

Characterization of the Student's Personality to Develop an Agent that Selects Intelligent Learning Environments Study Materials

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Abstract. This article presents a proposal on the characterization of the student's model considering the attributes that describe their personality. This work seeks similarities to establish a relationship between the personality types and learning styles present in students and in this way identify a correspondence between the learning style and the personality profile that influences how the student learns. The models in which the analysis is focused are the learning style based on the four sensory modes: visual, auditory, reading-writing, and kinesthetic and the type indicator instrument, Myers-Briggs Type Indicators, for the classification of personality. With the analysis of the characteristics of the personality and the attributes of the learning style, a series of relationships were identified that describe the way in which the attributes have similarities, thus identifying the frequency in which the descriptive aspects appear. Through percentages the level of acceptance for each learning style is identified according to the personality profile, this will represent with what type of material the student prefers to acquire knowledge. The result of this work is the characterization of the student's personality profile model to influence the generation of an automated process for selecting materials in an intelligent learning environment through an agent capable of establishing a relationship with their learning style.

Keywords: Personality, learning style, intelligent learning environment, selector agent.

1 Introduction

Personality is a unique element that involves our peculiar way of thinking, feeling and acting; consequently, this includes cognitive, affective and motivational psychological processes, a determining factor for the learning process [1].

This article performs an analysis of the personality profile, trying to connect with the teaching-learning style through descriptive attributes. To do this, section 2 analyzes the reading of the different theories about the instruments that involve personality within the teaching-learning styles. Through documentary research it is identified that students have different types of temperaments that involve their personality, however they also have different learning styles that is evidenced in their way of processing information, which is why there are students who have different abilities to analyze, summarize and interpret [1]. In section 3, a recognition of the attributes of both personality and learning style will be made, so that later in section 4, a relationship is established that may involve both and allows the design of a process model for the selection of materials according to that result. Section 5, shows the conclusions and finally section 6 presents future work.

2 Background of the Student's Personality Relationship and his Learning Style

Human beings grasp the world in different ways, therefore, there is no single appropriate way of learning, giving a different version to internal and external stimuli [2].

The concept of learning style basically refers to traits or modes that indicate the characteristics and ways of learning of a student. Identifying, classifying, and relating personality to each student's learning style can mean a different way of acquiring knowledge.

There are different learning styles, to mention a few we have the learning style proposed by Kolb [3] who points out that there are four learning styles: convergent, divergent, assimilating and accommodating. On the other hand, Cepeda [4] mentions that Honey and Mumford proposed four types of learning styles according to the way of organizing and working, these styles classify the student as active, theoretical, reflective and pragmatic.

Flemming and Mills [5] developed an instrument to determine the preference of students when processing information from the sensory point of view. This instrument provides a quantification of student predilections in each of the four sensory modes: visual, aural, reader-writer, kinesthetic (VARK) [6].

In this work we will focus on the VARK style because the sensory characteristics of the student proposed in this model can be associated with the characteristics of educational materials, especially when considering activities and production of multimedia educational material in online educational environments [7].

Regarding personality, there are two main approaches that allow the identification of different classifications. The first approach is based on personality traits such as the Five Factor Model [8] and the second approach based on personality types or styles. Our interest lies in this second approach.

Personality style refers to a series of individual qualities, activities, or behaviors that can be grouped into a category.

Table 1. Attributes that describe personalities influenced by sensory preferences.

Personality	Attribute	Personality	Attribute
ISTP	Convenient	ESTP	Energetic
	Practical		Practical
	objective		Pragmatic
	Adaptable		Spontaneous
ISTJ	Obedient	ESTJ	Organized
	Practical		Practical
	Logical		Logical
	Methodical		Spontaneous
ISFP	Tolerant	ESFP	Spontaneous
	Realistic		Practical
	Harmonious		Friendly
	Adaptable		Harmonious
ISFJ	Obedient	ESFJ	Friendly
	Practical		Practical
	Solidary		Loyal
	Meticulous		Organized

Awareness and knowledge of one's own style is one of the most effective ways to enhance human behavior in all those environments in which a sense of personal identity develops [9].

