoning, it allows us to carry out mental operations which allow us to categorize, know, understand, to judge and reason.[11]. Kolb, [12].Views learning as an integrated process, with each step reinforcing each other and feeding into the next. It is possible to enter the cycle at any stage and follow it in its logical sequence. However, effective learning only occurs when a learner can perform all four steps of the model. Therefore, no step in the cycle is effective as a learning procedure, [13]. In the Kolb cycle, the concrete and the abstract play an essential role in the learning process. This model allows learners to move from concrete to abstract and vice versa.

According to figure 4 extracted from the cycle of kolb and from a concrete experience which presents the concrete towards the abstract conceptualization which presents the abstract this passage is ensured by an inductive approach, the cycle of Kolb integrates the concrete and the abstract in a sequential and interactive manner. Learners go through a series of concrete experiences that are reflected on, conceptualized and put into practice. This iterative process promotes deeper understanding and practical application and encourages the development of practical and theoretical knowledge.

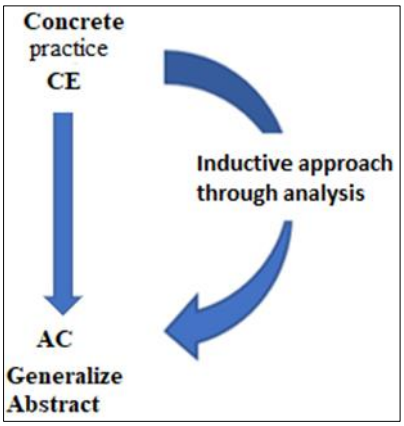



**Figure 4** From concrete to abstract following the inductive approach

## 5. The inductive approach

According to Beaugrand, [14]. The inductive approach "consists of approaching the topic of interest concretely and letting the facts suggest important variables, laws and, eventually, unifying theories."

So, the inductive approach is the way of reasoning which can guide the teacher in the choice of a model or a teaching method.

In the Kolb cycle, the inductive approach plays an essential role, as it facilitates the transition from the concrete to the abstract as shown in Figure 4, which presents the Kolb cycle with an integration of the inductive approach which involves the acquisition of concrete concepts that can be applied flexibly in various situations. Our work on the kolb cycle from concrete to abstract involves the use of the inductive approach defined in the following figure,


**Figure 5** Life cycle of the inductive approach

This figure illustrates the inductive approach which makes it possible to carry out an activity (Task and instruction), and through observations and analyzes to reach more general perspectives (generalization). Arguments based on experience or observation are best expressed inductively because concrete experiences are a field of observations and reflections that will be assimilated and induced into abstract concepts from which new knowledge and implications are drawn. These new implications are then used for experimentation, which leads to new experiences,[15]. Which allows the learner to gradually build more general knowledge and skills. Using the inductive approach in the Kolb cycle allows learners to develop their abstract thinking from concrete experiences.

## 6. The scenarios of learning activities from the concrete to the abstract

Online teaching is a complex discipline that requires reflection on the actions carried out, whether teaching or learning. It requires an organization of training and a narrow design of learning activities and the methods of intervention of the different actors involved in the process, [16]. For this reason, the educational scenario is developed which describes the learning activities, their articulation in the training sequence, the resources made available and the productions which are expected, [17].

The learning activity scenario is distinguished on the one hand by the prescriptive nature of the learning activities (expected products of the activity and procedure to follow to arrive at the products and deadlines for carrying out the activity) and on the other hand, by the degree of flexibility offered in the articulation of activities (the nature of the link which unites different activities and the criteria which condition the transition from one activity to another), [18].

The following figure illustrates the life cycle of a pedagogical scenario of an online learning situation.

