

Science Didactics: Theoretical Approaches and Active Pedagogical Methods

Hanane EL Fadel¹

¹Université Sidi Mohammed Ben Abdellah- Fès- Maroc

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Abstract

The present article focuses on theoretical approaches in science didactics, by confronting the competency-based approach founded on an interactionist and constructivist to teaching/learning with the objective-based pedagogy to which it is not unrelated. We will also try to demonstrate the concrete approaches called active that place the learner at the center of educational action.

Keywords : *Science Didactics, Competency- Based Approach, Objective- Based Pedagogy, Active Pedagogical Approaches.*

I. INTRODUCTION

The school is currently at the heart of our country's social project, due to the missions it must assume in the training of future citizens, in the achievement of sustainable human development objectives and in the guarantee of the right to education for all. It is in this perspective that it is at the center of national priorities and concerns [1].

At any time and anywhere in the world, education and training systems are constantly facing major and confusing changes in several respects: the diversification of learner profiles, the massification of the workforce, the reorganization of teaching methods and systems, the preparation of profiles for a job market where major technological changes play a crucial role. As the constraints become more and more complex, education and training institutions are called upon to profoundly rethink their vocations, teaching practices, evaluation methods and leadership. Faced with this worrying situation, pedagogical innovation constitutes a driving force for the survival and evolution of the Moroccan school [2].

In this article, we will show that the competency based approach (CBA) is subject to criticism, notably that it is an improved version of pedagogy by objectives (PBO). We will first recall the main features of the PPO and the criticisms it has suffered. Then, we will study in a second step the so-called active pedagogical approaches in which the learning of the learner results largely from the activities he deploys according to his own choices and in autonomy. Thus the acquired knowledge and skills will result (for a large part) from the activity personally taken in charge by the learners. The teacher is no longer only the professor who transmits knowledge but also the advisor (facing difficulties

encountered by learners) and the mediator (conflict management).

II. THE GENERAL DIDACTICS AND THE DIDACTICS OF THE DISCIPLINE

Didactics in general is the study of the interrelationships between the three poles of the didactic triangle, it is interesting to graft on them the concepts of curricular relationship, learning relationship and teaching relationship. Thus, the main areas of general didactics are the study of teaching (student-teacher relations), the study of learning (student-teacher relations and content), and the study of curriculum (teacher-teacher relations and content), as well as the interrelationships between these three areas.

Any didactics called disciplinary will be considered as a special case of general didactics [3]. The didactics of disciplines refers not only to knowledge or intellectual knowledge to be acquired (as is usually asserted), but also to everything that falls within the discipline in question, whether it is knowledge of know-to develop know-how of attitudes and values related to discipline. Indeed, it focuses more precisely on the study of the main concepts specific to a discipline, the evolution of these concepts, their popularization, their mode of acquisition.

➤ *Objective-Based Pedagogy (OBP)*

As an educational technology, OBP is characterized by its theoretical origin which lies in behaviourism. This psychological current focuses on observable and measurable behaviors and rejects the reference to consciousness, that is to say, to everything that happens in 'the black box' which is the brain. The OBP, therefore, "is based on behaviourism that it combines with disciplinary content broken down into very small units, this second aspect of the OBP mentioned in this

quote (the fractionation of knowledge) thus represents another brand of behaviourism for which the segmentation of knowledge would avoid error.

The OBP is based on three main concepts which are: a measurable behavior, a general objective, and a specific objective. For an objective to be qualified as a strategic operation, it must meet four conditions which are [4]:

- "Its content must be stated in the least equivocal manner possible." This means that the reading and interpretation of a goal by different people should not give rise to divergent interpretations.
- «He must describe an activity of the learner identifiable by an observable behavior». This means that an operational objective meets the requirements of enunciation in terms of concrete behavior, excluding any subjective verb such as understanding/appreciating. We note that this criterion stems from the reference to behaviourism.
- "It must mention the conditions under which the expected behaviour must occur." The operational objective must meet precision conditions of: place/time/means of achieving the objective. For example the use or not of a dictionary, to do an exercise in 30 minutes/1 hour....
- "It shall indicate the level of requirement at which learning is required to be situated, and the criteria that will be used for the evaluation of this learning." The operational objective must set the modalities and defining criteria for the evaluation, which will cover, for example, syntactic mastery, suitability for the communicative context, and the degree of success in the evaluation test. For example, we consider a test to be successful if eight out of ten positive responses are given.

