

Grade Level, Age, Gender and Learning-Style preferences of Ivorian Secondary School Students

Amadou Méité¹, Yao Eugène N'Dri²

¹University Félix Houphouët Boigny Abidjan, Côte d'Ivoire, Department of Psychology / Genetic and Differential Psychology
22 Bp 159 Abidjan 22, Côte d'Ivoire

²University Félix Houphouët Boigny Abidjan, Department of Psychology / Genetic and Differential Psychology

ABSTRACT: Several studies have focused on the strategies that students adopt to learn or to solve a problem. These studies, for the most part, highlight the characteristics of the individual or the learner as the main factors influencing learning strategies. In this perspective, the present study proposes a differential and developmental approach and aims to study the influence of gender and age on learning styles. To this end, one hundred and forty-three Ivorian students from the first cycle (6^{ème} to 3^{ème}) and the second cycle (2nd and 1^{ère}), divided according to gender and grade level, responded to the questionnaire of Bergeron & Goudreault, (2003). The data confirm the results of previous work that learning occurs differently: students use auditory, visual or kinesthetic learning styles to learn. The auditory learning style was found to be the dominant learning strategy for younger students (first cycle), while the visual learning style was found to be the preferred style for older students (second cycle). The visual and auditory learning styles are negatively and positively correlated with age and grade level, respectively. Furthermore, these learning styles do not differ by gender. These data thus suggest, from a practical point of view, the application of differentiated instruction especially when we know that "academic failure occurs when instruction is mostly visual for an auditory student and auditory for a visual student".

KEYWORDS: age, auditory learning style, gender, grade level, kinesthetic learning style, learning strategy, visual learning style

I. INTRODUCTION

Learning allows the acquisition of skills, knowledge or know-how. This acquisition would be different from one person to another. In other words, each learner has his or her own style or way of learning most effectively. Some students learn best by listening or seeing or touching what they are studying (Dunn & Dunn 1992; 1993; 2005). Learning thus occurs according to the main perceptual modalities and this general predisposition or tendency or particular way in which individuals are programmed to learn is called "learning style" (Chevrier, Fortin, Leblanc & Théberge, 2000; Pask, 1976; Schmeck, 1983).

Careful reading of certain works, in particular those of Huteau (1987) and Gilles (1999), on individual differences, makes it possible to understand that styles refer to strategies that a given individual tends to favor, most often without knowing it. We then speak of a "dominant" or "preferential" style. Hence the notions of "auditory learning style", "visual learning style" and "kinesthetic learning style" to designate respectively learners who use hearing, sight and touch to learn or to solve a problem. Perhaps with this in mind, Sousa (2002) writes that "just as one develops a preference for using the left or right hand, one also adopts a preferred method of gathering information from the environment" (Sousa, 2002, p 61). However, according to Paivio's coding theory and Meyer's multimedia theory (2003), one learning style is often dominant, but the learner may also exhibit a combination of the other styles depending on the situation. Thus, we cannot speak of a "preferred way" of learning or a "single way" of perceiving or processing information since, on the one hand, humans perceive and use all connections to process information and to learn (Keefe & James, 1979; Seitz-Kim & Shams, 2006) and, on the other hand, verbal representations (specialized in the direct processing of language) and nonverbal representations (specialized in the processing of nonlinguistic objects and events) are linked to an abstract conceptual system that is activated when recognizing, manipulating, or simply thinking about words or things (Paivio, 1971; 1986). Thus learning involves multi-sensory interactions.

As we can see, the person or "individuality" plays an eminently active role in the learning situation, precisely in terms of the strategies he or she uses to be effective. Many studies have shown that these strategies or learning styles are influenced by several factors. Entwistle (1981) distinguishes three groups of factors, namely the characteristics of students, teachers and institutions. Vermunt's (1998) theory describes four components: study strategies, regulation strategies, learning design and learning orientation, while Dunn and Dunn's theory identifies environmental, emotional, sociological preference and physiological factors. Some cognitive science studies emphasize the characteristics of the individual or learner, including age and gender. With regard to gender, Burke and Dunn (1998) were able to show differences in learning style preferences among 11- and 12-year-old Taiwanese students: for example,

Grade Level, Age, Gender and Learning-Style preferences of Ivorian Secondary School Students

females would prefer a more formal environment and would tend to be more "analytical" in their learning style. The authors suggest that males are more likely to use "sequential" learning than females, while males show a greater preference for their kinesthetic modality and prefer intake than females. Severiens and Ten Dam (1997), on the other hand, suggested that gender identity is the most important factor in learning style differences and, according to these authors, males would use more undirected learning while females would use more of a reproductive style. Jiménez Catalán (2003), who had addressed these differences in a quantitative approach, had observed in Spanish-speaking students that women used a greater variety of strategies (second language vocabulary acquisition strategies) than men. However, other authors have not observed such differences or have found relatively small gender differences in their various studies (Afshar, 2010; Zeegers, 2001).

