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A New Framework for E-Learning Using Learning Style and Personality

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Abstract

This paper presents the new framework for providing the appropriate contents for users in an e-learning system based on their Learning Style and Personalities. For seek best practice in e-learning Design. A large number of research attempts personalize contents based on users in an e-learning system. Most research focus only on personalizing e-learning based on learning style. In order to differentiate users from each other, users behaviors both observable and unobservable are introduced. The relationship between e-learning content and users behaviors such as personality is determined by groups of users. The researches on e-learning contents and learning style are reviewed. The final framework for e-learning contents using learning style and personality is developed and tested by unseen groups of e-learning users. The results show significant improvements of users satisfactions with e-learning contents using users learning style and personality

Keywords: e-learning, learning styles; personality types; personalize e-learning; instructional design

1. Introduction

The role of personal learning style is very important for online learning process and outcome. All students are exposed to same exercises, discussions, delivery of content, depending on preference of institution or tutor. Personalization in e-learning is the use of technology and student information to tailor the e-learning course for each individual difference in the way that students achieve better learning outcomes. In order to ensure that learners engage and take responsibility for their own learning, many researchers [2,9,12,13,28,36,37] suggested that the differences and distinctiveness of each learners must be taken into account in preparing the learning procedures. The differences between students can be their learning styles, learning orientations, learning rates, cognitive styles, multiple intelligence, talents and many more. The consideration of individual differences in learning allow them to be responsible for their own learning, retain information longer, apply the knowledge more effectively, have positive attitudes towards the subject, have more interest in learning materials, have higher score and high intrinsic

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motivation level [2,12,13,18,28,30,35,37]. It is found that necessary challenges and opportunities for learning and self-development will be provided if learners' differences are considered in learning [37]. Moreover, the emphasis of individual difference in learning increase both learner's satisfactions and motivation towards learning; producing a better grades in the subject [2,18]. One of the research develop framework intends to personalize the learning materials and accommodate to the majority of students in science and technology disciplines, through which their learning preferences could be effectively supported; producing a better learning performance [19]. The framework had been developed to identify the main e-learning system features accommodated to typical sciences and technology students [19]. Our studies relating to personalization in e-learning concentrate on two main aspects. Firstly, is the framework for e-learning content format based on learning style and personality? Secondly, is the relationship between both models and developing guideline for e-learning as an instructional design for each individual difference?

2. Related study

2.1 Introduction to e-learning and personalization

In the context of the modern economy, where the knowledge management is very important, the fast exchange of information and the continue knowledge and skill improvement is the key for success. The interest about the problem, the common aspects and the application of e-learning is incessantly increasing. This interest is one of the basic reasons for the variety of opinions and interpretations about the term e-learning. Nowadays the most popular and widely used are the multimedia web-based course. Multimedia is certainly one of the most appealing factors in the process of developing a web-based course, as compared to preparing conventional book. The term multimedia, ie interactive presentation of information with different media text, graphics, animation, video and sound is taking very important place in the modern definition about e-learning [34]. One reason for this is a great attractiveness of multimedia learning materials; which can satisfy the necessities of the modern information society. Serious problem in e-learning is the low level of personalization of the teaching and learning process. In the internet space can be found countless courses in the same theme, presented in different ways. The user has the very difficult task to find the e-learning course which is appropriate for their style. Based on the review of the research on personalized learning environment, the environment is best applied in an online medium, specifically a website. Moreover, website is found to be perfect for individualized [21], lead to innovations in education field [19] and increase students' satisfactions [22] that will inturn motivate them [18]. A flexible web-based course is urgent to be designed so that different students obtain different learning materials and mode of presentation [33].