➤ *Several Criticisms Were Made of the OBP, Notably:*

- According to Pelpel [5], the OBP has withdrawn into "behavioural operationalism, which has enormously distanced it from the pedagogical act and transformed it into an act made up of conditioned reflexes that disregard any creative thinking in the learner." Which implies that with OBP we are therefore in the conditioning, the assembly of reflexes and not in the construction of knowledge by the learner, in the appeal to their cognitive potential;
- Being subject to the teacher's objectives, the learner is not always at the center of the learning process, especially if the OBP amounts to setting the objectives in a technocratic manner;
- The OBP is criticized for splitting the knowledge to be learned to the point that the student loses the purpose of learning, which Deronne emphasizes [6] by accusing the OBP "of compartmentalizing knowledge too much by breaking down the content into multiple operational objectives. This accumulation of compartmentalized knowledge led to a loss of meaning in learning and an inability on the part of students to mobilize knowledge spontaneously in situations for which it would be relevant."

➤ *The Competency-Based Approach (CBA)*

The choice of CBA is almost universal. Many countries adopt this approach in their education systems and it has become an essential element in the development of school

programs. Its purpose is to emphasize the learner's potential to use what he has learned at school in complex situations. It is about providing each learner with tools to face the situations of life, school, and the professional world. It requires certain teaching practices, notably:

- The planning of learning in terms of skills based on a prior diagnosis of the learner's prerequisites;
- The proposal of complex activities allowing the learner to mobilize their achievements to solve the problem posed;
- The ongoing assessment of the learner's level of mastery of these skills;
- The exploitation of the results of this evaluation to propose support or remediation activities.

➤ *The CBA Pursues According to Roegiers [7] Three Main Objectives:*

- Focus on what the student must master at the end of each school year, rather than what the teacher must teach. The role of this one is to organize learning in the best way to bring its students to the expected level. We find there a direct reference to the focus on the learner, and a quasi-reformulation of the definition of an objective;
- Give meaning to learning, show the student what everything they learn at school is for, situate learning in relation to situations that make sense to them, and use their knowledge in those situations." This means that the CBA, like the Framework, refers to the principles of active education, to Dewey's experiential teaching [8] (to its famous principle of "Learning by doing");
- Certify the student's achievements in terms of solving concrete situations, and no longer in terms of a sum of knowledge and know-how that the student is quick to forget, and of which he does not know how to use them in working life. In other words, this is about evaluation in terms of knowing how to act in reality and no longer the restitution of knowledge disconnected from reality.

✓ *Finally, the CBA is Based on the Following Two Principles [9- 12]:*

- Integrate learning instead of having it acquired separately, compartmentalized or juxtaposed. With CBA, we move from a compartmentalized learning of knowledge to an integrated learning that gives them meaning.
- Determine and install skills to develop useful mental abilities in different situations. It is about developing transversal skills (such as: analyzing a situation).

III. ACTIVE PEDAGOGICAL APPROACHES

Research in cognitive sciences has shown that a passive brain learns little, retains less well and that little change is observed after a training session. To learn, one must modify the structure of their brain, adjust their neural networks, and jostle from a cognitive point of view. The best way to get there is to get involved, to be in action. Around the middle of the 17th century, Jan Amos Comenius [13] wrote 'Less should be taught more.'. The ideal approach would therefore be to make the student work and ensure that the teacher acts as a guide, as a facilitator.

As opposed to passive methods centered on the trainer's work, active methods are centered on action and not only on

listening and observation. It is the learners who are the actors of pedagogy, what they learn largely results from the activity they themselves deploy. They are based on the idea that pedagogy is created by the trainer of an environment that allows the learner to access knowledge or to appropriate it through discovery, experimentation, action and personal experience.

➤ *Active Methods are Based on the Principle that the Individual Learns Better:*

- If he is personally engaged in an action, that is to say, reflects, discovers by himself and experiments his solutions: it is better to retain what one learns by combining action with speech;
- If he constructs his own knowledge when faced with a problem or if he has the opportunity to discover it by himself (discovery method);

- If he feels concerned, involved and therefore motivated and not only intellectually interested;
- If he participates in a group because we learn more easily from the group.

In these methods, the teacher is rather a facilitator, a catalyst than an instructor, the animator of a group, giving everyone the means to appropriate the knowledge, which requires great abilities of animation groups.

They are indicated for learning with a creative and innovative character, that is to say those that allow the accomplishment of original tasks. They aim to develop higher cognitive processes, to acquire know-how and knowledge to be transferable. They are characterized by making it said and doing (Figure 1).