Moreover, these preferences in terms of learning style seem to evolve, according to studies that have highlighted the influence of age. For example, some authors, notably Dunn, Bruno, Sklar, and Beaudry (1990) identify two learning styles: distributed learning or "analytic style" (learning is easy when information is presented step by step in a sequential and cumulative scheme) and massed learning or "global style" (learning is easier when the learner understands first and can then concentrate on the details). For these authors, these two learning styles evolve as learner's age and progress through their level of studies. The majority of elementary school students, for example, use analytic style, but with age and grade level, some of them change and use global style. Gardner (1993) refers to learning styles as intelligence types (linguistic, logical-mathematical, musical, visual-spatial, kinesthetic, interpersonal, and naturalist intelligences). The author also speaks of style. He suggests that this dominant intellectual ability may change throughout life. Dunn and Griggs (1995) and Burke and Dunn (1998) also found that learning style preferences change over time. Moreover, these age-related differences could be explained by motivation and memory abilities (Vermunt, 2005), as well as by the level of life experience with learning situations (Zeegers, 2001).

To be clear, many researchers have been interested in how students learn and the different factors that can influence these learning styles. Most of the work on individual characteristics identifies age and gender as the main factors influencing learning strategies. However, a limited number of these studies take a differential and developmental perspective. The present study proposes an approach from this perspective and aims to investigate the influence of gender and age on the learning styles of secondary school students.

II. METHOD

A. Participants

One hundred and forty-three undergraduate (6^{ème} to 3^{ème}) and graduate (2nd and 1^{ère}) students, divided by gender and grade level, participated in the present study. Data on the enrolment and average age of these different groups are presented in Table 1.

Table 1. Distribution And Characteristics Of Students By Gender And Grade Level

	Gender		Grade level					
	Boys	Girls	6 ^{ème}	5 ^{ème}	4 ^{ème}	3 ^{ème}	2 nd	1 ^{ère}
Participants	79	64	21	13	21	41	26	21
Average age	14,23	13,98	10,43	12,00	12,95	15,27	16,15	16,52
Standard deviation	2,044	2,320	0,598	0,913	0,973	0,633	0,925	0,928

B. Materials and procedure

Questionnaires on learning styles have been developed from several works, notably those of Reinert (1976), Barbe, Swassing and Miloneen (1979), to estimate the type of representation favored by the learner in his or her language learning (Edmond Learning Style Identification Exercise) and to measure styles based on the learner's perceptions of his or her behavior (Swassing-Barbe Perceptual Modality Instrument). In addition, other instruments for measuring learning styles have been adapted into French and allow for the establishment of a student learning profile without "typifying" the student, i.e., classifying him or her into a single category. These are: the Learning Style Inventory (LSI) by Dunn, Dunn, and Price (1996), the Children's Embedded Figures Test (CEFT) by Karp and Konstadt (1963), and the Learning Style: The Clue to You! (LS:CY!) by Burke and Dunn (1998).

The Dunn, Dunn, and Price (1996) questionnaire was used by some authors, including Bergeron and Goudreault in 2003, as part of the "1996-1997 Peer Tutor Program" to help students discover their "visual," "auditory" or "kinesthetic" preference profile.

This questionnaire is composed of twenty-five items, each with three possible answers, noted A, B, and C. Each of the choices corresponds to each of the three learning styles. For example, for item 1 "I can remember things better than:", the subject has the choice between only these three answers: A "I read", B "I hear", C "I do". For this item, the answer "A" corresponds to the visual style, the answer "B" is the auditory style and "C" is the kinesthetic style.

The instructions are as follows: "You have a sheet of paper in front of you with twenty five questions. For each question, indicate what you do most often. Your answers will help you understand how you learn best. The way you learn best is your learning style. To do this, you must select an "X" for the statement that best suits you.