2.2 Personality Types

In the study of personality, specific trait have been attributed to personality types [1,6,16,23,26,29,32]. Within the study of personality and performance these traits have likewise been associated with learning style [23,24,31] and preferences towards group and individual participation within the classroom [27]. Advocates of personality theory strongly believe that conditions in which learning occurs can facilitate outcomes if these conditions favor the personality type of students [29]. "Personality" can be defined as a dynamic and organized set of characteristics possessed by a person that uniquely influences his or her cognitions, emotions, interpersonal orientations motivations, and behaviors in various situations. Personality may also refer to the patterns of thoughts, feelings, social adjustments, and behaviors consistently exhibited by an individual over time that strongly influence expectations, self-perceptions, values and attitudes, and predicts reactions to people, problems and stress (en.wikipedia.org/wiki/personality psychology #cite_note-1). There are several research try to measure humans both observable and non-observable. The observable one measures on behavior such as Learning Style while the non-observable measure on thinking preferences and personality. The example tools of thinking preference are Emergenetics, HBDI, NBI and the example tools of personality are DISC MBTI, Big 5, Values, Morals, Ethics, EQ, Beliefs and DNA.

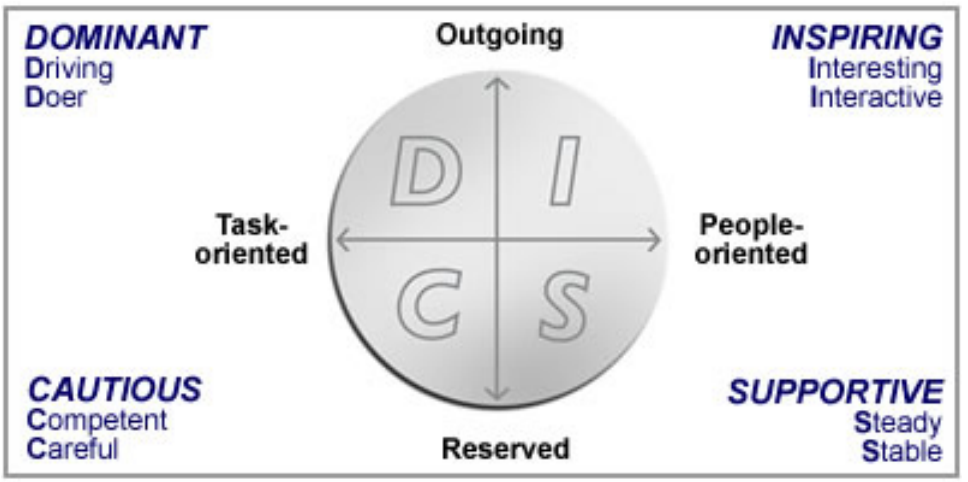

Figure 1. DISCPersonality model (http://www.stuartsimpson.me).

DISC is a quadrant behavioral model based on the work of Dr.William Moulton Marston (1928). Marston's beliefs are that characteristics of behavior can be grouped into four majors "behavior style" and they tend to exhibit specific characteristics common to that particular style. There are four dimension which are "D" Dominance, [20] defined as the Dominance behavior for the use of its own strength to overcome the weak or conflict opponents, or to overcome the obstacles in the environment. "I" Influence, [20] defined the Influence behavior as persuasive with conquest of power, charm to, and win the trust of others. With influence others, sell their own and can own the idea of selling and induced others to build new friendships. [11] indicated that the type I Personality is outgoing and lively. They like that around at the crowd and their opinions are subjective. "S" Steadiness, [20] subject that the behavior will automatically lower their resistance forces to face more than their own strength, to obtain a strong stimulation of balance, so that the feeling of peaceful co-existence of facilities to make and be obedient. And [11] stated that people with S-type personality show caring for others and tend to prefer to let others have the spotlight. "C" Conscientiousness, [20]considered that this behavior is defined as awe or fear by promoting the behavior of movable property give birth, and thus derived showed the tendency to go for flexibility and compromise because of fear. [11] pointed out that C-type personality care about accuracy. They like to have time to do a quality work, an environment that tends to like a commercial nature and where people concentrate on the logical rather than emotional things. Marston did not develop the DISC instrument, but his work did lay the foundation for the current DISC behavioral instrument [3]. Walter Clarke developed the first DISC related instrument entitled Activity Vector Analysis. The Style Insight – DISC instrument used in this study was developed and validated by [3] and Target Training International, Ltd. Over 20 years of research validation studies have been completed. The most recent validation study was conduct by [14].

