



University of Navarra

Working Paper

WP No 520

September, 2003

FOUR DIMENSIONS TO INDUCE LEARNING: THE CHALLENGE PROFILE

Beatriz Muñoz-Seca *
Cássia Silva Santiago **

* Professor of Operations Management and Technology, IESE

** Research Assistant, IESE

IESE Business School – Universidad de Navarra

Avda. Pearson, 21 - 08034 Barcelona. Tel.: (+34) 93 253 42 00 Fax: (+34) 93 253 43 43

Camino del Cerro del Águila, 3 (Ctra. de Castilla, km. 5,180) - 28023 Madrid. Tel.: (+34) 91 357 08 09 Fax: (+34) 91 357 29 13

Copyright©2003, IESE Business School. Do not quote or reproduce without permission

FOUR DIMENSIONS TO INDUCE LEARNING: THE CHALLENGE PROFILE

Abstract

Knowledge generation is critical for company survival and managers need to face a new role: becoming educators. This requires an understanding of how knowledge is generated and what triggers individual learning. We propose that each individual has a personal predisposition to use a particular learning profile. Our findings show the Educational Dimensions Portfolio (EDP) as a gallery of profiles that match each individual's problem-solving challenge. A manager-educator can use the EDP model for triggering individual learning. We have verified, using statistical methods, that there are four EDP dimensions. They are related to both David Kolb's and Peter Honey's learning styles. We have verified that each individual has a personal predisposition to use a particular profile. We call it the challenge profile. That specific combination provides the individual's gateway not only to his own learning but also to inducing learning in others.

Keywords: manager as educator, innovation, challenge, learning styles, knowledge management.

FOUR DIMENSIONS TO INDUCE LEARNING: THE CHALLENGE PROFILE

Introduction (1)

To excel, a company needs to improve, and knowledge is the keystone for a permanent improvement (2) process. This need for permanent improvement should start a managerial obsession: generating knowledge. Learning creates knowledge and the knowledge base of a company increases when individuals learn. A new managerial role emerges: inducing learning, thus the role of educator.

But how can a manager induce knowledge generation in adults (3)? Learning (Argyris 1982) is a process in which people discover problems and invent solutions to the problems, developing the ability to evaluate, which enables the learner to discover new problems. Sims and Sims (1995: 3) state that “in the world of teaching and training, adherence to adult learning theory calls for the design of learning activities to be based on the learners’ needs and interests so as create opportunities for the learners to analyze their experience and its application to their work and life situations”. Hayes, Wheelwright & Clark (1998) state that people learn mainly through problem solving. We take this same point of view and wholeheartedly embrace the idea that learning is the result of problem-solving activity. Problem creation carries with it the possibility of problem solution, through the problem-solving process. When a problem is solved, it gives rise to learning in the person or persons who solve it. Pérez López’s (1991) definition of a problem is: what arises whenever a person encounters a situation which is unpleasant to him/her. Keeping this in mind, we can define problem-solving as changing an unpleasant situation to one that is pleasant to the person, or bridging a perceived gap between what is and what ought to be.

If knowledge is generated through problem solving [Muñoz-Seca & Riverola], we need to probe further into the process and define the dimensions that are responsible for generating problems. What generates problems? If a problem is the existence of a situation that is “not agreeable” to a person, defining what produces “not agreeable” situations could

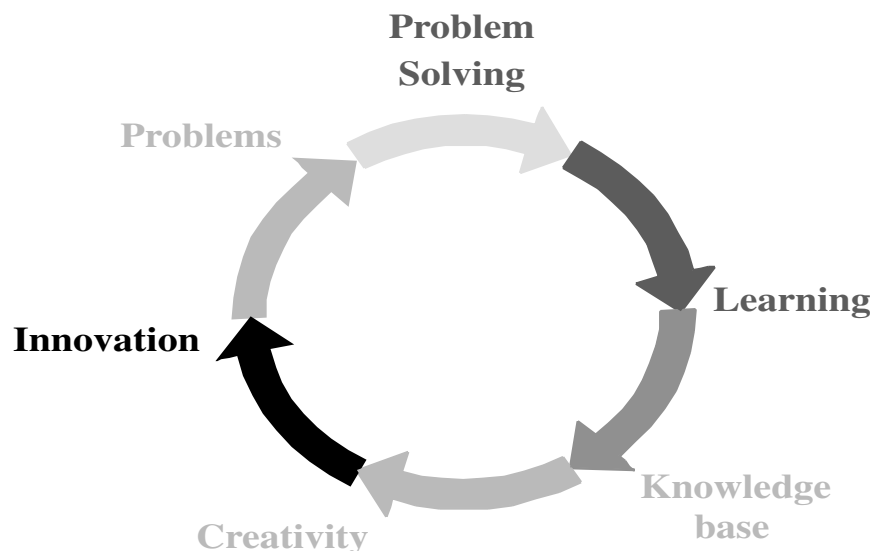
-
- (1) In this section we will summarize part of some previous research by one of the authors. For a more in-depth study, see : Muñoz-Seca and Riverola, “La gestión del conocimiento”, Folio 1997; and Muñoz-Seca and Riverola, “Del buen pensar y mejor hacer: Mejora permanente y Gestión del Conocimiento”, McGraw Hill 2003.
 - (2) There is a difference between continuous improvement and permanent improvement. Continuous improvement is more related to “nuts&bolts” innovations, ordinary everyday innovations (see Marquis, D.G., “The anatomy of successful innovations”, *Innovation*. November 1969). Permanent improvement relates to all types of innovations, going from revolutionary to nuts&bolts (see Abernathy, W.J.& Clark, K.B., “Innovation: Mapping the winds of creative destruction”, *Research Policy* 14, 1985).
 - (3) Knowledge generation in adults (andragogy) is different from knowledge generation in children (pedagogy). See the work of Malcom Knowles

help us locate what produces problems. Anything that is “new” is the result of change. In any action situation, problems appear whenever the agent’s environment changes to include new situations. In business, change has been analyzed for a long time under the heading of innovation. But it would be a mistake to think only of major innovations. Most innovations in a company are changes in the way operations are done, often small changes that do not have a dramatic effect on the lives of the people affected by them.

Innovation is simply doing things –new or old– in new ways. Innovation is creating and introducing original solutions for new or already identified needs. The main source of problems is change, and change is the result of innovation. Thus, we conclude that innovation is the first-order provider of problems. Innovation is the continuous and dynamic process of efficiently using the company’s knowledge base to do things, old or new, in new ways. It brings into the firm problems that need to be solved through a problem-solving process. The manager pushes innovations and thus creates problems.