Grade Level, Age, Gender and Learning-Style preferences of Ivorian Secondary School Students

The test took approximately 20 to 30 minutes to complete. On the whole, the students did not show any particular difficulty in understanding the instructions and in completing the questionnaire. At the end of the test, the experimenter indicated the total number of answers obtained by each student for each of the choices A, B and C.

In order to show inter- and intra-individual differences between students' grades and genders with respect to their learning styles, analyses of variance (ANOVA) for independent groups were performed. TUKEY comparisons were used to specify these differences for each of the modalities of the different factors studied.

III. RESULT

A. Grade level, age and learning style of secondary school students

The average scores of students in each of the learning styles, by grade level, are shown in Table 2. Comparison of these mean scores across grade levels shows that there is a significant difference between these mean scores; indicating that learning occurs differently: (Visual / Auditory: $[t(142) = -1.131, ns]$; Visual / Kinesthetic: $[t(142) = 5.743, p < .001]$; Auditory / Kinesthetic: $[t(142) = 6.581, p < .001]$). When students were divided into their preferred learning style(s) (visual, auditory, kinesthetic, visual and auditory, visual and kinesthetic, visual, auditory, and kinesthetic), auditory learning style was found to be the dominant style (51.0%) followed by visual learning style (32.9%) and kinesthetic learning style (7.7%) (Table 6).

Table 2. Average Scores And Standard Deviations By Grade Level Of Ivorian Secodary School Students In Bergeron And Goudreault's Scale (2003)

Learning styles	Grade level	Average	Standard deviation
Visual	4 ^{ème}	12,62	2,334
	5 ^{ème}	11,85	2,824
	6 ^{ème}	11,81	3,473
	3 ^{ème}	10,61	1,626
	2 nd	8,69	1,975
	1 ^{ère}	8,14	1,062
	Total	10,48	2,690
Auditory	1 ^{ère}	13,86	1,389
	2 nd	13,08	2,465
	5 ^{ème}	11,08	2,722
	3 ^{ème}	9,98	2,185
	4 ^{ème}	9,33	2,176
	6 ^{ème}	8,95	2,539
	Total	10,97	2,867
Kinesthetic	3 ^{ème}	9,46	1,859
	6 ^{ème}	9,24	3,360
	2 nd	8,23	1,557
	4 ^{ème}	8,10	2,406
	1 ^{ère}	8,00	,949
	5 ^{ème}	7,08	1,754
	Total	8,57	2,190

Moreover, the analysis of variance shows an effect of students' grade level on visual $[F(5,137) = 14.519, p < .001]$, auditory $[F(5,137) = 18.672, p < .001]$, and kinesthetic $[F(5,137) = 3.941, p < .002]$ learning styles (Table4). In other words, the learning style differs by students' grade level and visual and auditory styles are the dominant styles of students, The auditory learning style is the dominant learning strategy among older students (2nd and 1^{ère}) while younger students (6^{ème}, 5^{ème}, 4^{ème}, 3^{ème}) use the visual learning style instead.

Table 3. Summary Of The Treatment Of The Observations (Anova)

Learning styles		Sum of squares	ddl	Everage of squares	of F	Meaning
Visual	Intergroup	373,059	5	74,612	16,026	,000
	Intragroup	614,564	132	4,656		
	Total	987,623	137			
Auditory	Intergroup	549,540	5	109,908	25,665	,000

Grade Level, Age, Gender and Learning-Style preferences of Ivorian Secondary School Students

	Intragroup	565,278	132	4,282	
	Total	1114,819	137		
	Intergroup	118,716	5	23,743	,000
kinesthetic	Intragroup	479,168	132	3,630	
	Total	597,884	137		

Significance level $\alpha=.05$.

In addition, the relationships between visual, auditory, and kinesthetic styles, students' age, and grade level were tested (Table 4). The intercorrelational analysis shows a strong negative correlation between the three learning styles. The visual style is correlated negatively with age ($r= -.458$) and level of education ($r= -.508$) while auditory style is positively correlated with age ($r= .388$) and level of education ($r= .516$). On the other hand, the kinesthetic style correlates neither with the level of education nor with the age.