2.3 Learning Style Model

The concept of learning style has a broad-meaning. In this research, it is proposed and defined as an individual's preferential focus on different types of information; ways of perceiving the information and understanding the information [17]. "Learning Style" are categorized and developed by educational researchers to classify learners based on their customary approach to perceiving and processing information [15]. Educational research and practice have demonstrated that learning can be enhanced when the instructional process accommodates the various learning style of a student. (e.g. [4,15]). The research argued that a student can learn efficiently, retain the information longer, apply the knowledge more effectively when their learning styles are consistent with teaching styles [5,8]. A number of adaptive e-learning systems have been developed applying different learning style theories as well as Felder-Silverman's Model [19]. Those systems offer personalized content depending on the students' learning styles, known as adaptive presentation. Felder Silveraman's theory classifies learners into four different groups according to their preference in Sensing/Intuitive, Verbal/Visual, Active/Reflective, and Sequential/Global (Table1).

Table1: Felder-Silverman's learning theory (based on Felder, 1993)

Dimensions	Descriptions		Dimensions	Descriptions
Sensing	Prefer to learn facts, procedures and real cases.	Vs	Intuitive	Prefer to learn concept, theories, and symbols
Visual	Learn via visual images (pictures, charts or graphs, etc)	Vs	Verbal	Learn via verbal sources (written and spoken words, i.e. lectures or reading etc.)
Active	Learning by doing (trying things out)	Vs	Reflective	Learning by reflecting (thinking thing through before doing)
Sequential	Learn in a certain sequence, assimilate and understand information in a linier and incremental step, but lack a grasp of big picture	Vs	Global	Learn globally, absorb information in unconnected chunks and achieve understanding in large holistic jumps without knowing the details

3. Research Design and Methodology

In order to identify the relationship between e-learning content and user personality, the experiment was designed and tested with 50 students of Faculty of Science and Technology, Assumption University. The focus group of 50 respondents was chosen from each of 8 personality types, collected data were statistically processed and relations were researched among personality types and preferable of e-learning content. The received results proved some of our expectation and the result was shown in Table 2 [7].

Table2. Content Design Usage for the each DISC learner's type

	D	**DI**	**C**	**CD**	**I**	**IS**	**S**	**SC**
Description Voice	✓	✓	✓	✓	✓	✓	✓	✓
Interaction						✓	✓	✓
Conversation						✓	✓	✓
Precision of information	✓	✓		✓				
Statistic and Graph	✓	✓	✓	✓			✓	✓
Animation		✓			✓	✓		
Story		✓			✓	✓		
Examples			✓	✓			✓	✓
Games		✓			✓	✓		

Then the experiment to identify the relationship between learning style and e-learning had been developed based on Summary of Learning Styles and hypermedia course components [5] and Framework for supporting user preferences in e-learning [5][8][25]. To verify the framework, the questionnaire had been designed with 4 sections and had been distributed to 400 respondents which are e-learning users in Bangkok Thailand.

The questionnaires of this study consist of 78 questions categorized in 4 sections. Section I is the demographic of the respondent. Section II is DISC Personality Types measurement consists of 8 questions which is need to rank from 1-4 in order to determine the personality type. Section III is Learning Style Questions based on Felder's Silverman Index of Learning Style Questionnaire measurement by 44 questions in order to determine the learning style. And section IV is users preference of e-learning content measured by 16 questions with using a Likert Scale from 1-5. The scale 1 stands for "Strongly disagree" and then 2,3,4 until 5 "Strongly Agree". The data from 400 respondents was entered into an Excel spreadsheet. In terms of analysis, this study used percentage and frequency to analyze the result. First, to identify the individual preference in e-learning content using section I, II and III. Then section IV is used to verify the content provided by the framework and actual user preference.