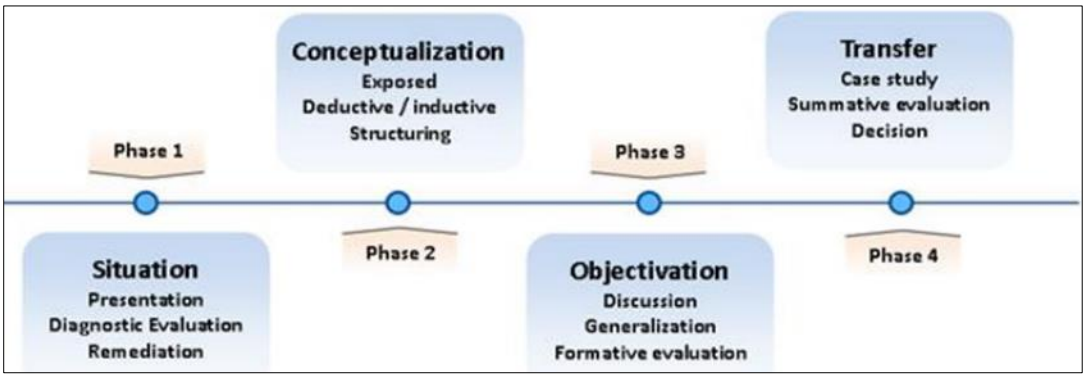



**Figure 6** Life cycle of an educational scenario for a learning situation, [19]

Based on this plan of the life cycle of an educational scenario of a learning situation, we propose the conceptualization scenario in order to structure the activities, from the concrete to the abstract of an online teaching module , according to the inductive approach in the context of the kolb cycle.

### 6.1. Practical side

In this article, we propose an architecture of activities according to KOLB, going from the concrete to the abstract according to the inductive approach. We propose in our work a scenarios of learning activities from the concrete to the abstract associated with the inductive approach, which can be confronted in online teaching for a module without taking into account either the nature of the discipline or the nature of the concept to be treated.

## 7. The architecture of activities according to KOLB from concrete to abstract according to the inductive approach

On the above and on the basis of modular learning, we propose the architecture of a conceptualization activity for an inductive approach to a learning situation according to KOLB for the transition from the concrete to the abstract, composed of three systems:

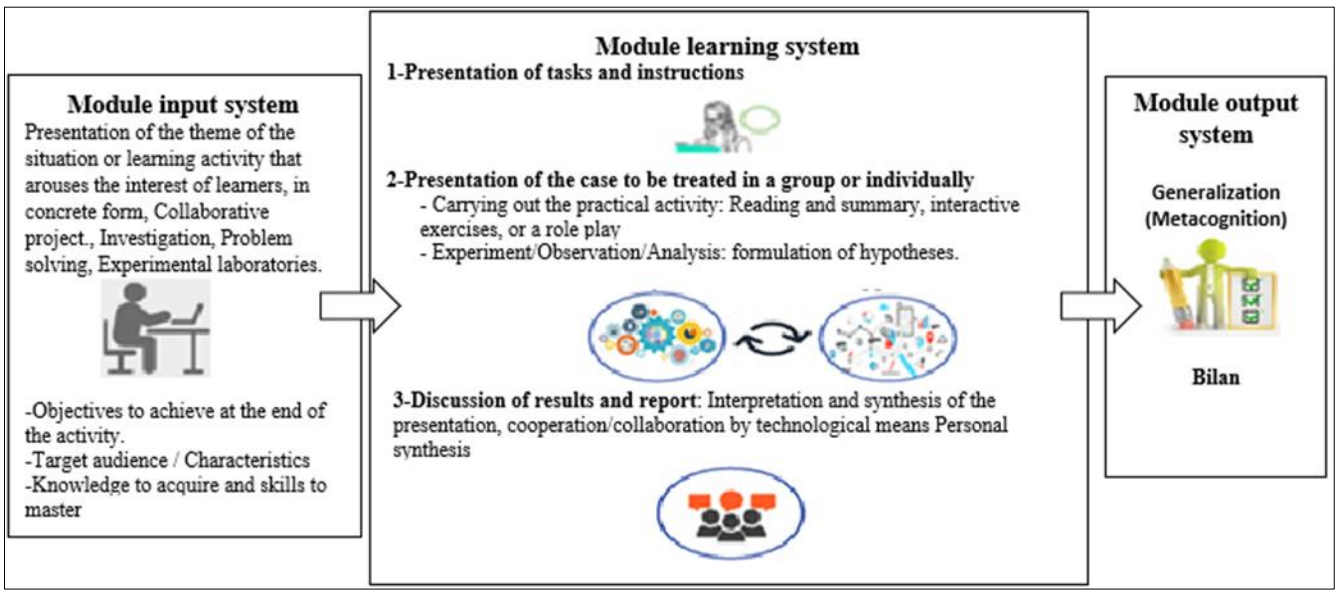



**Figure 7** Architecture proposed to conceptualize from the concrete to the abstract with an inductive approach to the learning situation

