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Learning Styles as a Tool to Improve both Guidance and Tutoring Actions

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Abstract
The reduction of the dropout represents, at the moment, a big point of attention for all the institutions.
In Italy, the percentage of population with a high level of education is dramatically lower with respect to other UE countries. The Europe 2020 strategy for growth includes strategies to improve the educational levels.
University of Camerino support the students with guidance and counseling centre with the aims to promote self-awareness and self-expression. In parallel, a critical revision of general plan, teaching programs, student performance and so on, is performed every year.
In the course of "Nutritional Biology", a big number of dropout students was observed. Moreover, the students with an adequate number of ECTS/year are not enough.
In order to reduce the dropout and increase the performance of the students, a pilot study was developed.
Firstly, the possible approaches useful to analyze the target involved in the study and suitable to develop a personalized learning, were evaluated.
*We chose to analyze a sample of 64 students enrolled in the first year of nutritional biology utilizing two questionnaires to find indicators relate to the teaching/learning activities and to define a plan of guidance (*helping students *to become* aware *of* their *individual* strengths/weaknesses*) and strategies for* effective *teaching and tutoring. The questionnaires, compiled online and in personal form, lead us to define the socio-cultural contexts and learning styles of the students.*
*Learning styles were defined by using the CHAEA questionnaire (*Cuestionario Honey-Alonso de Estilos de Aprendizaje*) and the data obtained indicate that the predominant learning style results to be Reflexive followed by Theoretical, Pragmatic and Active. In addition, the data indicates that learning style is influenced by several factors: it's related to gender, high school and family context.*
The study of learning styles is useful as a starting point for improve strategies in the field of learning/teaching and to stimulate the students' self-evaluation. The obtained results encourage the use of CHAEA questionnaire, considered of great value such as innovative support in the field of University teaching.

1. Introduction
On June 19th, 1999, the Ministers of higher education of 29 European countries met in Bologna to kick off a process of harmonization of the systems of higher education, to promote free movement of students and teachers. From this meeting came the document known as the "**Bologna Declaration**" [1], which, in a context of *life long learning*, seeks greater competitiveness in schools, along with a gradual increase in diplomate and graduate people in Europe.
Since then, many reforms to restructure the University system and secondary schools were proposed in Italy but they failed to support the action of these changes with a plan for guidance. In fact, in Italy, the national guidelines for lifelong guidance [2] are issued in 2014.
The effects of such insufficient orchestration are unfortunately evident. Italian graduates (22.4%) represent the lower percentage in the European Union with a predominance of women (27.2%) over men (17.7%) [3].
Italy is thus not managed to implement this long-awaited paradigm shift. That's why we have to ask ourselves what kind of culture we send to the younger generations and how do we favor "that young people have opportunities to develop skills and ways of thinking" [4].
Universities intercept the students' needs with difficulty: many of them perceive a sense of loneliness and frustration, which eventually leads them to dropout.

For these reasons the University of Camerino (Unicam) offers a lot of services to their students. Particularly, in order to find a way to reduce dropout and increase students performance, this research group focused the attention on students, learning styles and their monitoring.

2. Learning styles

Learning is a process whereby everyone acquires new knowledge and on which many factors can influence: individual and collective experiences, information and motivation coming from environment, social, cultural and emotional influences.
In general, learning style refers to the way in which a person feels and reacts when faced with learning tasks. Theories of learning and their impact on current teaching practices help us to identify the most useful resources to re-arrange the guidance and tutoring, in order to encourage students to independent development in learning.
A corollary of the cognitive theories of the 20th century, there's constructivism which marks the transition from an approach centered on the content to be learned to one centered on learners. In this sense, the teaching-learning process becomes a horizontal relationship between teachers and students, exceeding the vision in which learning takes place only for knowledge transfer. There is significant learning activity when the individual collaborates with others and internalizes the knowledge. Among constructivism's exponents there are Piaget, Vygotsky, Bruner, followed by Gardner with his theory of multiple intelligences and Kolb with his learning cycle [5], which focus on the subjects and the conditions in which they can make the most of their abilities.
Kolb's model describes learning as transformation of an experience that takes place through four steps: concrete experimentation, reflective observation, abstract concepts and active experimentation of concepts in new situations. Everyone learns with its own learning style, making the four steps in a unique and personal way. If the subject performs with skill all steps, we can say that he has got a balanced learning style. Most of the time just a few steps are made with good skills, while others are tackled poorly or not at all. The preference for certain step than others is classified into four types of style (adaptive, divergent, convergent and assimilative), identified by Kolb with a specific questionnaire.
In the 1980's, in line with the studies of Kolb, also Honey and Mumford describe learning as a cyclical process, according to four steps or styles: active, reflective, theoretical and pragmatic [6].
Later, Honey works with Alonso and Gallego, teachers of UNED Spanish University, experts in the field of learning styles. Honey delineates with them a list of features that clearly describes the four styles. To define how a subject learns, they prepare the CHAEA questionnaire (*Cuestionario Honey-Alonso de Estilos de Aprendizaje*) [6], consisting of 80 items (20 items for each of 4 styles), translated (in italian) by Bocciolesi and subsequently modified [7, 8, 9].
The CHAEA [6], offers a valuable approach to locate the student's attitude, through a series of statements that lead an abstract dimension to objective situations or actions.