A new framework for supporting user preference in e-learning, the presented framework has three major modules as follows:

1. Learning Styles module: Users have to take the test to identify their learning style
2. Personality Types module: User have to take the test to identify their personality type
3. E-learning content module: The content will based on learning style & personality type

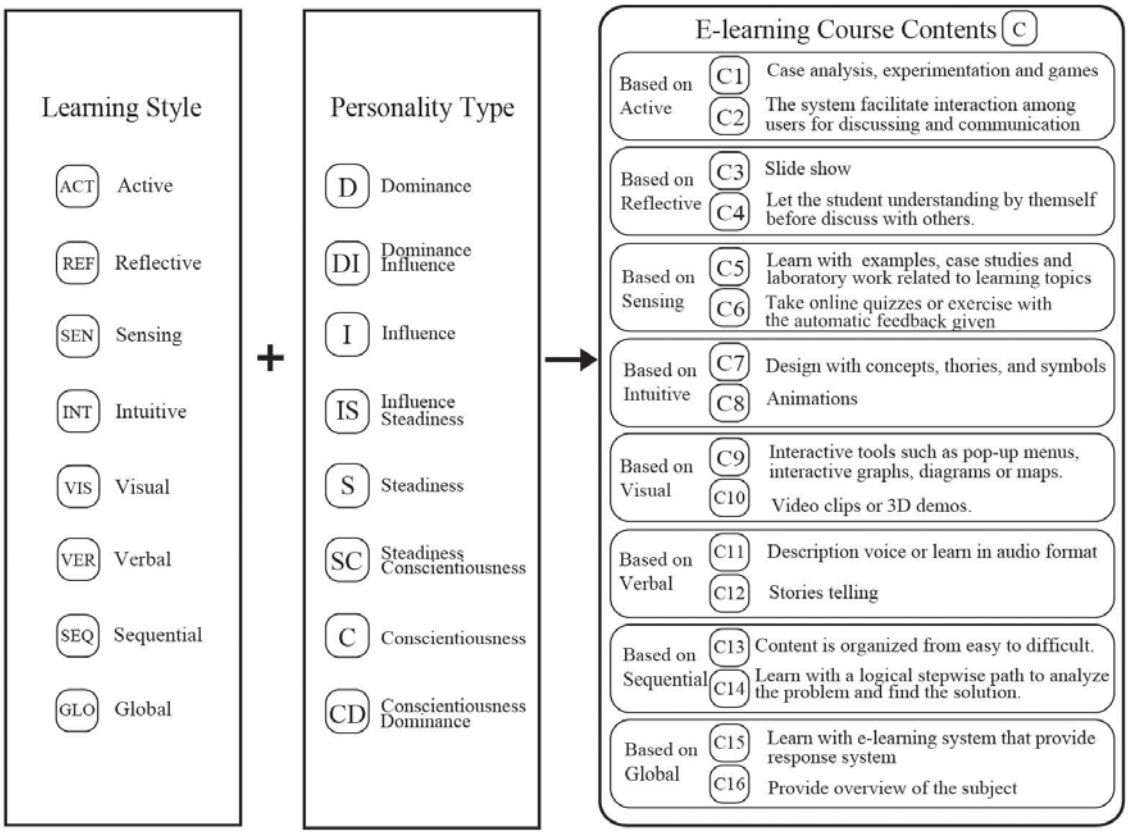

Figure 2: A new framework for e-learning design using Learning Styles and Personality

3. Data preparation and analysis

The proposed framework for e-learning design using Learning Style and Personality is tested with 400 respondents who are undergraduate and graduate students studying in universities in Thailand. Majority of the respondents are male, which represents 54% (216 respondents), while female represents 46% (184 respondents). The data set is statistically analyzed based on frequencies and percentages of respondents' personality styles in relations to their learning styles and e-learning contents. According to the respondents' personality styles, majority of the respondent style is "I" (Influence) which represents 33% of the respondents followed respectively by 24% of "C" (Conscientiousness), 13% of "D" (Dominance), 12% of "S" (Steadiness), 6% of "CD" (Conscientiousness and Dominance), 5% of "SC" (Steadiness and Conscientiousness), 4% of "DI" (Dominance and Influence), and 3% of "IS" (Influence and Steadiness) as presented in figure 3.