### 7.1. Interpretation of the proposed architecture

The modular system is a teaching method which makes it possible to structure distance learning and determine the educational objectives to be achieved. It organizes courses into shorter, more flexible training units. It can be used for distance learning, which is a mode of teaching that uses digital technologies to allow students to learn at their own pace and location, [20].The design of a module is spread over three stages which presents:

- **Input system**: Concerns the presentation of the learning activity by defining the objectives to be achieved at the end, the target audience, the knowledge to be acquired and the skills to be mastered by the learner or the group. By a presentation of the theme of the situation or the learning activity which arouses the interest of learners, in concrete form, Collaborative project., Investigation, Problem solving, Experimental laboratories,
- **Learning system**: Consists of moving from the concrete to the abstract, using the learner-centered indirect teaching strategy. It is based on inquiry, induction, problem solving, decision-making and discovery, which promotes motivation, creativity and skill development. For our system, it first proposes:
    - A presentation of the task to be carried out, the nature of the concept to be addressed (experience, problem to be solved, investigation, etc.).
    - Carrying out the practical activity, the task proposed according to the grouping of learners (individuals or in groups), the distribution of roles if the group; provide concrete experiments to analyze, test, manipulate and formulate hypotheses.

At the end the discussion of the results obtained, cooperation/collaboration, using technological communication tools (computers, smartphones, tablets, social networks, video games, website, connected objects, etc.) then interpretation results in order to justify the experimental results and to verify them against theoretical laws and rules.

- **Output system**: The evaluation of the conceptualization activity of the inductive approach proposed by generalization by appealing to metacognition through the emission of a model or to laws through a mathematical formalism.

### 7.2. Observations

The design of training units according to Kolb consists of structuring educational activities according to the four phases of the experiential learning cycle: concrete experience, reflective observation, abstract conceptualization and active experimentation, [21].

Figure 7 presents the architecture proposed according to a modular system, a training unit qualifying as a learning system begins with a scenario which allows learners to live a concrete experience linked to the learning subject. Then, learners are encouraged to analyze their experience, identify strengths and weaknesses, exchange their points of view and formulate questions1.

Then, learners are invited to conceptualize their experience, that is to say, to construct theoretical models, to establish links with prior knowledge, to compare different sources of information and to synthesize the key elements1.

Finally, learners are encouraged to experiment with their new knowledge, that is, to apply it to other situations, to solve problems, to carry out projects, to evaluate their results and to receive feedback1.

The transition from the entry system to the learning system presents certain skills and characteristics, the following figure presents a set of characteristics and abilities that the learner must develop:

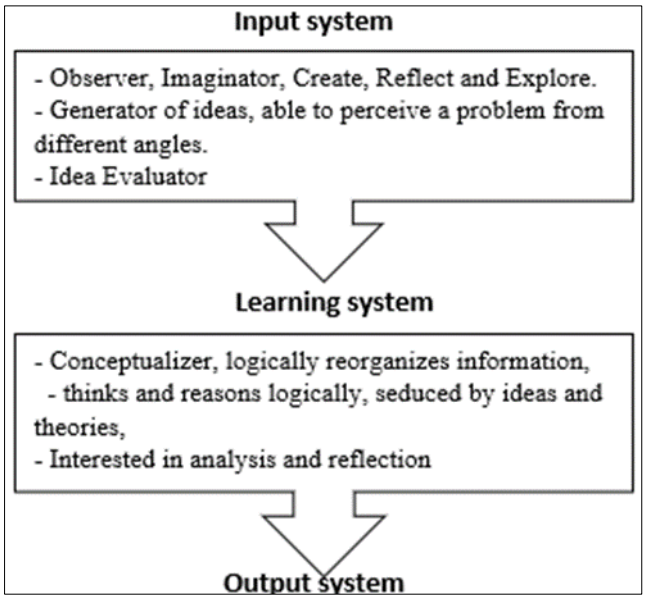



**Figure 8** The qualities/abilities that a learner must possess for the transition from one system to another according to the proposed architecture