In summary, knowledge is fed and generated by learning. Problem solving generates learning, and a higher level of knowledge will lead to the generation of new ideas for application. Generating new ideas is essentially formulating suggestions for change, which demands creativity. Creativity leads to implementation, and thus to innovation, which in turn generates problems that need to be solved, and the problem-solving activity itself generates learning. Thus, innovation creates problems, problem solving induces learning, and learning increases the company’s knowledge base, closing the circle of competitiveness. Figure 1 shows this circle, the Knowledge Generation Loop (KGL).

Figure 1. The Knowledge Generation Loop (Muñoz-Seca & Riverola, 1997)



A critical entry point in this loop is the individual’s capacity to absorb the challenge that the introduction of an innovation represents. The key point is that problems will generate learning as long as the challenge they present lies within certain bounds. If the challenge is too small, the problem is trivial; no effort has to be made to solve it, and very little learning results. If the challenge is too great, frustration ensues. The problem solver is incapable of making a dent in the problem, and feels frustrated and alienated from the environment. Thus, a main issue to generate knowledge is how to configure challenges and match them to individual needs.

Our proposition is that to match challenges with individual needs we need to understand the “gateway” that opens the problem-solving activity. We have said that to produce learning, a problem needs to generate a challenge that is appropriate for the individual. This challenge is not the same for everyone. If we individualize challenges through this gateway, then the learning process will be more efficient and less time-consuming. The learning experience will be more satisfactory for the individual and more productive for the company.

We propose that this “gateway” is a combination of four dimensions. They comprise the elements to generate a learning experience. All individuals use these elements in different degrees when facing a personal learning experience. The level of usage of each dimension defines the person’s challenge profile. A person’s challenge profile is his/her tendency to adopt each dimension when facing a learning experience. We propose that each individual has a personal predisposition to use a particular profile. That specific combination is the individual’s “gateway” not only to his own learning but also to inducing learning in others. Accordingly, these dimensions are involved both in absorbing knowledge and in generating learning in others.

This paper presents the four dimensions that comprise the challenge profile. These dimensions are based on the educational literature and on research in learning/teaching styles. The model has been tested on a sample of 191 managers from different countries and different academic backgrounds.

Starting Point. The Learning Styles

Kolb’s Model of Learning

Kolb (1984) defines learning as the process of acquiring knowledge through the transformation of experience. Kolb considers that some people learn better through seeing and listening (Type I: reflective observation); others by thinking (Type II: abstract conceptualization); others by acting (Type III: active experimentation); and others by feeling (Type IV: concrete experience). Each type of learning, on its own, is incomplete for an individual; learning is achieved when they are used in combination. The types are combined in twos and each combination configures a certain learning style (Stice, 1987).

Kolb proposes four learning styles: converger, diverger, assimilator and accommodator.

Converger. This style is associated with individuals who are skilled at solving problems, making decisions and putting ideas into practice. The name comes from the fact that they work best in situations where there is only one correct answer and solution to a question or problem. They are able to find a practical use for ideas and theories, evaluating consequences and selecting solutions, following detailed, sequential steps and setting clear goals with a logical sequence of activities. They prefer to deal with technical tasks and problems rather than with social and interpersonal discussions. “They grasp the experience through abstract conceptualization and transform it through active experimentation” (Claxton & Murrell, 1987: 27).

Diverger. They have a high imaginative capacity that allows them to analyze specific situations from different viewpoints. They apply observation rather than action. Their

name comes from the fact that they are good in situations that need to generate a broad range of alternative ideas and implications. They are good at identifying problems, sharing information and becoming involved in group activities. “They grasp the experience through concrete experience and transform it through reflective observation” (Claxton & Murrell, 1987: 27).

Assimilator. They stand out for their inductive reasoning. They learn with abstract ideas, create conceptual models, design experiments, analyze quantified information. They are less focused on people and more focused on abstract ideas and concepts. They judge ideas more for their theory than for their practical value. They assimilate broad spectra of information and are able to translate them in a concise, logical manner. “They grasp the experience through abstract conceptualization and transform it through reflective observation” (Claxton & Murrell, 1987: 27).

Accommodator. They learn from experiences, making plans and coping with risk situations. They stand out for their flexibility and willingness to join in with group activities. Theory and plans must be aligned with reality; otherwise, they are not valid for them. They tend to solve problems intuitively. They feel comfortable with other people but sometimes they are impatient and insistent. “They grasp the experience through concrete experience and transform it through active experimentation” (Claxton & Murrell, 1987: 27).

Honey and Mumford’s Model of Learning

Honey and Mumford (1988) take Kolb’s postulates and try to adapt them to the business world. In 1986, they performed an analysis of David Kolb’s theory and questionnaires with a view to applying the Learning Styles to manager training in the United Kingdom.

Honey and Mumford reached the conclusion that there are four learning styles:

Activist. These are experience-driven; they are open-minded and readily become enthusiastic about new situations. They like immediate experiences and their philosophy is “I will try anything once”. They tend to act first and consider the consequences afterwards. They are very active and readily become involved with other people, centering all activities on them.

Reflector. They review and ponder on experiences and look at them from different viewpoints. They perform a comprehensive compilation and detailed analysis of information about experiences. Their philosophy is to be cautious and they prefer to remain in the background in any meeting or discussion. They enjoy observing and listening to others, following the direction taken by the discussion but without becoming involved until they have mastered the situation.

Theorist. They view problems following a step-by-step upward logic. They tend to be perfectionists and order things in a rational framework. They like to analyze and synthesize on the basis of hypotheses, principles, theories, models and systematic thinking. Their philosophy is “If it is logical, it is good”. They try to be independent, analytical and centered on rational goals rather than on subjective or ambiguous goals.

Pragmatist. They are experts in trying ideas, theories and techniques to see if they work. They come back from management courses with new ideas, which they wish to put into practice. Their philosophy is “If it works, it is good”. They see the positive side of new ideas and like to experiment with applications. They are eminently practical in decision-making and problem solving.

Learning style is equal to teaching style

We have seen that learning occurs differently depending on the learning style. Moreover, research shows that individuals induce learning following their own individual learning style. They interact with the world in the same manner as they absorb (learn) from the world. Montgomery (1998) in his research shows that the learning style is equal to the teaching style. Honey (1983) argues that each learning style's strengths and weaknesses clearly affect an instructor's efficiency. For instance, an Activist tends to act under the influence of his learning styles and, consequently, people who have Theorist styles might show a reaction of withdrawal.