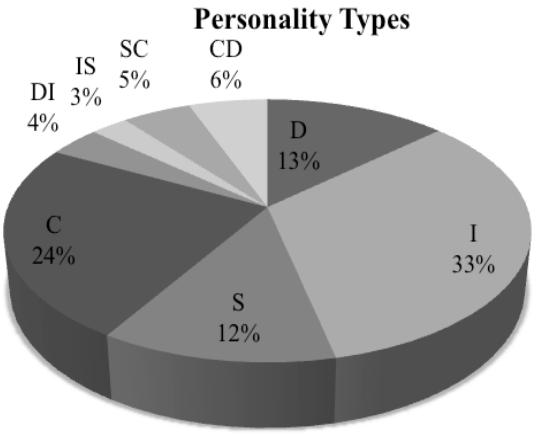

Figure3: Personality Types of the respondents in percentage

Learning styles of the respondents in percentage in which majority of the respondents prefer visual style which is the learning via visual images, for examples: pictures, charts, or graphs are presented in Figure4. According to the results, 36% of the respondents prefer visual style. It is followed by global style at 9%, sensing and sequential styles at 6%, reflective style at 5%, intuitive style at 4%, and active style at only 3% respectively. The other respondents prefer more than single learning style, however, most of the percentages of these respondents are very low compared to the single learning styles.

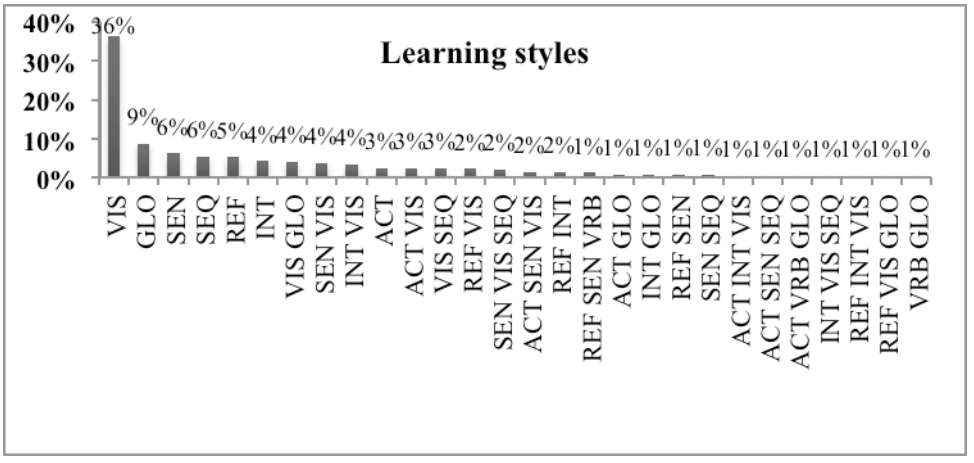

Figure 4: Learning Styles of the respondents in percentage

The relationships between Learning Styles and E-learning contents (C1-C16) are shown in Table3.1. The learning styles of the respondents from section III of the questionnaire are grouped based on their preferred styles of learning in which maximum values replied by each respondent are taken to represent their own preferable styles and the data re-summarize in column1. The E-learning contents are classified into 8 contents and there are 2 questions per content in the questionnaire using the Likert scale. The response values of each respondent towards each e-learning content is averaged in which the results are ranged from -1 to 1, recalculated and presented in column 2-9.The positive values that are greater than or equal to 0.5 represent strong relationships between the Learning Styles and the E-learning contents represented with dark background. The light background present weak relationship and will not be consider as preferential E-leaning content.

Table 3.1: Preferable of e-learning content without integration of their particular Personality Types