3. Aims and methods

This research activity involves guidance service, tutoring, a Ph.D. student in Science Education and the course of study in Nutritional Biology (Unicam). This study examines the areas of tutoring and guidance, following the dictates of modern pedagogy, for which the student must be helped "not only in the subject he is studying, but also in their own way of learning and thinking" [4].
In the present paper, the pilot study developed in 2015 with a sample of 64 students out of 167 enrolled in the first year, is reported. The study intends to explore some topics such as: the causes behind the students dropout, reflection on the way of studying, interventions to improve the approach in the acquisition of skills and knowledge. In particular, the learning processes and the ways in which these are influenced, by the socio-cultural context, are investigated.
The study's objective is to identify a simple tool to draw a comprehensive profile of the student population and to devise appropriate structured and personalized initiatives for guidance and tutoring.
Learning styles, in agreement with Alonso and Gallego, were evaluated with the italian version of CHAEA [7, 8, 9]. For the first time in Italy, the questionnaire has been compiled by students in non-anonymous form.

4. Results and discussions

Data analysis were performed by using "R", a free software environment for statistical computing and graphics. We present here only an indicative selection of the obtained results.

total student	sample	female students	male students
167	64	52	12

Table 1. Population and sample data.

The CHAEA attaches to each style (activist, reflector, theorist, pragmatist) a score ranging from 0 to 20. The statistical analysis for each type of learning style was reported.

style	mean	median	SD	IQR	0%	25%	50%	75%	100%
pragmatist	12.41	12.00	2.28	3.00	8.00	11.00	12.00	14.00	18.00
reflector	15.94	16.00	2.44	3.00	10.00	15.00	16.00	18.00	20.00
theorist	13.22	13.50	2.49	3.25	6.00	11.75	13.50	15.00	19.00
activist	11.28	11.00	2.91	4.00	5.00	9.00	11.00	13.00	20.00

Table 2. Statistical treatment of learning styles'data and distribution of scores in quartiles

style	10% quantile: max value of very low level	30% quantile: max value of low level	70% quantile: max value of moderate level	90% quantile: max value of high level	100% quantile: max value of very high level
pragmatist	9.00	11.00	14.00	15.00	18.00
reflector	12.00	15.00	17.00	19.00	20.00
theorist	10.00	12.00	14.00	16.00	19.00
activist	8.00	10.00	12.00	15.00	20.00

Table 3. Scale of interpretation of preference levels for the different styles

It should be noted that the score for each quantile is style-related, for example, getting a score of 15 for the theoretical style does not have the same meaning as getting 15 for reflective style. From the scores we have obtained a scale, for interpreting the preference levels for each style (very low, low, moderate, high, very high), following the suggestions of Honey and Mumford [10] and as calculated in Table 3.
From the statistical analysis of the data, we get a result set (Table 1 and Table 2.) that allow us to build the box-plot reported in Fig. 1 and the radar-chart reported in Fig. 2.