Entwistle (1991) argues that learning theories and the practical applications of teachers' behavior illustrated by Kolb show that teachers tend to teach and use their own learning style when designing the course and implicitly assume that their students learn this way too. Kolb recommends teaching techniques based on each individual's learning style

Alonso (1997) shows that teaching styles are heavily influenced by one's own learning style. She states that it is common for teachers to follow their own learning styles in the way that they teach. Peirce (1999) maintains the same ideas as the above authors. He says that college students do well in courses in which their learning styles are in sync with their teacher's teaching methods.

This has crucial implications. If a manager does not understand the relationship between learning and teaching/educating styles, he will unconsciously educate in accordance with his own learning style. This might give rise to a dysfunctionality with individuals who do not have his identical style of learning. He might propose innovations and problems in ways that only match his own learning style.

The issue then becomes: how can a manager induce adequate learning? Kolb's research related learning styles with specific teaching activities, but we did not find any literature that related Honey's learning styles with particular educational approaches. Honey's work, being more focused on managers, showed a greater potential for our research needs than Kolb's. But Kolb's research had a deeper insight on educating activities linked to learning styles, though very much concentrated on the educational world, whereas we were interested in the business world. We wanted to offer managers a hands-on approach. We reviewed the literature and did not find any research that related Honey's learning styles with Kolb's teaching styles. So, we had to test the relationship.

We merged the results of the two lines of research to see if we could come up with specific educational activities for Honey's learning styles. Remember that Honey's research was focused on the business world. So, if we could find a linkage, we could find a path to develop a frame of reference to apply to the business world.

Relationship between Honey's and Kolb's theories of learning

We started with the research that related Kolb's learning types to Honey's learning styles. Alonso et al. (1997) carried out a study to correlate Honey and Mumford's learning styles with Kolb's learning types. They found three significant correlations. Honey and Mumford's "reflector" style and Kolb's "reflective observation" exhibited the highest correlation coefficient (0.73); the correlation coefficient between "pragmatist" and "active

experimentation” was 0.68; and finally, the “theorist” style revealed a correlation coefficient of 0.54 with “abstract conceptualization. On the other hand, the authors found a low correlation coefficient (0.23) between the “activist” style and “concrete experience”.

We see that each Honey learning style is linked not only with a Kolb learning type but also with two Kolb learning styles (4). For example, Honey’s “activist” style is related with Kolb’s “accommodator” and “diverger” styles. Table 1 shows this relationship.

Table 1. Relationship between Honey’s and Kolb’s learning styles

Honey’s styles	Relationship with Kolb’s styles
Reflector	Diverger and Assimilator
Theorist	Assimilator and Converger
Pragmatist	Converger and Accommodator
Activist	Accommodator and Diverger

Our data confirm this relationship. Our study uses a sample of 191 executive students at IESE Business School (Universidad de Navarra, Spain) and the IDE (Instituto de Desarrollo Empresarial, Ecuador) during the year 2001. The sample consists of business executives with work experience of no less than 7 years on average. They come from different countries (UK, Ecuador, Spain, France, Netherlands and Mexico, etc.). They also have diverse academic backgrounds: 46% are engineers; 35% are economists; 4% have a law degree; the remainder have a B.Sc. in other fields.

In order to determine the sample’s preferred learning style, we used the Spanish version of Honey’s L.S.Q. (5) (Learning Style Questionnaire). In analyzing the survey results, we took as our reference the standards established in Mumford and Honey’s research (1992).

The Bivariate Correlation test was used to analyze the data. This test consists of studying, using Pearson’s linear correlation coefficient, whether the degree of linear association between the values of the dimensions indicated is statistically significant. Thus, in our analysis, the criterion was established that a level of significance greater than 0.05 would be feasible to reject the null hypothesis ($H_0=0$). The results shown in Table 2 give the degree of association between the learning styles established by Honey and Kolb (6), with a 95% probability of being considered statistically significant in accordance with Pearson’s correlation coefficient.

(4) Remember that a Kolb style is composed of the union of two types.

(5) The questionnaire has 80 questions, each style being represented by 20 questions. We used the Spanish version of the test (“Cuestionario Honey-Alonso de Estilos de Aprendizaje”), published by the Instituto de Ciencias de la Educación (ICE) at the Universidad de Deusto.

(6) Kolb’s Learning Style Inventory (LSI) is a simple self-description test, based on experiential learning theory. The test has 8 questions that can each have values from 1 to 4.

Table 2: Pearson's Correlation Coefficients Between Learning Styles (N=191)

Honey/Kolb*	Assimilator	Diverger	Accommodator	Converger
Activist				
<i>Pearson's C.</i>	-.203	.365	.362	-.398
<i>Sig.</i>	.014	.000	.000	.000
Theorist				
<i>Pearson's C.</i>	.245	-.316	-.483	.416
<i>Sig.</i>	.003	.000	.000	.000
Reflector				
<i>Pearson's C.</i>	.334	.268	-.202	-.292
<i>Sig.</i>	.000	.001	.015	.000
Pragmatist				
<i>Pearson's C.</i>	-.323	-.177	.347	--
<i>Sig.</i>	.000	.033	.000	

Note. Dashes indicate the correlation was not significant (Sig. > .05).

Pearson's C. = Pearson's Linear Correlation Coefficient.

* The correlation is significant in accordance with the criterion established (Sig. $\leq$.05)

The results show that Honey's "activist" style seems to have a more positive correlation with Kolb's "diverger" and "accommodator" styles. Likewise, a negative correlation is observed between the "activist", "converger" and "assimilator" styles. This means that an "activist" may have features of Kolb's "diverger" and "accommodator" styles, but must not have features of the "converger" and "assimilator" styles.

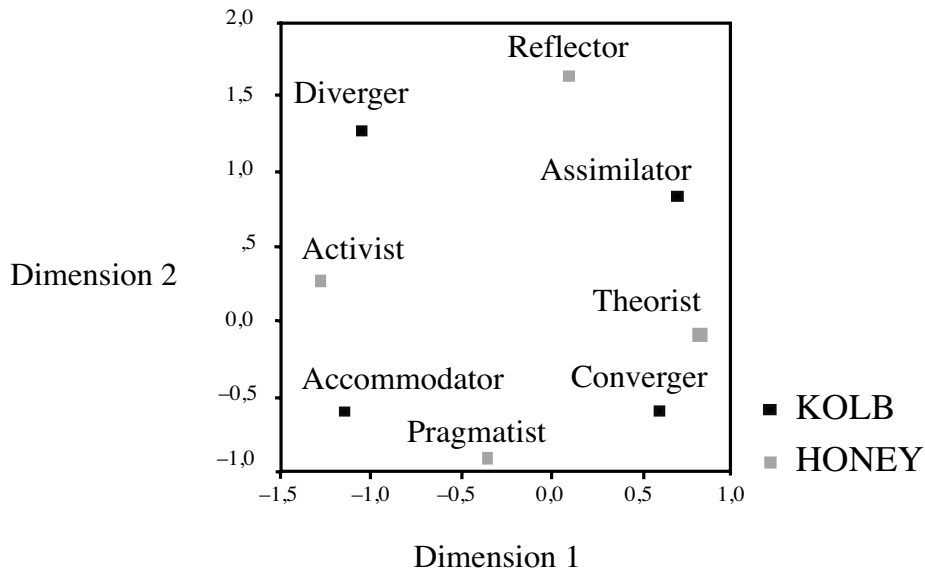
As regards the "theorist" style, the values observed show a positive correlation with the "converger" and "assimilator" styles. On the other hand, we see a negative correlation with the "accommodator" and "diverger" styles. In other words, a "theorist" may have features of the "converger" and "assimilator" styles, but he must not have features of the "accommodator" and "diverger" styles.