	E-Learning Contents based on Learning Style							
	ACT	REF	SEN	INT	VIS	VRB	SEQ	GLO
Learning Styles	C1,C2	C3,C4	C5,C6	C7,C8	C9,C10	C11,C12	C13,C14	C15,C16
ACT	0.50	0.50	0.55	0.45	0.35	0.55	0.40	0.55
ACT GLO	1.00	0.75	0.75	1.00	1.00	0.25	1.00	1.00
ACT INT VIS SEQ	0.75	0.25	0.50	-	0.50	0.75	0.25	0.25
ACT SEN SEQ	0.25	0.25	0.25	0.25	-	-	0.50	-
ACT SEN VIS	0.75	0.50	0.63	0.50	0.63	0.88	0.38	0.75
ACT VIS	0.20	0.15	0.30	0.35	0.45	0.15	0.30	0.35
ACT VRB GLO	0.25	0.50	0.50	0.75	0.50	0.50	0.25	0.25
GLO	0.29	0.13	0.15	0.25	0.36	0.26	0.44	0.24
INT	0.28	0.28	0.24	0.47	0.46	0.40	0.26	0.29
INT GLO	0.75	0.75	0.25	1.00	1.00	0.50	0.50	1.00
INT VIS	0.57	0.48	0.50	0.64	0.66	0.48	0.80	0.82
INT VIS SEQ	0.25	0.25	0.75	0.25	0.50	0.75	0.50	0.75
REF	0.43	0.19	0.40	0.40	0.36	0.26	0.57	0.29
REF INT	0.13	0.13	0.38	0.50	0.25	-	0.50	0.25
REF INT VIS	0.25	0.50	0.50	1.00	1.00	0.50	-	0.50
REF SEN	1.00	0.25	1.00	0.50	0.75	0.25	0.25	0.50
REF SEN VRB GLO	0.25	0.50	(0.50)	0.25	(0.25)	0.75	0.25	-
REF VIS	0.39	0.75	0.36	0.53	0.33	0.53	0.56	0.50
REF VIS GLO	1.00	0.75	0.50	0.75	0.75	0.75	1.00	0.50
SEN	0.43	0.30	0.39	0.29	0.40	0.36	0.55	0.49
SEN SEQ	0.25	0.25	-	0.25	0.25	0.50	-	-
SEN VIS	0.28	0.32	0.25	0.15	0.50	0.40	0.60	0.28
SEN VIS SEQ	0.34	0.16	0.69	0.25	0.25	0.03	0.34	0.06
SEQ	0.32	0.32	0.08	0.23	0.05	0.23	0.38	0.07
VIS	0.53	0.32	0.33	0.53	0.67	0.46	0.50	0.53
VIS GLO	0.61	0.41	0.47	0.34	0.41	0.41	0.44	0.34
VIS SEQ	0.53	0.45	0.25	0.38	0.43	0.43	0.45	0.45
VRB GLO	0.50	0.25	0.25	0.50	0.50	0.50	0.50	0.50

The relationships among Learning Styles, Personality Type and e-learning contents (C1-C16) are shown in Table3.2. First, the Learning Styles of the respondents from section III of the questionnaire are identified and segmented with their related Personality Type from Section II of the questionnaire as presented in column 2. The e-learning contents are classified into 8 contents and there are 2 questions per content in the questionnaire using the Likert scale. The response values of each respondent towards each e-learning content is averaged in which the results are ranged from -1 to 1, recalculated and presented in column 3-10.The positive values that are greater than or equal to 0.5 represent strong relationships between the Learning Styles and the e-learning contents are presented with dark background. The light background present weak relationship and will not be consider as preferential e-learning content.

Table 3.2: Preferable of e-learning content with integration of their particular Personality Types