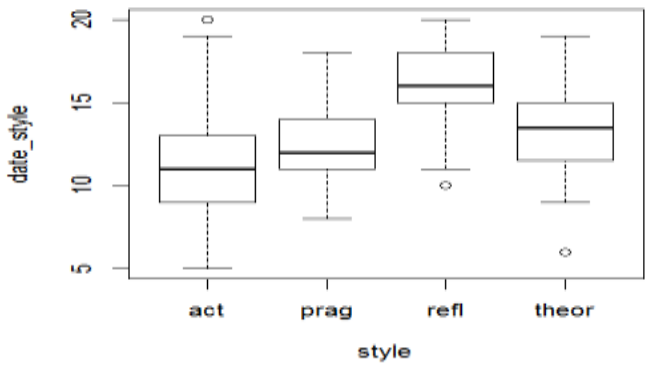

Fig. 1. Box plot of Learning Styles

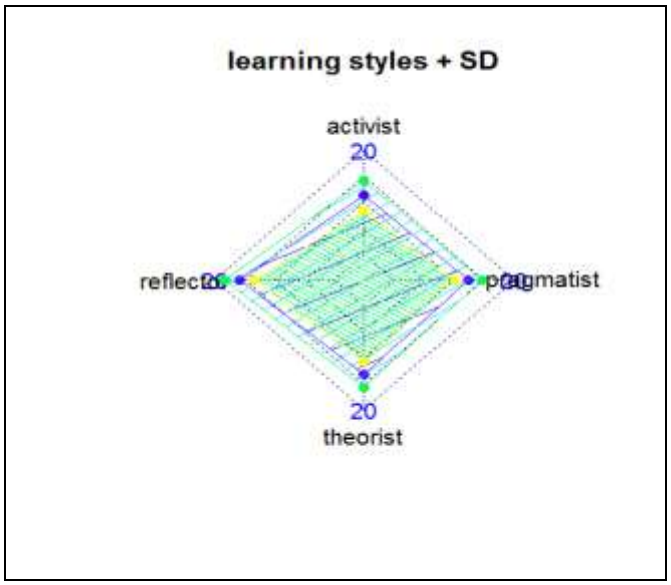

Fig. 2. Mean of Learning Styles (blue) ± SD (yellow, green)

In Fig.1 and Fig. 2. it can be seen that the sample shows the four styles with levels of preference moderate; but considering standard deviations (SD) can be seen that reflective-theoretical styles prevail on the pragmatic-active ones.
The Anova test (Table 4) indicates that there is significant difference in scores between the four styles of fresheman of the Degree course of Nutritional Biology.

	DF (Degrees of Freedom)	Sum (Sum of squares)	Sq Mean (Square Mean)	Sq F value (Square F value)	PR (> F) (P value)
styles	3	755.5	251.85	38.96	< 2e-16
Residuals	252	1629.1	6.46	---	---

Table 4. Summary results of Anova Tests

A significant correlation is detected, using a Bonferroni post-hoc test, between the active-reflective, active-theroretical, pragmatic-reflective and reflective-theoretical pairs of styles (Table 5).

	active	pragmatic	reflective
pragmatic	0.07769	---	---
reflective	< 2e-16	6.9 e-13	---
theoretical	0.00014	0.43106	3.1 e-08

Table 5. Bonferroni post-hoc test of the data analyzed in Table 4 by Anova.

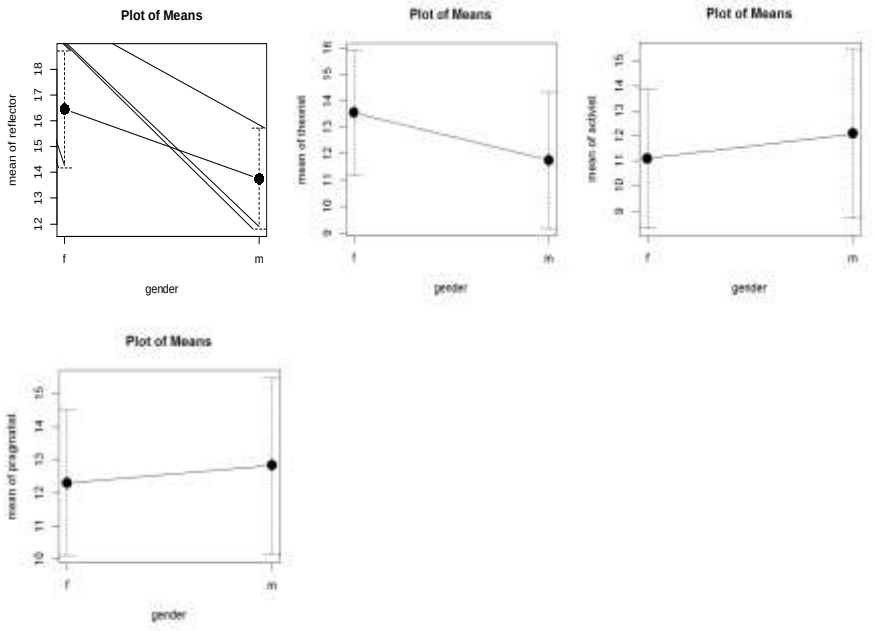

Fig. 3. Plots of Means: gender vs style

Examining the correlation between the averages of the styles and gender (Fig. 3), the predominance of reflective-theoretical style more than the active-pragmatic one is evidenced for females. For the males, however there is a lower preference of reflective-theoretical style, while it is preferred active-pragmatic style (although deployed on a wide range of values). These results may be related to the socio-cultural environment, in which students are subjected by virtue of their gender. These results could also explain the higher women graduates reported in Eurostat data [3], in fact, in Italy, both high-school and University studies required more reflective-theoretical styles.

5. Conclusions

Data collection through the CHAEA questionnaire, along with other socio-cultural and academic data, prove to be a valuable tool for analyzing the student profile, helping to support them in self-evaluation and to reformulate the academic activities (guidance, teaching and tutoring) according to students' learning styles.

These preliminary results appear consistent with the difficulties revealed by students, during the exam sections. Of course, the whole process will be assessed in retrospect, when the analysis of the data collected and the interviews of the involved students will provide clear answers about the methodology adopted, its operation and any changes to be made.

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