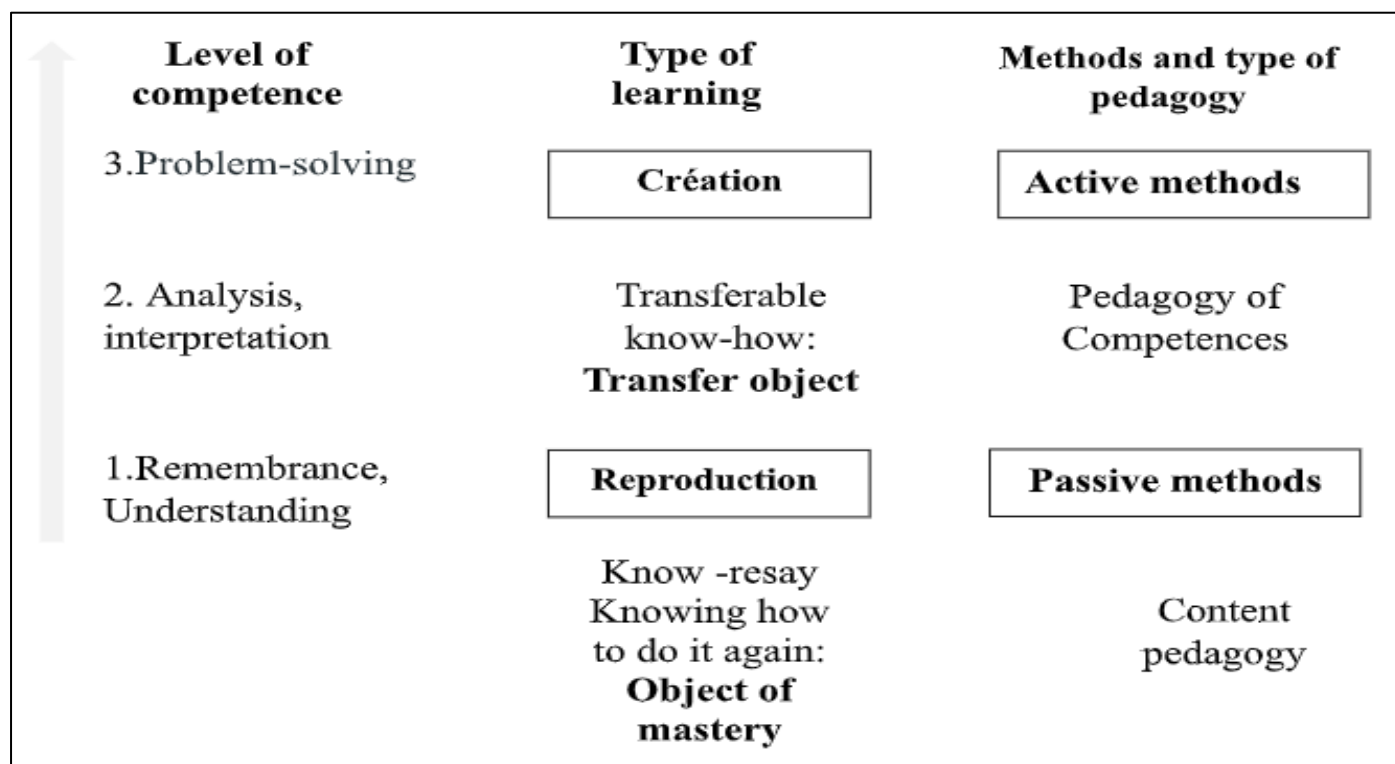


Fig 1 Correspondence Between Levels of Competences, Type of Learning, Methods and Type of Pedagogy

➤ *The Project Approach*

The project approach consists of designing, innovating, creating and producing a production based on a need to be satisfied (Figure 2).

• *The Characteristics of the Project Approach:*

- ✓ She always leads the students to a real production, that is to say, having meaning in relation to its usefulness either for the student or for a third person;
- ✓ She therefore necessarily has a strong emotional involvement more than useful;
- ✓ She develops behaviors justified by necessity: researching, planning, communicating, organizing;
- ✓ It is often multidisciplinary because complex and calling upon different types of knowledge;
- ✓ It leads to just-in-time learning, as opposed to the school system that wants people to learn and use it later, if needed.

• *This Approach is Divided into These 6 Steps for Convenience:*

- ✓ Emergence of the idea;
- ✓ Analysis of the situation;
- ✓ Choice of a strategy;
- ✓ Assembly and planning;
- ✓ Implementation;
- ✓ Evaluation, assessment and possible readjustments.

The project is not an end in itself, it is a detour to confront students with obstacles and provoke learning situations. At the same time, if it becomes a real project, its success becomes a strong challenge, and all actors, teachers and students, are tempted to aim for efficiency at the expense of learning opportunities.