Lozano [10] proposes a learning style by means of the type indicator, this is based on the studies for the classification and identification of the personality type of Myers-Briggs Type Indicator (MBTI) [11], in which preferences are measured on four scales derived from Carl Jung's theory of psychological types [12], which are mentioned below:

1. Influence on the flow of interest: for example if it is Extroverted (E), the interest flows are from the inside out; on the other hand, if it is Introvert (I), the person's interests flow inward.
2. Influence on Attention: if it is Sensorial (S), the person prefers to perceive through the senses and what really exists; if it is Intuitive (N), the person prefers to perceive through their "sixth sense" and take more into account what could be.
3. Influence on judgments and decision making: If it is Thinking (T), it prefers to make judgments or make decisions in an objective rather than impersonal way; however if he is Feeling (F), it prefers to make judgments or make decisions in a subjective and emotional way.
4. Influence in life: if it is Judicious (J), the person prefers to live in a planned and orderly way but if it is of the Perception type (P), the person prefers to live in a flexible and spontaneous way.

To establish the relationship between learning styles and personality, the work of Lozano [10] and Rodríguez [2] was reviewed, which makes a description of personality focused on student learning.

Table 2. Attributes that describe personalities influenced by intuitive preferences.

Personality	Attribute	Personality	Attribute
INFP	Perceptive	ENFP	Optimistic
	Innovative		Innovative
	Idealistic		Compassionate
	Adaptable		Versatile
INFJ	Devotee	ENFJ	Friendly
	Innovative		Innovative
	Idealistic		Solidary
	Compassionate		Idealistic
INTP	Interrogative	ENTP	Take Risks
	Innovative		Innovative
	objective		Outgoing
	Abstract		Adaptable
INTJ	Independent	ENTJ	Determined
	Innovative		Innovative
	Analytical		Strategic
	Determined		Outgoing

Table 1 and 2 present the attributes that describe the 16 types of personality that were identified to establish the proposed relationship between personality and the materials used in the learning style.

3 Proposal of the Characterization of the Personality in the Student Associated with the Characteristics of the Learning Style

The personality of students is one of the psychological factors that influence their school performance; personality characteristics can provide us with relevant data to better understand academic performance [13]. Personality can be identified, classified and related to the learning style of each student, this can mean a different way of acquiring knowledge.

To generate the characterization, the analysis of the characteristics of the classification of the study materials was carried out by applying the attributes that were identified according to the VARK style [14]. Students have a dominant value and in some cases they can combine two or more values, each with a different dominant sensory representation system. According to VARK the attributes that describe a visual student are: being creative, observant, imaginative and analytical; an auditory learner is defined as pragmatic, perceptive, analytical, and expressive; a student reader-writer is theoretical, thoughtful, understanding, and thoughtful; the kinesthetic student maintains the attributes of being adaptable, creative, intuitive, and versatile.

Returning to the classification of the 16 types of Lozano's work [10], the attributes that describe the personality are used to relate the characteristics between the learning style and the personality profile, it is proposed to organize these attributes in tables

Table 3. Introvert personality relationship and learning style.

		Learning style		Visual		Aural		Reading / Writer			Kinesthetic					
		Creative	Observer	Imaginative	Analytical	Pragmatic	Perceptual	Analytical	Expressive	Theoretical	Reflective	Comprehensive	Thoughtful	Adaptive	Creative	Intuitive
Personality																
ISTP	Convenient		x	x								x		x		
	Practical objective	x				x			x	x					x	
	Adaptable		x		x								x	x		
ISTJ	Obedient											x				
	Practical Logical	x				x									x	
	Methodical				x			x	x	x		x				
ISFP	Tolerant									x	x			x		
	Realistic		x				x	x	x	x	x					
	Harmonious Adaptable						x	x					x	x		
ISFJ	Obedient											x				
	Practical Solidary	x				x									x	
	Meticulous				x		x	x		x	x	x				
INFP	Perceptive		x		x		x	x								
	Innovative				x			x							x	
	Idealistic Adaptable				x					x		x				x
INFJ	Devotee				x		x	x	x	x		x				
	Innovative				x			x							x	
	Idealistic Compassionate								x			x				
INTP	Interrogative															
	Innovative objective				x											x
	Abstract		x		x		x			x						
INTJ	Independent															x
	Innovative				x	x		x							x	
	Analytical					x			x							
	Determined							x						x		x