Table 4. Matrix Of Intercorrelation Between Age, Grade Level And Learning Styles (Visual, Auditory And Kinesthetic) Among Ivorian Secondary School Students

	Learning styles			Age	Grade level
	Visual	Auditory	kinesthetic		
Learning styles	Visual	1			
	Auditory	-,686**	1		
	kinesthetic	-,320**	-,468**	1	
Age		-,458**	,388**	,058	1
Grade level		-,508**	,516**	-,052	,866**

**The correlation is significant at the 0.01 level (two-tailed).

B. Gender and learning style in secondary school

Table 5 shows the influence of gender on the different learning styles. Statistical analysis (Analysis of Variance) indicates that students' learning styles (visual, auditory, and kinesthetic) do not differ by gender (Visual: $[F(1,141) = 0.058, ns]$, auditory $[F(1,141) = 2.037, ns]$ and kinesthetic $[F(1,141) = 2.555, ns]$). In other words, depending on whether the student is female or male, the student does not have a dominant learning style.

Table 5 Summary Of The Treatment Of The Observations (Anova)

Learning styles		Sum of squares	ddl	Everage of squares	F	Meaning
Visual	Intergroup	,426	1	,426	,058	,809
	Intragroup	1027,280	141	7,286		
	Total	1027,706	142			
Auditory	Intergroup	16,616	1	16,616	2,037	,156
	Intragroup	1150,210	141	8,158		
	Total	1166,825	142			
kinesthetic	Intergroup	12,118	1	12,118	2,555	,112
	Intragroup	668,861	141	4,744		
	Total	680,979	142			

Significance level $\alpha=.05$.

In addition, students are categorized according to their preferred learning style(s) (Table6). Note that one learning style is often dominant, but the individual may also exhibit a combination of the other styles, depending on the situation; hence the combinations visual and auditory; visual and kinesthetic; visual, auditory, and kinesthetic styles. The χ^2 test also shows that learning styles do not differ by gender [$\chi^2 (5) = 7, 033, ns$].

Descriptive analysis of the distribution of students according to their preferred learning style(s) shows that the order of choice of learning styles is the same, regardless of gender (Boys: auditory (27.3%), visual (18.2%), kinesthetic (6.3%); Girls: auditory (23.8%), visual (14.7%), kinesthetic (1.4%)).

Grade Level, Age, Gender and Learning-Style preferences of Ivorian Secondary School Students

Table 6: Distribution Of Students By Preferred Learning Style

Gender		Learning style					
		Visual	Auditory	Kinesthetic	Visual / Auditory	Visual / Kinesthetic	Visual / Auditory / Kinesthetic
Boys	workforce	26	39	9	0	3	2
	Theoretical workforce	26,0	40,3	6,1	1,7	2,8	2,2
	%	18,2%	27,3%	6,3%	,0%	2,1%	1,4%
Girls	workforce	21	34	2	3	2	2
	Theoretical workforce	21,0	32,7	4,9	1,3	2,2	1,8
	%	14,7%	23,8%	1,4%	2,1%	1,4%	1,4%
Total	workforce	47	73	11	3	5	4
	Theoretical workforce	47,0	73,0	11,0	3,0	5,0	4,0
	%	32,9%	51,0%	7,7%	2,1%	3,5%	2,8%

Significance level $\alpha=.05$.

Regarding the combined effect of gender and grade level on different learning styles, statistical analysis (ANOVA) shows that girls and boys have a comparable distribution for each level of education [$F(5,136) = 0.396, ns$].

IV. DISCUSSION

In this study, visual, auditory and kinesthetic learning styles were also observed in Ivorian students at the younger and older levels. Learning is therefore done differently, as Dunn and Dunn (1992; 1993; 2005) pointed out. Moreover, for all levels of study combined, the auditory learning style is the dominant style, followed by the visual learning style and the kinesthetic learning style. Nevertheless, a significant number of students (16.1%) show a combination of the other styles (visual and auditory; visual and kinesthetic; visual, auditory, and kinesthetic). This is consistent with Paivio's (1971; 1986) dual coding theory and Meyer's (2003) multimedia theory, which states that although verbal and visual information are processed in different ways and through different channels in the human mind, both types of information can be used when recalling information.

The learning style also differs according to the students' grade level. Indeed, the majority of students at the undergraduate level favor the visual learning style, but once at the graduate level, some of them change and use the auditory learning style. This indicates, as Dunn, Cavanaugh, Eberle, and Zenhausern (1982), Dunn, Bruno, Sklar, and Beaudry (1990), Dunn and Griggs (1995), and Burke and Dunn (1998) have suggested, that learning style evolves or changes over time. This change is related to motivation and memory abilities as well as to the level of life experience with learning situations (Vermunt, 2005). Zeegers (2001), who conducted a longitudinal study with Australian students, also showed that the preferential style is dynamic and likely to change as a result of the learning experience. In addition, it was observed in the present study that visual style is negatively correlated with age and level.