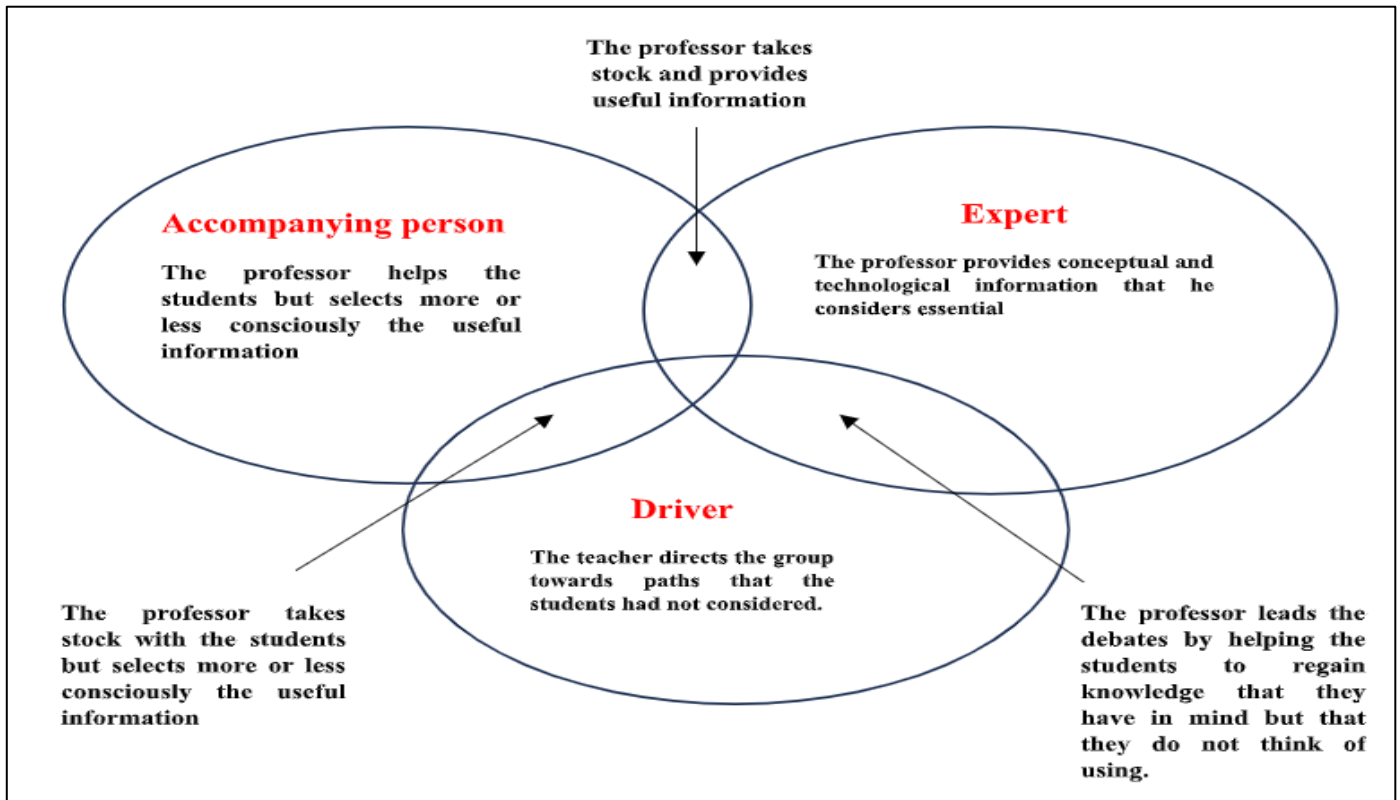


Fig 2 Educational Approach of the Project

➤ *The Problem-Solving Approach*

It is an active method that allows learners to work in groups to solve a problem posed by the teacher, without any particular training, so as to learn content and know-how and discover new concepts actively. The teacher plays the role of facilitator.

Problem solving can be a complex intellectual act, it is also a teaching strategy used to elicit learning. But there is only problem solving if there is really a 'problem' for the learner; in this case, we no longer speak of 'solving' a problem but rather of a particular situation, the 'problem situation'. Indeed, if the teacher develops teaching and learning strategies through problem-solving, it is above all for his learners to implement intellectual approaches to problem-solving. However, these learners will only be able to solve problems if they are offered problem situations.