When moving from the input system to the learning system is characterized by managing ideas being creative, imaginative and likes to think and how to approach a task. At this point in observing, some thinking is required, the divergent style can evaluate these ideas and identify what is worth pursuing, observing, synthesizing and drawing conclusions. While the transition from the learning system to the output system, relies on the individual's ability to think and reason; The assimilator may be more interested in developing ideas and theories. They analyze and reflect on their experiences in order to gain new ideas and perspectives. Finally, our proposed architecture allows learners of divergent style and assimilating style to lead this approach according to the kolb cycle during the passage from the concrete to the abstract.

## 8. Results and discussion

According to John Dewey, founding father of experiential learning .Dewey, [22].Learning is a continuous and recurring activity which accompanies human beings throughout their lives and which is deeply rooted in His experience. Learning constitutes a process of adaptation of the individual to his environment. Our work presents an architecture of activities in the context of kolb and the method used when moving from concrete to abstract according to the inductive approach which presents multiple advantages for the learner who follows a logical approach of modeling and experimentation . The concrete to the abstract, are two key concepts in learning and present two phases of the kolb cycle, our reflection requires that they must be interpreted in terms of concrete activities which involve practical experience or direct interaction by following the cycle through observation and the collection of hypotheses with a deeper analysis leads to a conceptualization in the form of a principle or rule to be concluded which promotes learning among learners. As its activities may include field experiments, simulations, practical laboratory work, practical projects or internships which promotes the preferences and needs of learners according to their dominant styles and leads to its styles being effective criteria of effective learning that help learners better understand abstract concepts and develop practical skills, in order to acquire practical knowledge and master theoretical concepts. It provides practical experience in real-life situations, which builds learners' confidence and improves their problem-solving skills, including work will be in groups or individually tailored to different learning levels. Finally, it is important to choose the learning activities that best suit the learners' learning styles, in addition to the inductive method chosen, this allows a learner to be able to build their learning while maintaining their confidence and knowledge. , know-how and be free from want.

## 9. Conclusion

The kolb cycle begins with the concrete experience, a concrete action to be carried out by the learner followed by a reflective observation, at this stage the learners reflect on the actions to be carried out by questioning themselves and communicating via an adapted vocabulary to achieve an abstract conceptualization during this stage, it is a question of giving meaning to the actions already carried out with the results obtained, it is also necessary to make the link between

the events and to associate knowledge, theories of observations, experiences...and finally it is a question of reflecting on the implementation of learning through planning of the actions to be carried out, according to kolb this stage of active experimentation is relevant and necessary to give meaning to the actions to be carried out. So experiential learning is considered as a strategy because it structures the content of teaching activities. This strategy implies that the experience offered to learners must come as close as possible to the reality they will have to experience, Kolb's experiential learning theory posits that individuals have different learning styles that influence how they learn and process information, this view helps learners understand how they learn and develop. Our proposed activity model is consistent with Kolb's cycle and learning styles, it helps learners improve their ability to learn and solve problems more effectively in an online environment. This work presents the architecture of a global scenario for designing learning activities in the transition mode from the concrete to the abstract. Concrete experience involves learning through doing, feeling, and experiencing, while abstract conceptualization involves learning through thinking, analyzing, and creating theories. Reflective observation falls in between, with reflective observation being more contemplative and observational, and experimentation, understanding different learning styles according to Kolb's experiential learning theory is crucial to designing effective educational activities . By integrating activities tailored to each learning style, stakeholders can create a more inclusive and engaging learning environment where learners can maximize their potential and achieve their learning goals.

In conclusion, the Kolb Learning Cycle is a powerful model that helps learners identify their preferred learning styles and how best to approach learning activities. By identifying their dominant learning style, learners better engage in different types of learning experiences and develop their skills in both concrete and abstract modes.

The proposed activity model according to the learning styles of the kolb cycle is a tool that leads learners to improve their ability to learn and solve problems more effectively in an online environment and to benefit from its advantages.

## Compliance with ethical standards

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The authors indicate that there are no financial/personal interests or beliefs that could affect the objectivity of this work, then there are no potential competing interests.

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