The "reflector" style shows a positive correlation with the "assimilator" and "diverger" styles, and negative correlations with the "converger" and "accommodator" styles.

Finally, upon analyzing the results for the "pragmatist" style, we see a positive correlation with the "accommodator" style. At the same time, it has negative correlations with "assimilator" and "diverger". This suggests that a "pragmatist" in our sample may have features of the "accommodator" style but must not have features of the "assimilator" and "diverger" styles.

Another statistical test used –the analysis of Simple Correspondences– is a technique for representing the dimensions selected in a small space, which enables the similarities between dimensions to be interpreted. If two dimensions are close together, it means that they are related. In our case, we sought to analyze the similarities between Honey's and Kolb's learning styles. This analysis, too, confirms the relationship between Honey's and Kolb's styles in the same sample, as shown in Figure 2.

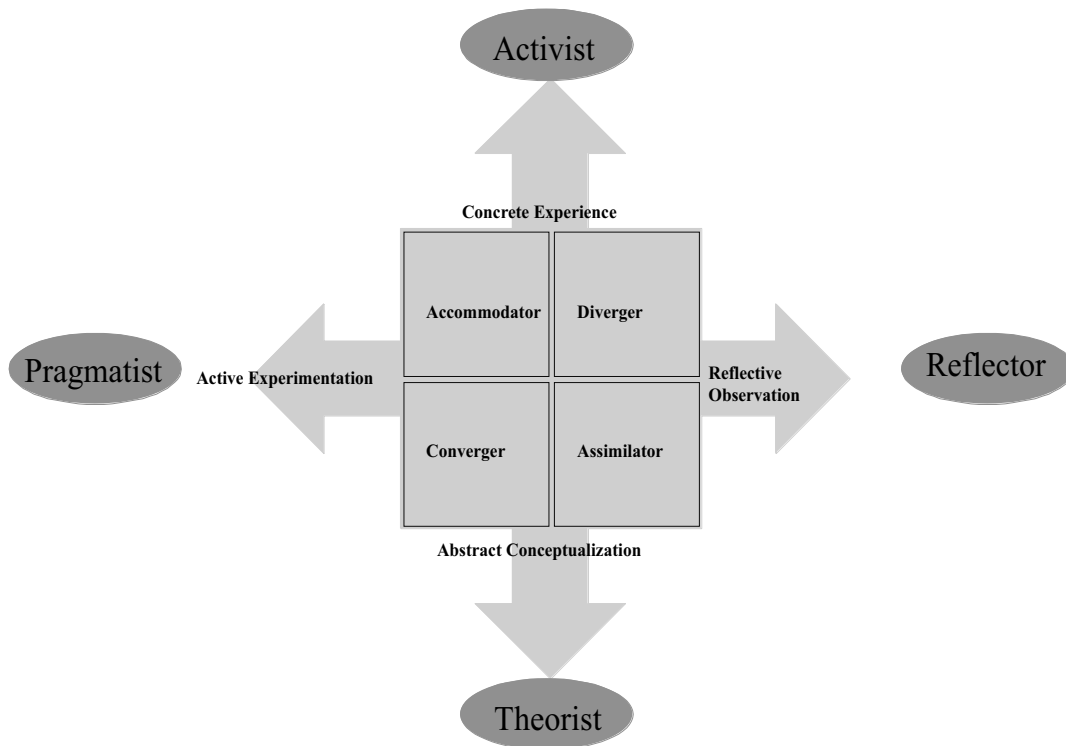
Figure 2: Graph of Simple Correspondences: Column (Kolb) and Row (Honey) Scores



As shown in Figure 2, we can see that the “pragmatist” point is plotted between the “accommodator” and “converger” points. Consequently, we can say that Honey’s “pragmatist” style is related with Kolb’s “accommodator” and “converger” styles. Likewise, upon comparing the plots of the other points, we can confirm the relationship between “activist” and “accommodator” and “diverger”; between “reflector” and “diverger” and “assimilator”; and, finally, between “theorist” and “assimilator” and “converger”, as proposed in Table 2.

We conclude that an individual with a “theorist” style has a greater tendency to show features of the “converger” and “assimilator” styles. Similarly, the “activist” style shows a greater tendency to be related with the “diverger” and “accommodator” styles. Likewise, its position on the graph indicates that the “reflector” style seems to be more related with the “assimilator” and “diverger” styles. Finally, “pragmatists” seem to have features of the “converger” and “accommodator” styles. The results obtained are summarized in Figure 3.

Figure 3. Relationship Between Kolb's and Honey/Mumford's Learning Styles



So far we have shown that Kolb's learning styles match specific Honey's learning styles. Now, as proposed previously, we can link Kolb's learning/ teaching styles with Honey's learning styles. First, let us present Kolb's ideas on teaching styles. Then we will apply them to Honey's learning styles and come up with the EDP, or Educational Dimensions Portfolio.

Teaching styles according to David Kolb's model

David Kolb developed a teaching model that was applicable to each learning style (1984). The model guides the instructor, following a framework of pedagogic behavior, so that he teaches in accordance with the learner's needs.

According to Rainey & Kolb (1995: 129), "learning flourishes when learners have equal opportunity to develop and utilize their talents and perspectives to the fullest". Kolb also considers that the instructor must be aware that the main goal pursued by the teaching must be to cover each style's learning needs.

Anderson and Adams (1992, pp. 19-33) give a content to the functions that an instructor must perform and relate Kolb's learning types to the learning situations preferred by the students. They describe them as follows:

Concrete Experience: people with this profile learn by intuition, from specific experiences, interacting with people and sensitivity to feelings. They learn better from new experiences, games and role-plays. Also important is peer feedback and discussion as well as individual counseling. They benefit greatly from the role of the teacher as coach and helper.