The auditory style is positively correlated. These different links are in line with the correlation observed by Dunn and Dunn (2005) for whom the older we get, the more we prefer auditory style and the less we prefer visual style. Could this change be related to aging, i.e. to a problem of the speed of alteration of these two functions (visual and auditory)? The learning style preference for undergraduates could be explained by the advent of multimedia learning (videos, images and animations, course illustrations with images and graphics, etc.). Thus, it appears that the hypothesis regarding the effect of grade level and age is fully supported. On the other hand, the predictions concerning gender differences were not validated insofar as the visual, auditory and kinesthetic learning styles did not differ according to the gender of the students. Furthermore, the order of choice of learning styles was the same regardless of gender. In fact, auditory learning style was the dominant style followed by visual learning style and kinesthetic learning style. These results are not consistent with those of Severiens and Ten Dam (1997) who found differences between male and female students in reproductive and non-directed learning styles. This discrepancy could be attributed to the different levels of education considered in the two studies. However, although the study was conducted with students, the data are related to those of Zeegers (op cit.) who conducted a comparison of student learning styles longitudinally. This suggests that there is a great deal of homogeneity between boys and girls on learning styles as they progress through their studies. This is consistent with what is shown in this study when the effect of the gender and grade interaction is taken into account. In other words, girls and boys are similarly distributed at each level of schooling.

V. CONCLUSIONS

This study is part of the research on individual differences in learning and aims to highlight the different learning styles adopted by junior and senior high school students, and to verify whether these styles differ according to gender or evolve according to the level of education. The data set regarding the influence of grade level and age reveals that learning style differs by student grade level and that visual and auditory styles are the dominant styles of students. The auditory learning style was found to be the dominant learning strategy for senior students while the visual learning style was found to be the preferred style for junior students. The low proportion of students using the kinesthetic style (7.7%) and a combination of more than two styles (16.1%) to learn or solve a problem is noteworthy. Certainly, adapting teaching strategies to each student's learning style profile is of great interest, since academic failure occurs when instruction is primarily visual for an auditory student and auditory for a visual student (Ismail and al., 2010). However, it turns out that learning involves multi-sensory interactions and has cognitive, affective and metacognitive aspects. Consequently, for greater efficiency and personal empowerment of the students, the competent authorities, more specifically the pedagogues, should harmonize the pedagogical formulas with the preferences and characteristics of these learners.

Notwithstanding the identification of different learning styles using Bergeron and Goudreault's (2003) questionnaire, the use of other instruments seems necessary, such as Burke and Dunn's (1998) 'Learning Style: The Clue to You (LS:CY!)' or 'global assessment of learning styles', and Dunn, Dunn, and Price's (1996) 'Learning Style Inventory (LSI)'. For example, the LSI takes into account the immediate environment, emotionality, sociological and physiological factors and, among other things, determines the best time of day for each student to engage in the difficult subjects required. In this sense, other studies could extend, from a chronopsychological perspective, on the variations of these performances according to the best day of week. Also, using other instruments that take into account school or academic subjects, the gender difference in learning style would be more pronounced, since the learning styles are correlated with these subjects (Curry, 1990; Dunn, Bruno, Sklar, & Beaudry, 1990; Mosconi, 2004).