		E-Learning Contents based on Learning Style							
		ACT	REF	SEN	INT	VIS	VRB	SEQ	GLO
Learning Styles	**Personality Types**	C1,C2	C3,C4	C5,C6	C7,C8	C9,C10	C11,C12	C13,C14	C15,C16
ACT	C	0.38	0.38	0.50	0.63	0.38	0.63	0.50	0.50
	D	0.75	0.50	0.25	0.25	0.50	0.50	(0.25)	0.50
	I	0.50	0.63	0.75	0.38	0.25	0.50	0.63	0.63
ACT GLO	C	1.00	0.75	0.75	1.00	1.00	0.25	1.00	1.00
ACT INT VIS SEQ	I	0.75	0.25	0.50	-	0.50	0.75	0.25	0.25
ACT SEN SEQ	I	0.25	0.25	0.25	0.25	-	-	0.50	-
ACT SEN VIS	C	1.00	-	0.25	0.50	0.50	0.75	0.25	0.50
	S	0.50	1.00	1.00	0.50	0.75	1.00	0.50	1.00
ACT VIS	C	0.25	0.25	0.50	0.25	0.50	-	-	0.50
	D	0.25	(0.25)	0.25	0.25	0.50	-	0.50	0.50
	I	-	0.50	0.25	0.50	0.50	0.25	0.25	0.25
	SC	0.25	0.50	0.25	0.50	0.25	0.50	0.25	-
ACT VRB GLO	IS	0.25	0.50	0.50	0.75	0.50	0.50	0.25	0.25
GLO	C	(0.38)	(0.25)	(0.13)	(0.25)	0.13	-	(0.13)	-
	CD	0.75	0.50	0.25	0.25	(0.25)	0.50	0.50	0.75
	D	0.11	0.25	0.11	0.18	0.07	0.50	0.82	(0.21)
	DI	-	(0.25)	0.50	0.25	-	0.75	0.50	0.50
	I	0.45	0.16	0.25	0.32	0.45	0.05	0.43	0.36
	IS	0.25	-	0.25	0.50	1.00	0.75	0.75	0.50
	S	0.58	0.25	-	0.42	0.67	0.08	0.17	0.33
INT	C	0.75	(0.25)	(0.25)	0.75	1.00	0.25	0.50	-
	D	0.50	1.00	0.50	0.75	0.75	0.25	-	0.50
	I	0.11	0.17	0.17	0.39	0.22	0.44	0.06	0.22
	SC	0.25	0.25	0.50	0.25	0.50	0.50	1.00	0.50
INT GLO	CD	0.75	0.75	0.25	1.00	1.00	0.50	0.50	1.00
INT VIS	C	0.50	0.50	0.50	0.50	0.75	0.25	0.75	1.00
	D	1.00	1.00	0.75	1.00	0.75	0.75	1.00	1.00
	I	0.25	0.75	0.25	0.75	0.25	-	0.75	0.25
	IS	0.25	0.25	0.25	0.25	0.25	0.75	0.25	0.50
	SC	0.50	(0.25)	0.50	0.50	1.00	0.50	1.00	1.00
INT VIS SEQ	I	0.25	0.25	0.75	0.25	0.50	0.75	0.50	0.75

Table 3.2: Preferable of e-learning content with integration of their particular Personality Types (cont.)

		E-Learning Contents based on Learning Style							
		ACT	REF	SEN	INT	VIS	VRB	SEQ	GLO
		C1,C2	C3,C4	C5,C6	C7,C8	C9,C10	C11,C12	C13,C14	C15,C16
REF	C	0.55	0.10	0.60	0.55	0.75	0.25	0.75	0.50
	CD	0.75	0.50	0.50	0.25	(0.50)	0.25	1.00	0.50
	I	0.21	0.29	0.07	0.29	0.14	0.21	0.36	-
	S	0.25	-	0.50	0.25	-	0.50	-	-
REF INT	C	0.13	0.13	0.38	0.50	0.25	-	0.50	0.25
REF INT VIS	S	0.25	0.50	0.50	1.00	1.00	0.50	-	0.50
REF SEN	S	1.00	0.25	1.00	0.50	0.75	0.25	0.25	0.50
REF SEN VRB GLO	I	0.25	0.50	(0.50)	0.25	(0.25)	0.75	0.25	-
REF VIS	D	0.25	0.75	-	0.25	0.25	0.25	0.25	0.50
	I	-	0.75	0.25	0.50	0.25	0.50	0.75	0.50
	S	1.00	0.75	0.75	0.75	0.50	0.75	0.50	0.50
REF VIS GLO	C	1.00	0.75	0.50	0.75	0.75	0.75	1.00	0.50
SEN	C	0.50	0.35	0.50	0.35	0.35	0.30	0.75	0.55
	CD	0.75	0.25	0.25	0.25	0.50	0.75	0.50	0.50
	DI	0.25	-	0.25	0.25	0.50	0.25	0.25	0.25
	I	0.50	0.25	-	0.50	0.50	0.50	0.50	0.50
	IS	-	-	0.75	0.50	0.25	0.50	0.50	0.50
	S	0.40	0.55	0.40	-	0.40	0.25	0.40	0.50
SEN SEQ	CD	0.25	0.25	-	0.25	0.25	0.50	-	-
SEN VIS	C	0.25	0.25	0.20	(0.02)	0.50	0.36	0.64	0.16
	IS	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	S	0.25	0.50	0.25	0.75	0.50	0.50	0.50	0.75
SEN VIS SEQ	I	0.38	0.13	0.75	0.25	0.25	(0.13)	0.38	-
	S	0.25	0.25	0.50	0.25	0.25	0.50	0.25	0.25
SEQ	CD	0.75	0.50	0.50	(0.25)	0.25	-	0.50	0.25
	D	-	0.50	-	0.75	-	0.25	0.50	(0.25)
	I	0.37	0.25	-	0.13	0.04	0.25	0.35	0.10
	S	0.25	0.25	0.25	0.25	-	0.25	0.25	0.25
VIS	C	0.41	0.38	0.32	0.52	0.65	0.38	0.58	0.54
	CD	0.67	0.58	0.33	0.58	0.67	0.17	0.58	0.75
	D	0.59	0.19	0.19	0.61	0.80	0.44	0.42	0.48
	DI	0.75	0.50	-	0.25	1.00	0.75	0.50	0.75
	I	0.55	0.34	0.42	0.51	0.64	0.49	0.50	0.54
	S	0.36	0.31	0.22	0.60	0.64	0.40	0.44	0.32
	SC	0.75	0.13	0.38	0.38	0.67	0.71	0.50	0.67
VIS GLO	C	1.00	0.75	0.50	0.75	0.50	0.25	0.50	0.50
	CD	0.50	0.25	0.75	-	0.75	0.75	0.75	0.25
	D	0.60	0.30	0.40	0.30	0.35	0.25	0.40	0.40
	I	0.45	0.40	0.35	0.35	0.20	0.45	0.25	0.25
VIS SEQ	C	0.75	0.75	0.50	0.50	0.75	0.50	0.75	0.25
	DI	0.47	0.38	0.19	0.34	0.34	0.41	0.38	0.50
VRB GLO	C	0.50	0.25	0.25	0.50	0.50	0.50	0.50	0.50