Reflective Observation: here the learning is by perception. Careful observation is very important to the judgment making process. The ability to view things from different perspectives, and to look inward for meaning is a common characteristic. They learn better from lectures and playing the role of active observer. The teacher plays the role of guide /taskmaster.

Abstract conceptualization: people with this learning type learn by thinking, from logical analysis of ideas and systematic planning. Deductive thinking is also an important characteristic. They prefer learning from theory readings and situations where the presentations are well structured and clear. Communicator of information is the role that the teacher assumes here.

Active experimentation: here people learn by doing. They have the ability to get things done. They assume risks. And as extroverts, they try to influence people and events. They learn better when they have opportunities to practice and receive feedback. They prefer working in small groups where decision-making regarding projects is individualized and self-paced. The teacher here models the role of a doer.

Adding both Kolb's and Anderson's proposals, we see that a "diverger" would learn from specific experiences and viewing things from different perspectives. The "assimilator" would learn from viewing things from different perspectives and from logical analysis of ideas. The "converger" would learn by thinking from logical analysis and doing things. Finally the "accomodator" would learn by doing things, practicing and getting feedback and learning from specific experiences.

Accepting our previous proposition that two Kolb styles relate to one Honey style, we can now transpose these educating findings to Honey's learning styles. So, in each Honey learning style we will have three educating functions, one with higher intensity than the other two. With this in mind, we formulate our main proposition as follows.

The Educational Dimensions Portfolio

Expanding Kolb's (1984) and Anderson and Adams' (1992, 1995) contributions and applying them to Honey's research, we introduce the Educational Dimensions Portfolio: EDP. The EDP is the combination of specific elements needed to induce an individualized problem-solving experience. The EDP is made up of four elements or dimensions. The problem-solving activity is faced through different perspectives, each one being the combination of these four dimensions. The EDP provides the manager with a frame of reference "hands-on" approach, to design a learning experience matched to the individual learning style.

The EDP's four dimensions are: delivering experiences, analyzing alternatives, guiding through the process and providing concrete knowledge or information (7).

Delivering experiences. Some individuals need to face the problem-solving activity with a portfolio of experiences that helps them as a frame of reference for the problem at hand. Thus, this dimension focuses on the degree to which the individual can perceive the immediate results and consequences of his problem-solving activity. This includes the possibility of having an immediate perception of the process's implications and real outcomes.

(7) We adopt the following definition (Russell & Norvig, *Artificial Intelligence*, Prentice Hall, 1995):
Information = data + structure.

Analyzing alternatives. The problem-solving activity is here faced with the different alternatives that may arise in the analysis of the situation. This dimension focuses on the degree to which the individual deepens the evaluation of the different alternative paths to follow. This requires anticipation of positive and negative effects for each alternative.

Guiding through the process. The process points out the steps and obstacles that the individual faces in his problem-solving activity. The individual might need to have some roadblocks that would guide him through the process. This dimension deals with the degree to which the individual can make use of a guiding tutor that incrementally shows him how to perform and act.

Providing knowledge. Some individuals need to be presented with the theory that relates to the problem at hand. This dimension focuses on the degree to which the individual requires a conceptual, abstract framework to relate the problem to. The framework is then a source of knowledge that will help him solve the problem.

We propose that individuals have a particular intensity of each dimension. All individuals have all four, but the intensity of each one will create a different problem-solving path. Problem solving is faced through a combination of these dimensions, and this combination shapes the individual challenge profile. Learning should therefore be induced through different combinations of the EDP. In the next section we will typify these profiles and link them with learning styles, seeing that each style acquires a specific profile.

The challenge profile: A gallery of profiles

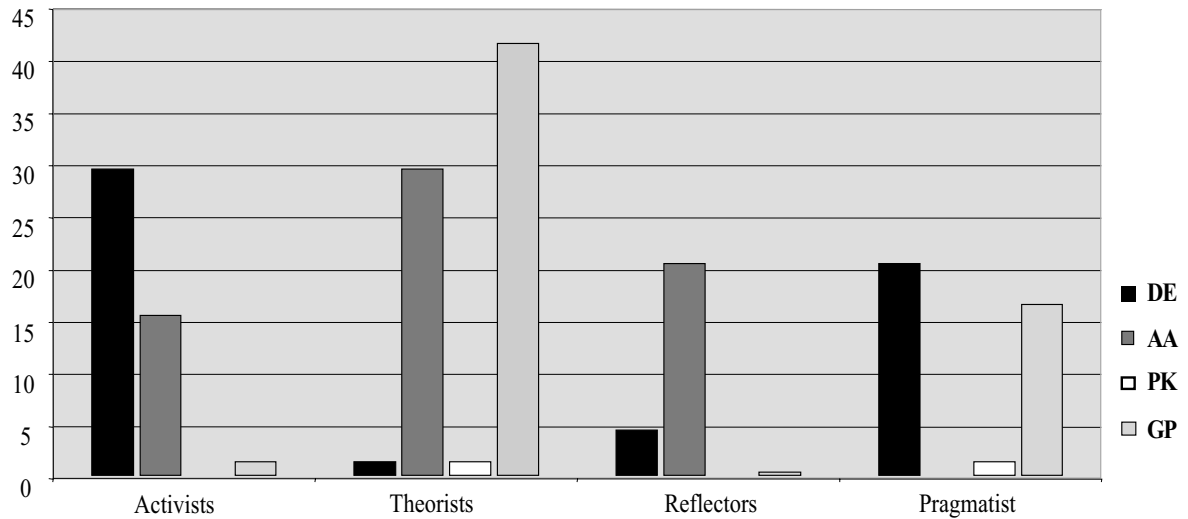
We have performed an empirical analysis of the data collected at IESE and IDE during the year 2001 using a questionnaire designed to identify the respondents' preferences with respect to each action dimension of the EDP. Briefly, we can say that we have been able to verify the EDP model, both as regards the existence of individual profiles, and as regards the relationship between the four EDP dimensions and Kolb's and Honey's learning styles.

The "EDP Questionnaire" consists of 32 questions distributed into four groups of 8 questions corresponding to each EDP dimension (Delivering Experiences, Analyzing Alternatives, Providing Knowledge, and Guiding through the Process). Each dimension has been presented in the form of activities. The activities configure each dimension's focalization. Each question must be answered with "yes" or "no", and all the questions must be answered for the questionnaire to be valid. The evaluation of the questionnaire consists of adding the answers to the 8 questions corresponding to each dimension of the EDP. Therefore, each dimension of the EDP has a rating within the range [0-8]. The questionnaire was administered to a sample of 191 executive students enrolled at IESE-IDE during the year 2001.