Problem solving as a skill to develop in learners or as an educational strategy is an increasingly present concern in the world of education. Thus, and in an educational context, problem-solving is often considered as a training objective, a skill to be acquired, but it is also conceived as a means of learning. The use of problem-solving is most likely to promote significant and permanent learning in the learner and support transfer. Thus, subject to problems, the learner must constantly reuse his knowledge in a context of most often real tasks taking into account the various interactions between this knowledge. This requires teachers to ask questions about the learning objectives they are pursuing. They must identify the advantages, but also the limits and requirements of such an approach, be able to set up the necessary supervision arrangements with their learners.

Problem-based learning is a method that involves confronting the learner with significant and real problems in

order to promote the acquisition of the knowledge required for solving these problems, as well as to develop self-learning habits associated with problems to be solved. It aims both at the achievement of content objectives and the development of skills by the learner. The problem serves as a kind of focal point or stimulus for the application of a problem-solving process but also for the search for information and for the study of the knowledge necessary to understand the mechanisms involved in the problem. The problem-based learning method requires several phases:

- *Phase 1 : With the Class Group : Learners First Become Aware of the Problem.*
- ✓ *Five Steps Will then be Completed:*
 - ❖ Clarify the terms and data not understood in the individual reading of the problem;
 - ❖ Define the problem. That is, agree on the phenomena that must be explained;
 - ❖ Analyze the problem by getting learners to state their ideas and assumptions about understanding the problem based on their current knowledge. This step takes the form of brainstorming;
 - ❖ Organize the explanations into a schematic representation as needed;
 - ❖ Formulate learning objectives from the questions raised in the problem analysis.
- Phase 2: individually, in pairs or in small groups: this is the stage of study and personal research. Each learner collects information that meets the objectives established in the previous phase using various resources or materials.
- Phase 3: with the class group: The presentation, discussion, synthesis and verification of the information acquired in the previous phase allow the learner to test

their new knowledge and to connect all the concepts required to understand and solve the problem.

In conclusion, problem solving involves both the basic intellectual competences necessary for processing information and other thinking strategies and metacognitive skills. It also requires the use of knowledge and the presence of certain attitudes. The use of this strategy constitutes in itself a real learning process for the individual since it is likely to lead each time, through the construction process that it requires, to a modification and probably an enrichment of his cognitive structure. In this respect, it is therefore a powerful means of bringing together and addressing various dimensions related to learning, including the integration of knowledge and its transfer.

➤ *Investigative Approach*

The inquiry approach stems from so-called active teaching methods in which the learner's learning largely results from the activities he deploys according to his own choices and independently (two conditions considered to promote intrinsic motivation and therefore conducive to learning). However, these choices were previously planned and guided by the professor during the development of the session.

The activity is built around a triggering situation accompanied by a questioning that has real meaning for the learners and a value other than academic. The goal is to:

- To bring out the representations of learners facing a situation that makes sense for them;
- Encourage initiative-taking;
- Trigger the implementation of skills through the tasks they will choose to develop.

➤ *Within Restricted Groups, the Learners:*

- Confront their representations with those of their peers (situation favorable to sociocognitive «conflicts») and their representations with the results of experiments conducted to verify them: situation favorable to cognitive «conflicts» (the child realizes the lack of efficiency of his previous representations) and the phenomenon of accommodation (the child seeks and integrates new knowledge that restores a new cognitive balance: he learns);
- Negotiate and organize among themselves (interactivity).

Thus the acquired knowledge and skills will result (for a large part) from the activity personally taken in charge by the learners. The teacher is no longer only the professor who transmits knowledge but also the advisor (facing difficulties encountered by learners) and the mediator (conflict management).

• *The Investigation Process is Carried Out in Several Stages:*

✓ *Step 1: The Motivation*

The teacher provokes a starting situation that arouses the interest of the learners:

- ❖ Triggering situation:

- ❖ Situation to capture: life situation, class event, during an outing, spontaneous question from the learners... etc.
- ❖ Situation to create: varies according to the unit, the chapter, and the activity of the session. Appeals to learners' knowledge and challenges them, as it is unfamiliar.

✓ *Step 2: Highlighting the Learners' Representations and Choice by the Teacher of the Scientific Problem to be Solved*

The learners express their initial conceptions, ask questions, give their opinion (importance of keeping track of this initial questioning to measure progress at the end of the sequence).

➤ *The Professor:*

- Organizes the first confrontations.
- Selects the scientific problem that lends itself to an investigative approach leading to the construction of know-how, knowledge and cultural benchmarks provided for by the programs.

✓ *Step 3: Investigation phase*

Learners make hypotheses and attempt explanations (tests of possible answers to the question asked that are worth testing) using:

- ❖ A direct experimentation designed and carried out by the learners;
- ❖ A material realization, search for a technical solution;
- ❖ A direct or instrument-assisted observation with or without measurement;
- ❖ A search on documents ;
- ❖ An investigation, a visit.