where the relationship between them is identified, Table 3 shows the attributes of different types of personality that have the flow of introverted interest, however it was also carried out for the personality with the flow of extroverted interest.

The rows represent the attributes of the 16 personality types, the columns contain the characteristics of the VARK sensory modules. The characteristics of the VARK style that are related to the attributes of the personality, indicating with an x the similarity of their abilities to acquire knowledge, in this way it is identified as certain

characteristics of the classification of the learning style presents a similarity with the characteristics of the personality.

4 Description of the Student's Personality Model for the Materials Selection Process

For the creation of a selection process for study materials within a learning platform, the information obtained in the analysis of the relationship between personality and VARK learning style will be taken as a basis, which is represented in Table 4.

In this table the relationship of the personality attributes with the learning style can be observed through the percentages of frequencies of similarities found between them, which were obtained by counting the occurrences of the personality attributes and characteristics of the learning style shown in Table 3.

Obtaining this information shows which learning styles the student can feel more empathy with when learning, because they have a higher percentage. However, it is not ruled out that if the learning environment does not have material associate to the learning style, it may be able to offer some other material that can be associated with some of the other learning preferences.

Table 4. Percentage of frequencies of similar attributes between personality and VARK.

Personalidad	V	A	R	K
ISTP	35.71%	14.29%	28.57%	21.43%
ISTJ	16.67%	25.00%	50.00%	8.33%
ISFP	7.69%	30.77%	46.15%	15.38%
ISFJ	18.18%	27.27%	36.36%	18.18%
INFP	33.33%	25.00%	16.67%	25.00%
INFJ	20.00%	30.00%	40.00%	10.00%
INTP	57.14%	14.29%	14.29%	14.29%
INTJ	30.00%	30.00%	0.00%	40.00%
ESTP	23.08%	23.08%	0.00%	53.85%
ESTJ	25.00%	16.67%	33.33%	25.00%
ESFP	23.08%	30.77%	23.08%	23.08%
ESFJ	7.14%	28.57%	42.86%	21.43%
ENFP	18.18%	36.36%	27.27%	18.18%
ENFJ	27.27%	27.27%	27.27%	18.18%
ENTP	20.00%	13.33%	20.00%	46.67%
ENTJ	26.32%	15.79%	21.05%	36.84%

5 Conclusions

In a learning environment it is important to know the preferences of the student, in this work it is proposed to achieve it from their personality. Each student learns differently, not everyone wants to study or do activities with which they do not feel motivated. Knowing the student's personality can describe how they react to learning methods or materials. Another characteristic to consider is the learning style which reflects the preferences on the way of learning, with this it is possible to identify the materials that facilitate the acquisition of knowledge. The study materials have characteristics that could be associated with learning styles, such as an infographic, which stimulates the visual sense.

In this work, the classification of the personality profile and its relationship with the teaching style allows us to observe that a student has a dominant learning style. However, it is possible to work with some material from the other learning styles if their characteristics indicate it. In this way, the preferences that the student has when learning are taken into account, being able to provide the appropriate materials to them.

6 Future Work

With the information obtained, it is possible as future work to create rules that lead to the automation of the process of selecting learning materials under the influence of personality. These rules would contribute to the design of a finite state machine to guide its process. The selection process is one of the main functions of a material selector agent that could be inside an intelligent learning environment.

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