REFERENCES

1. Afshar, H. S. (2010). Iranian EFL learners' most and least frequently-used vocabulary learning strategies: The relationship to success and gender. *The Iranian EFL Journal*, 6(1), 72-100.
2. Barbe, W. B., Swassing, R. & Milone, M. (1979). *Teaching through Modality Strengths: Concepts and Practices*. Columbus, OH: Zaner-Bloser.
3. Bergeron, M. & Goudreault, J. (2003). *Questionnaire to know your sensory perception profile Visual / Auditory / Kinesthetic*. Peer Tutor Program 1996-1997. Layout Gaëtan Noël. Sherbrooke Quebec. Retrieved March 2, 2020 from: <https://karinesimardcoaching.com/data/documents/VAKENFANT.pdf>
4. Burke, K., & Dunn, R. (2003). Learning-Style based teaching to raise minority student test scores: There's no debate! *The Social Studies*, 94(4), 167-170.
5. Chevrier, J., Fortin, G., Leblanc, R. & Théberge, M. (2000). Le style d'apprentissage: une perspective historique. *Éducation et francophonie*, 28(1), 20-46
6. Curry, L. (1990). *Learning styles in secondary Schools: A Review of Instruments and Implications for their use*. Madison: National Center of Effective Secondary Schools & University of Wisconsin-Madison, Wisconsin Center for Education Research.
7. Dunn, R., Bruno, J., Sklar, R.I., & Beaudry, J. (1990). Effects of matching and mismatching minority developmental college students' hemispheric preferences on mathematics scores. *Journal of Educational Research*, 83(5), 283-288.
8. Dunn, R., Cavanaugh, D., Eberle, B., & Zenhausern, R. (1982). Hemispheric preference: The newest element of learning style. *The American Biology Teacher*, 44(5), 291-294.
9. Dunn, R and Dunn, K (2005). Thirty-five years of research on perceptual strengths: Essential strategies to promote Learning. *The Clearing House*, Vol78, No6, pp 273-276.
10. Dunn, R., Dunn, K., & Price, G. E. (1996). *Learning Style Inventory*. Lawrence, KS: Price Systems, Inc.
11. Dunn, R., & Griggs, S. A. (1995). *Multiculturalism and learning style: Teaching and counseling adolescents*. Westport, CT: Praeger.
12. Entwistle, N.J. (1981). *Styles of Learning and Teaching*. New York: Wiley.
13. Gardner, Howard (1993). *Multiple intelligences: the theory in practice. A reader*. New York: Basic Books.
14. Gilles, P. (1999). *Psychologie différentielle*, Collection Grand Amphi, Breal.
15. Ismail, A. Raja Hussaina, R.M. & Jamaluddina, S. (2010). Assessment of students' learning styles preferences in the faculty of science, Tishreen University, Syria, *Procedia Social and Behavioral Sciences* 2 (2), 4087-4091
16. Jiménez Catalán, R.M. (2003). Sex differences in L2 vocabulary learning strategies, *International Journal of Applied Linguistics*, 13(1), 54-77.
17. Karp, S.A., & Konstadt, N.L. (1963). *Manual for the Children's Embedded Figures Test*. Cognitive Tests.
18. Keefe, J.W. (1979). Learning Style: An Overview. In James, W. Keefe, J.W. (Ed.), *Student Learning Styles: Diagnosing and Prescribing Programs*, pp.1-17. Reston, VA: National Association of Secondary School Principals (NASSP).

Grade Level, Age, Gender and Learning-Style preferences of Ivorian Secondary School Students

19. Mayer, R.E. (2003). The promise of multimedia learning: using the same instructional design methods across different media, *Learning and Instruction*, 13, 125-139.
20. Mosconi, N. (2004). On gender inequality in family and school education. *City, School, Integration - Diversity*, 138, 15-22.
21. Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart, and Winston.
22. Paivio, A. (1986). *Mental representations: a dual coding approach*. Oxford. England: Oxford University Press.
23. Pask, G. (1976). Styles and Strategies of Learning. *British Journal of Educational Psychology*, 46, 128-148.
24. Reinert, H. (1976). One Picture Is Worth a Thousand Words? Not Necessarily! *The Modern Language Journal*, 60, p. 160-168
25. Schmeck, K., Ronald R. (1983). Learning Styles of College Students, in Rona F. Dillon and Ronald R. Schmeck, K. (Eds.), *Individual Differences in Cognition*, vol. 1. New York: Academic Press, pp. 233-279.
26. Seitz, A.R., Kim, R., & Shams L. (2006). Sound facilitates visual learning. *Current Biology*, 16, 1422-1427.
27. Severiens, S. & Ten Dam, G. (1997). Gender and Gender Identity Differences in Learning Styles. *Educational Psychology*, 17(1-2), 79-93
28. Sousa, D.A. (2002). *A brain for learning*, Chenelière / McGraw-Hill, Montreal, 328p.
29. Vermunt, J.D. (1998). The regulation of constructive learning processes, *British Journal of Educational Psychology*, 68, 149-171.
30. Vermunt, J.D. (2005). Relationships between student learning patterns and academic performance, *Higher Education*, 49, 205-234.
31. Zeegers, P. (2001). Approaches to learning in science: a longitudinal study, *British Journal of Educational Psychology*, 71, 115-132.