The teacher, with the aim of awakening the scientific spirit of his young learners, can help them to progress in the investigation process:

- ❖ By verbalizing the expected result in relation to an action;
- ❖ By having several possible solutions researched instead of one;
- ❖ By making the doubt and the necessity of verification appear;
- ❖ By providing assistance in the practice of experimenting to verify by offering an experiment himself or by bringing behavioral inducing material;
- ❖ Collecting and formatting results for communication within the group.

✓ *Step 4: The Synthesis*

The professor:

- ❖ Organizes the confrontation of the results which leads to the formulation of a provisional knowledge specific to the class. When the answer is incomplete or insufficient, the teacher leads the learners to continue the investigation.
- ❖ Leads learners to confront the results with established knowledge, with scholarly knowledge, in the perspective of a generalization of knowledge or know-how. Learners with the help of the teacher format the written record.

✓ *Step 5: Assessing and Measuring Progress*

The teacher assesses the targeted abilities.

Learners take stock of what they have learned (return to the initial questioning to evaluate the progress), how they learned it, what was difficult or not.

The problem-solving approach and the investigation approach overlap in their stages as shown in Table 1

The choice of a triggering situation: object, image, video or text accompanied by a questioning (in the form of an open problem, challenge, paradox...) allowing to reveal the representations of the learners and the implementation of their abilities.

Table 1 Steps of the Problem-Solving Approach and the Investigation Approach

Steps	Description of the stage and activities of the Learners	Role of Professor
Appropriation- Analysis of the problem posed or the problem that arises	Definition and clarification of the terms and concepts mentioned. Extraction of relevant information and/or search for additional information. Analysis of the situation from different angles (points of view). Identifies paradoxes, potential contradictions in the situation. Search for examples and counterexamples.	Guides and orients the learners.
Reformulation	Search for possible explanations. Linking of recognized concepts in game. - Investigative approach: reformulation of the questioning. - Approach to solving the problem: reformulation of the problem.	Professor guides by generating a questioning. It helps to rephrase the questions to ensure their meaning and refocus them on the problem to be solved. Is there a connection with something you have already encountered? How to express the fact that ... ? What elements require an explanation?
Economic situation - hypothesis	Investigative approach: - Search for possible explanations (formulation of hypotheses): expressions and collection of initial personal representations. - Formulation of research objectives (and/or of learning). Proposal of protocols. Problem solving approach: - Analysis of constraints and search for strategies to implement to solve the problem: feasibility. - Proposed solution. - Proposal of protocols. Internal group debate: collective analysis of the strategies to be implemented to solve the problem: relevance, feasibility. 2. A member of each group comes to present the resolution or hypothesis retained to the rest of the class. 3. Reasoned exchanges with the class.	Professor helps to structure the hypotheses used: What obstacle could present itself? What do you want to show? Why do you think that...? A What can we expect if...? Which method or technique could allow for...? What equipment would be necessary?
Investigation Phase or Resolution of problem.	Confrontation: Implementation of the different solutions or hypotheses adopted. Exploitation of methods and/or results. Documentary research. • Investigative approach: - Confrontation-experimentation ; - Experimentation, study of the influence of parameters; - Validation or not of the hypotheses. • Problem solving: - Implementation of the proposed solutions and verification of their relevance	What do you observe? What are you doing? Why do you do it? How could we do it? Is it possible to go about it differently? How could we interpret that? How could we classify? What can we put together?
Collection of results -Debate-Evaluation Information collected.	One member of each group presents the work done and the results obtained to the rest of the class	
Institutionnalization	Summary: The professor takes over to: - The analysis of elements, facts and concepts to remember. - Knowledge writing (in close relation with the context involved in the activity).	Professor takes over for the analysis of the elements, facts, and concepts to remember and the writing of knowledge
Reinvestment	Target experimental exercise or activity: Mobilization (reinvestment) of acquired knowledge in various applications or in new situations.	Ensure that the learners have properly integrated the knowledge involved.

➤ *Experimental Approach*

The experimental approach is a pedagogical approach that requires the teacher to teach by scientific problem. It constitutes a rigorous reasoning by which one submits hypotheses to the test of facts.

The experimental approach takes place in several stages, summarized by the acronym OPHERIC:

• *Definition of the Scientific Problem (P)*

The scientific problem is a scientific question raised by the observation (O) of scientific facts. To define it, one must:

- ✓ Observe the biological and geological environment in order to understand it;
- ✓ Develop relationships between observation data and already acquired knowledge;
- ✓ State the questions raised by these observations.