The results confirm the existence of profiles. Considering the average preferences for the entire sample, we have found that, in general, the reflectors show a clear preference for the "Analyzing Alternatives" dimension. However, they rate negatively the "Guiding through the Process" dimension. The pragmatists prefer the "Guiding through the Process" and "Delivering Experiences" dimensions and rate negatively the "Analyzing Alternatives" dimension. The theorists show a greater preference for the "Analyzing Alternatives" and "Guiding through the Process" dimensions and show a clear rejection for the "Delivering Experiences" dimension. The activists have a greater preference for the "Delivering Experiences" dimension and rate negatively the "Guiding through the Process" dimension.

Upon performing the frequency analysis of the results, we have verified the existence of different profiles. Figure 4 shows the mean values of the respondents' preferences.

Figure 4. The Highest Rated Dimensions of the EDP for Different Learning Styles



Our findings show how each learning style has a favorite profile. Each learning style has a dominant dimension, two intermediate dimensions and a neutral dimension. Table 3 shows each learning style with its profile.

Table 3. Learning Styles and Their Profiles

	Activist	Pragmatist	Theorist	Reflector
Guiding through the Process	+	++	+	-
Delivering Experiences	++	+	-	+
Analyzing alternatives	+	-	+	++
Providing knowledge	-	+	++	+

Note. We identify the dominant dimension by “++”, the intermediate dimension by “+”. The neutral dimension is represented by a dash.

The most common Honey style within the sample was the theorist style (40% of the respondents). The activist (25%) and pragmatist (21%) styles, and, lastly, the reflector style (14%) followed the theorist style. Table 4 summarizes the statistical analysis of the results found.

Table 4. Summary of the Data Analysis

Analysis Type	Results
Descriptive statistics (frequency analysis)	Profiles of IESE-IDE students: Activist – rates DE higher Reflector – rates AA higher Pragmatist – prefers GP and DE Theorist – prefers AA and GP
Bivariate Correlation (Peter Honey Styles x Dimensions of the EDP)	Activist* – positive correlation with DE and negative correlation with GP Theorist* – positive correlation with AA and GP and negative correlation with DE Reflector* – positive correlation with AA and negative correlation with GP Pragmatist* – positive correlation with DE and GP and negative correlation with AA
Bivariate Correlation (David Kolb Styles x Dimensions of the EDP)	Converger* – positive correlation with GP and negative correlation with DE and AA Assimilator* – positive correlation with AA and negative correlation with DE and GP Diverger* – positive correlation with AA and negative correlation with GP Accommodator* – positive correlation with DE and negative correlation with AA
Simple Correspondences (Peter Honey Styles x Dimensions of the EDP)	Activist – clear preference for DE Reflector – clear preference for AA Pragmatist – related with DE and PK Theorist – more correlated with GP
Simple Correspondences (David Kolb Styles x Dimensions of the EDP)	Converger – clear preference for GP Assimilator – clear preference for AA Diverger – prefers AA and DE Accommodator – prefers DE

Note. AA = Analyzing Alternatives; DE = Delivering Experiences; GP= Guiding through the process; PK = Providing Knowledge.

* Correlation is statistically significant.

The next step was to perform a bivariate correlation analysis (Pearson's correlation coefficient) and a Simple Correspondences analysis. Table 5 shows the results of the bivariate correlation analysis.

Table 5. Correlation Coefficients Between Honey's Learning Styles and Dimensions of the EDP

Honey*	DE	AA	PK	GP
Activist				
<i>Pearson's C.</i>	.405	—	—	-.335
<i>Sig.</i>	.000			.000
Theorist				
<i>Pearson's C.</i>	-.496	.193	—	.351
<i>Sig.</i>	.000	.017		.000
Reflector				
<i>Pearson's C.</i>	—	.337	—	-.232
<i>Sig.</i>		.000		.001
Pragmatist				
<i>Pearson's C.</i>	.248	-.360	—	.282
<i>Sig.</i>	.001	.000		.001

Note. Dashes indicate the correlation was not significant (Sig. > .05). AA = Analyzing Alternatives; DE = Delivering Experiences; GP= Guiding through the process; PK = Providing Knowledge. Pearson's C. = Pearson's Linear Correlation Coefficient.

* The correlation is significant in accordance with the criterion established (Sig. ≤ .05).

The results show that the respondents with Honey's theorist style showed a clear preference for the "Guiding through the Process" dimension, followed by "Analyze Alternatives", and a clear rejection of the "Delivering Experiences" dimension. The reflector style shows a positive correlation with the "Analyzing Alternatives" dimension and a negative correlation with the "Guiding through the Process" dimension. Likewise, the values observed indicate that pragmatists prefer the "Generating Experiences" and "Guiding through the Process" dimensions. However, they rate negatively the "Analyzing Alternatives" dimension of the EDP. Lastly, activists rate positively the "Delivering Experiences" dimension but negatively the "Guiding through the Process" dimension. The doubt is raised as to whether the small number of respondents with this style (only 48 respondents have the activist style) may be the cause of the correlations identified. This issue would require a future analysis with a larger number of individuals with the activist style.

Table 6 shows that the results of the bivariate correlation analysis confirm the degree of association between the learning styles established by Kolb and the EDP dimensions proposed in our model.

Table 6. Correlation Coefficients Between Kolb's Learning Styles and the EDP Dimensions

Kolb*	DE	AA	PK	GP
Converger				
<i>Pearson's C.</i>	-.250	-.353	--	.569
<i>Sig.</i>	.002	.000		.000
Assimilator				
<i>Pearson's C.</i>	-.310	.512	--	-.167
<i>Sig.</i>	.000	.000		.044

Diverger				
Pearson's C.	--	.259	--	-.303
Sig.		.005		.000
Accommodator				
Pearson's C.	.548	-.303	--	
Sig.	.000	.000		

Note. Dashes indicate the correlation was not significant (Sig. > .05). AA = Analyzing Alternatives; DE = Delivering Experiences; GP= Guiding through the process; PK = Providing Knowledge. Pearson's C. = Pearson's Linear Correlation Coefficient.

* The correlation is significant in accordance with the criterion established (Sig. $\leq$.05).

As shown in Table 6, the respondents with the converger style have a clear preference for the "Guiding through the Process" dimension and rate negatively the "Analyzing Alternatives" and "Generating Experiences" dimensions. The assimilators showed a clear preference for the "Analyzing Alternatives" dimension and rated negatively the "Guiding through the Process" and "Generating Experiences" dimensions. With respect to the respondents with the diverger style, a positive correlation is observed with the "Analyzing Alternatives" dimension and a negative correlation with "Guide through the Process". Lastly, the results for the accommodator style indicate a positive correlation with "Delivering Experiences" and a negative correlation with the "Analyzing Alternatives" dimension.