• *Formulation of the Conceptual Hypothesis (H)*

The hypothesis represents a proposal for a response to a scientific problem. Test of the hypothesis. To test the conceptual hypothesis, it is necessary:

- ✓ Formulate an operative hypothesis;
- ✓ Design an experimental protocol;
- ✓ Conduct the experiments;
- ✓ Note the results of the experiment.

• *Operative Hypothesis*

To formulate an operative hypothesis, three rules must be followed:

- ✓ List the intervening parameters (H1);
- ✓ Isolate the parameters because a hypothesis only concerns one parameter (H2);
- ✓ Predict an observable, measurable or readable effect of the parameter (H3).

• *Design of the Experimental Protocol (E)*

To test a hypothesis through experience, four rules must be followed:

- ✓ Test the effect of a parameter, removing it or varying it (E1);
- ✓ Test the effect of only one parameter, making other parameters constant for the duration of the experiment (E2);
- ✓ Create a control experience to compare the results. Without a control, it is not an experiment but a manipulation. The experiment therefore includes a mental phase and a manual phase (E3);
- ✓ Repeat the experiment several times to ensure that it always leads to the same results (E4).

• *Analysis of Results (R)*

The analysis of the results of an experiment requires three phases.

• *Observation of the Results*

- ✓ The results are systematically presented in table form, which makes them easier to read;

- ✓ The vertical reading of the table makes it possible to note the changes between the beginning and the end of the experiment.

• *Interpretation of the Results of the Experiment (I)*

- ✓ The horizontal reading of the table at the end of the experiment makes it possible to interpret and explain the differences between the test and the control.
- ✓ The interpretation corresponds to a critique of the results.

• *Conclusion (C)*

The conclusion reflects the links established by the results, between the experiment and the scientific problem posed. Hypothesis checking is the answer to the problem.

Only one system of experiments has been materialized, so the generalization of the results obtained cannot be done without some precautions being taken beforehand.

➤ *Differentiated Pedagogy*

Differentiated pedagogy is an educational approach that aims to take into account the individual differences of students in learning processes, while ensuring access to common objectives. According to Halina Przesmycki [14], she implements a flexible framework allowing each student to learn according to their own itinerary while remaining integrated into the collective dynamics of the class. For a student to be in a situation of success, he must acquire three powers:

- **Psychic power:** having confidence in oneself, mobilizing one's energy through motivation, specifying one's project;
- **Economic power:** mastering learning, demonstrating intellectual, technical, cultural skills to integrate into society;
- **Social power:** acquiring a valued position in and by the school, vis-à-vis one's peers, educators.

For Philippe Perrenoud [15], a pioneer in this field, differentiation does not just superficially modify tasks, but seeks to place each student in optimal learning situations while taking their specific needs into account. The objective is to go beyond uniform teaching to offer an education truly adapted to the heterogeneity of students.

The American researcher Carol Ann Tomlinson [16], internationally recognized for her work on the subject, describes differentiated pedagogy as an approach that relies on a thorough understanding of the needs, interests and levels of competence of students. She argues that the teacher must adjust not only the content, but also the activities, the evaluation methods and the learning environment to better respond to this diversity.

This current is part of a long pedagogical tradition that challenges the idea of a homogeneous and static class. Pedagogues such as Jean-Pierre Astolfi [17] have emphasized that differentiation is not simply a new method, but rather a professional attitude that involves mobilizing a diversity of strategies to respond thoughtfully to the needs of students.

Thus, differentiated pedagogy is not a single recipe, but a teaching philosophy based on adaptability, the recognition of diversity and the search for favorable learning conditions for all, in order to reduce inequalities and promote academic success [18- 25].

IV. CONCLUSION

Refocusing educational action on the skills that the learner must acquire is therefore a priority if the education system is to fulfil its assigned mission.

But the pedagogy of skills is not limited to an approach, methods, techniques or tools. It is above all a state of mind, a new approach that requires from all the actors two main virtues:

- Humility: to admit that one can always do better even in a difficult environment and accept a permanent evaluation of educational action to measure its impact and make the necessary corrections;
- The common sense that leads to asking three simple questions:
 - What is the goal to achieve, in other words, what are the skills to be acquired by the learners and do they correspond to the needs?
 - What is the best way to achieve the goals?
 - Is the goal achieved?

This is indeed the most difficult challenge, but also the most exalting one that must be taken up to engage the education system in a dynamic of permanent adaptation to the evolution of the world around it.