Figures 5 and 6 show the results found when performing the Simple Correspondences analysis.

Figure 5. Graph of Simple Correspondences: Row (Kolb) and Column (EDP) Scores

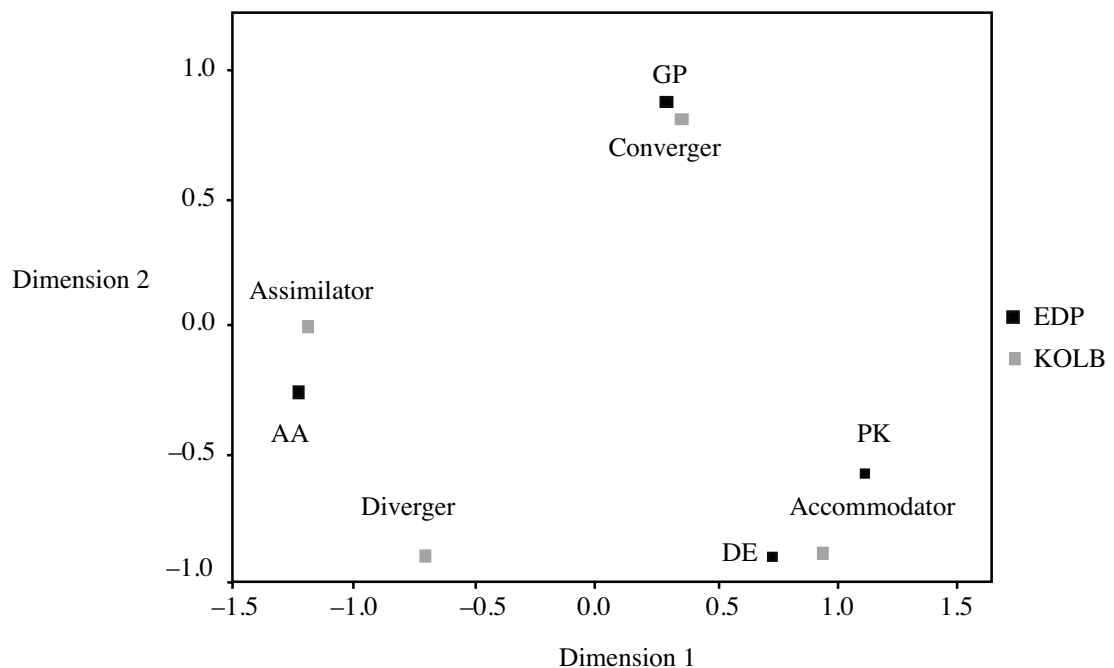
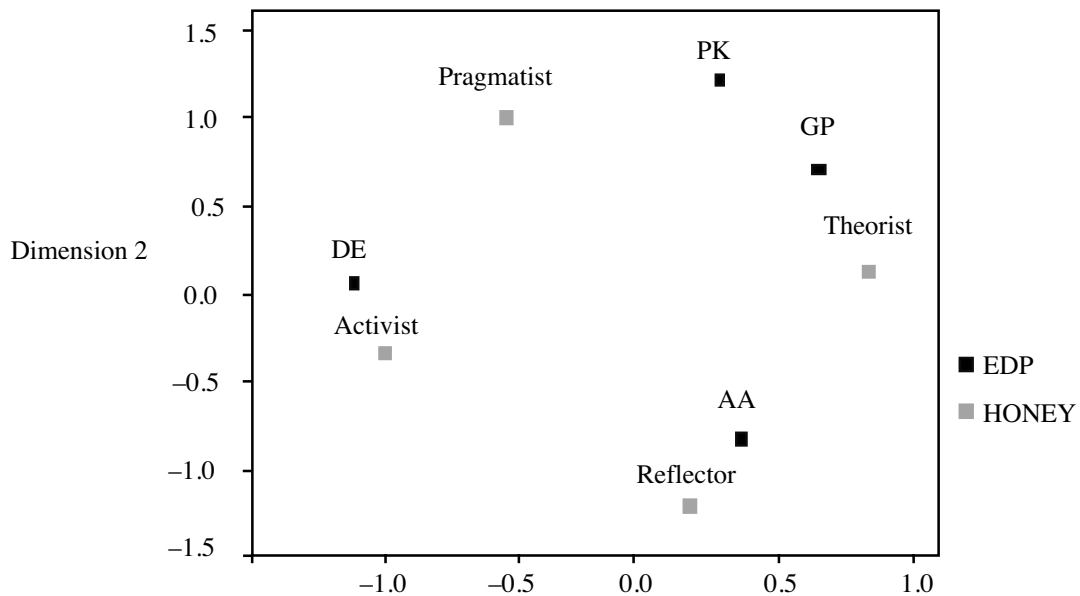


Figure 6. Graph of Simple Correspondences: Row (Honey) and Column (EDP) Scores



As indicated previously, in the graphs plotted from the Simple Correspondences analysis, the proximity between the points plotted is analyzed. Consequently, upon analyzing Figures 5 and 6, the following conclusions can be drawn:

With respect to the Kolb styles, the assimilators and divergers show a greater preference for the “Analyzing Alternatives” dimension; the convergers clearly prefer the “Guiding through the Process” dimension; and, lastly, the accommodator style seems to be closer related to the “Delivering Experiences” dimension. The “Providing Knowledge” dimension appears in a position close to the accommodator style, as the two respondents who rated this dimension very highly have this learning style.

As regards the Honey styles: the activists have a greater preference for the “Delivering Experiences” dimension; the reflectors show a clear preference for the “Analyzing Alternatives” dimension; the theorists show a greater preference for the “Analyzing Alternatives” and “Guiding through the Process” dimensions; and, lastly, the pragmatist style seems to be more correlated with the “Delivering Experiences” dimension. Similarly, the “Providing Knowledge” dimension shows a good correspondence with the pragmatist style.

All of the analyses performed in our research indicate a significant deficit in the respondents with respect to the “Providing Knowledge” dimension. The results found indicate a situation where the “Providing Knowledge” dimension is not highly rated in any of the styles included in the sample. The “Providing Knowledge” dimension is the worst rated dimension, even in the styles in which it should score well (theorist, pragmatist and reflector styles) according to the profiles proposed in Table 3. This opens possibilities for further research.

Summarizing, we have verified, using statistical methods, that there are four EDP dimensions. They are related to both Kolb’s and Honey’s learning styles. We have also proposed that in each Honey’s learning style the EDP has a dominant dimension, two intermediate dimensions and one neutral dimension. We have verified that each individual

has a personal predisposition to use a particular profile. We call it the challenge profile. That specific combination provides the individual's gateway not only to his own learning but also to inducing learning in others. The implications are obvious. Assume a manager wants to induce learning. If he acts spontaneously, he will try to induce learning by using his own profile, his own dimensions, with a specific degree of intensity. If he is dealing with a person with the same profile, this intensity matches the other person's profile. The challenge will be presented through a similar gateway and the learning experience is thus facilitated. However, assume now that the learner has a different profile. Since the profiles do not match, the manager may be "blocking the gateway", i.e. using the wrong approach to induce learning. This might create all sorts of difficulties, the most common one being blocking learning, because the problem is focused under different perspectives. Unless the manager is aware of the different dimensions and profiles, he may not know how to deal with the impasse.

Final Conclusions and future research

To induce knowledge generation, challenges have to be matched to individual needs. To do so, we have presented the four dimensions of the EDP. They form the individual challenge profile and are linked to the individual learning style. A complementary aspect of the above is the fact that the individual learns and educates in the same manner. A manager educator needs to be aware of his own challenge profile and how to induce learning through different profiles.

We need to further expand our data gathering and analysis to further validate our findings. In all styles, the "Providing Knowledge" dimension is rated very low and further research is needed to clarify these intriguing results. Several hypotheses can be put forward to explain this. Our favorite is that the arrival of these theorists at IESE Business School arises from the need to fill this knowledge-providing gap they have. We wish to expand our analysis to verify whether this deficit is more widespread among our students than those of other business schools. It would also be interesting to verify whether this deficit can be seen in a population of former IESE and IDE students. □

References

- Alonso, C.M. (1992), "Análisis y diagnóstico de los estilos de aprendizaje en estudiantes universitarios", Faculty of Philosophy and Educational Sciences, Department of Research Methods and Education Diagnosis, Universidad Complutense de Madrid, Madrid, Spain.
- Alonso, C.M., D.J. Gallego and P. Honey (1997), *Recursos e instrumentos psico-pedagógicos. Los learning styles. Procedimientos de diagnóstico and mejora* (3rd ed.), Spain: Ediciones Mensajero.
- Anderson, J.A. and M. Adams (1992), "Acknowledging the learning styles of diverse student populations: Implications for instructional design", *New Directions for Teaching and Learning*, 49, 19-33. San Francisco, CA: Jossey-Bass.
- Anderson, J.A. (1995), "Toward a framework for matching teaching and learning styles for diverse populations", in R.R. Sims and S. Sims (Eds.), *The importance of learning styles: Understanding the implications for learning, course design, and education* (pp. 69-78), Westport, CN: Greenwood Press.

- Argyris, C. (1982), *Reasoning, Learning and Action*, San Francisco, CA: Jossey-Bass.
- Blackmore, J. (1996), "Learning Styles: Preferences", retrieved July 3, 2001, from: <http://www.cyg.net/~jblackmo/diglib/styl-d.html>.
- Claxton, C.S. and P.H. Murrell (1987), "Learning styles: Implications for improving educational practices", ASHE-ERIC Higher Education Report No. 4, Washington, D.C.: Association for the Study of Higher Education.
- Entwistle, N.J. (1991), "Cognitive style and learning", in K.M. (Ed.), *The foundations of students' learning* (pp. 139-145), Oxford: Pergamon.
- Felder, R.M. (1993), "Reaching the second tier: Learning and teaching styles in college science education", *J. College Science Teaching*, 23 (5), 286-290.
- Felder, R.M. (1996), "Matters of style", North Carolina State University, *ASEE Prism*, 6(4), 18-23.
- Grasha, A. (1996), *Teaching with Style*, Pittsburgh, P.A.: Alliance Publishers.
- Hayes, R.H., S. C. Wheelwright and K. B. Clark (1988), *Dynamic Manufacturing. Creating The Learning Organization*, New York: The Free Press.
- Honey, P. (1988), *Improve your people skills*, Buckingham, U.K.: Institute of Personnel Management.
- Honey, P. and A. Mumford (1983), "Building on Learning Styles," Peter Honey Training Officer. Retrieved June 20, 2001, from: <http://www.mcb.co.uk/services/coursewa/tutguide/tut-010.htm>.
- Honey, P. and A. Mumford (1986a), *The Manual of Learning Styles*, Maidenhead, Eng: Ardingly House, Peter Honey Publications Limited.
- Honey, P. and A. Mumford (1986b), *Using our Learning Styles* (2nd ed.), Maidenhead, Eng: Berkshire.
- Kolb, D.A. (1984), *Experiential learning: Experience as the source of learning and development*, Englewood Cliffs, NJ: Prentice Hall.
- McLoughlin, C. (1999), "The implications of the research literature on learning styles for the design of instructional material", University of New England, *Australian Journal of Education Technology*, 15 (3), 222-241.
- Montgomery, S.M. and L.N. Groat (1988), "Student learning styles and their implications for teaching", *CRLT Occasional Papers*, 10, University of Michigan.
- Mumford, A. and P. Honey (1992), "Questions and answers on Learning Styles Questionnaire", *Industrial and Commercial Training*, 24 (7), 10-13. MCB University Press.
- Muñoz-Seca, B. and J. Riverola (1997), *Gestión del conocimiento*, Biblioteca IESE de Gestión de Empresa. Barcelona: Ediciones Folio.

- Peirce, W. (1999), "Understanding students' difficulties in reasoning, Part two, the perspective from research in learning styles and cognitive styles", Prince George's Community College. Retrieved January 10, 2000, from: <http://academic.pg.cc.md.us/diffpt2.html>.
- Pérez López, J. A. (1991), *Teoría de la acción humana en las organizaciones: La acción personal*, Madrid: Ediciones Rialp, S.A.
- Rainey, M.A. and D. Kolb, (1995), "Using experiential learning theory and learning styles in diversity education", in R.R. Sims and S. Sims (Eds.), *The importance of learning styles: Understanding the implications for learning, course design, and education* (pp. 129-146), Westport, CN: Greenwood Press.
- Sims, R. R and S. Sims (1995), "Learning enhancement in higher education", in R.R. Sims and S. Sims (Eds.), *The importance of learning styles: Understanding the implications for learning, course design, and education* (pp. 1-24), Westport, CN: Greenwood Press.
- Smith, D. and Kolb, D. A. (1986), *A user's guide for the Learning Style Inventory. A manual for teachers and trainers*, Boston: McBer & Co.
- Stice, J. (1987), "Using Kolb's learning cycle to improve student learning", *Engineering Education*, 77, 291-296.