Effective teaching is not a set of generic practices, but a series of decisions on teaching taken in a given context. An effective teacher does not use the same set of practices for each course but constantly reflects on his work, observes his students to see if they are learning or not and adjusts his teaching practice accordingly.

REFERENCES

- [1]. Hanane EL Fadel. (2025). Towards An Innovative Educational Model for Quality in Education and Training, Int. Jr. of Contemp. Res. in Multi (IJCRM).
- [2]. CSEFRS. (2015). Vision stratégique de la réforme 2015-2030 pour une école de l'équité, de la qualité et de la promotion. Maroc : Publication du Conseil Supérieur de l'Éducation, de la Formation et de la Recherche Scientifique.
- [3]. Martinand, J-P. (1989). Pratiques de référence, transposition didactique et savoirs professionnels en sciences techniques. Les sciences de l'éducation, pour l'ère nouvelle, 23-29.
- [4]. Hameline, D. (1991). Les objectifs pédagogiques dans la formation continue. Paris. E.S.F.
- [5]. Pelpel, (2002). Se former pour enseigner, Paris : Dunod.
- [6]. Deronne, M. (2012). L'approche par compétences dans l'enseignement des mathématiques. Mémoire de master en sciences mathématiques. Université du Mons, France.
- [7]. Rogiers, X (2006). L'APC dans le système éducatif algérien, la refonte de la pédagogie en Algérie, bureau international de l'éducation. Unesco, ministère de l'éducation nationale. pp 51-84.
- [8]. Dewey, J (1968), Expériences et éducation, Paris : A. Colin.
- [9]. Abernot. Y. (1996). Les méthodes d'évaluation scolaire. Dunod, Paris.
- [10]. Labin, E. (1975). Comprendre la pédagogie. Bordas Initiation.
- [11]. Mager. R.F (1986). Comment mesurer les résultats de l'enseignement. Dunod, Paris.
- [12]. Tardif. J (1997). Pour un enseignement stratégique. L'apport de la psychologie cognitive. Les éditions logiques, Montréal.
- [13]. Comenius, Jean Amos (1992). La grande didactique. trad. intégrale M. F. Bosquet-Frigout, D. Saget B. Jolibert, Paris, Klincksieck.
- [14]. Halina Przesmycki (1991). Pédagogie différenciée. Paris : Hachette éducation;
- [15]. Perrenoud, Philippe & Issy-les Moulineaux : ESF (2004). Pédagogie différenciée : des intentions à l'action. (Pédagogies). - ISBN 2-7101-1674-X. Ce livre tente de faire le point sur l'état des principaux chantiers de la pédagogie différenciée. Chacun est confronté au même dilemme : comment tenir compte des différences sans enfermer chacun dans sa singularité, son niveau, sa culture d'origine ? 370A PER P.
- [16]. Carol Ann Tomlinson (2000). Differentiating Instruction: Finding Manageable Ways to Meet Individual Needs (Excerpt)" by Scott Willis and Larry Mann, in Curriculum Update.
- [17]. Astolfi, J.-P. (2020). Pour différencier l'enseignement : l'entrée didactique. *Recherches en didactiques*, 29(1), 53-64.
- [18]. Legrand, L. (1995). Les différenciations de la pédagogie.
- [19]. Bour Pol. Vers la mise en œuvre des pratiques de pédagogie différenciée. *L'éducateur*, n° 9, avril 2002, 68 p
- [20]. Lhoir Séverine. La pédagogie différenciée. 78 f dactyl
- [21]. Davignon Nathalie. Les cahiers pédagogiques de l'école normale : la pédagogie différenciée au service de l'orthographe. 49 f dactyl.
- [22]. T.F.E. : section primaire : ENC du Brabant Wallon, 1994.
- [23]. Rey, Bernard & Issy-les Moulineaux : ESF (1998). Faire la classe à l'école élémentaire. (Pratiques & enjeux pédagogiques, 15). - ISBN 2-7101-1258-2 371B REY F. Comprend un chapitre sur la pédagogie différenciée : p.105-123.
- [24]. Przesmycki, Halima & Peretti, André de.- Paris : Hachette (1991). Pédagogie différenciée. (Pédagogies pour demain. Nouvelles approches). - ISBN 2-01-017963-3 371A PRZ P.
- [25]. Meirieu, Philippe, Hameline, Daniel [préf.] & Issy-les Moulineaux : ESF (2004). L'école, mode d'emploi : des "méthodes actives" à la pédagogie différenciée ; Postface : la pédagogie différenciée est-elle dépassée ? - (Pédagogies). - ISBN 2-7101-1666-9 370A MEI E.