By combining the relationship between Personality Type and E-Learning Content (Table 2) with the relationship between Learning Styles and E-Learning Content (Table 3.1), and also with the relationship among Learning Styles, Personality Type and E-learning Content (Table 3.2), the final results of this research is presented in Table 4. Table

4 shows two sets of results, one is the E-learning Contents without Personality and the other is the E-Learning Contents with Personality type. These results clearly demonstrate that there are significant differences of E-Learning Contents when Personality Type of users is introduced.

Table 4 Results of study

Learning Styles	Preferred E-Learning Contents without Personality	Associate with Personality	Preferred E-Learning Contents with Personality
ACT	C1, C2, C3, C4, C5, C6, C11, C12, C15, C16	C	C5, C6, C7, C8, C11, C12, C13, C14, C15, C16
		D	C1, C2, C3, C4, C9, C10, C11, C12, C15, C16
		I	C1, C2, C3, C4, C5, C6, C11, C12, C13, C14, C15, C16
ACT GLO	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C13 C14, C15, C16	C	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C13, C14, C15, C16
ACT INT VIS SEQ	C1, C2, C5, C6, C9, C10, C11, C12	I	C1, C2, C5, C6, C9, C10, C11, C12
ACT SEN SEQ	C13, C14	I	C13, C14
ACT SEN VIS	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C15, C16	C	C1, C2, C7, C8, C9, C10, C11, C12, C15, C16
		S	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16
ACT VIS	No preferential E-learning Contents	C	C5, C6, C9, C10, C15, C16
		D	C9, C10, C13, C14, C15, C16
		I	C3, C4, C7, C8, C9, C10
		SC	C3, C4, C7, C8, C11, C12
ACT VER GLO	C3, C4, C5, C6, C7, C8, C9, C10, C11, C12	IS	C3, C4, C5, C6, C7, C8, C9, C10, C11, C12,
GLO	No preferential E-learning Contents	C	No preferential E-learning Contents
		CD	C1, C2, C3, C4, C11, C12, C13, C14, C15, C16
		D	C11, C12, C13, C14
		DI	C5, C6, C11, C12, C13, C14, C15, C16
		I	No preferential E-learning Contents
		IS	C7, C8, C9, C10, C11, C12, C13, C14, C15, C16
		S	C1, C2, C9, C10
INT	No preferential E-learning Contents	C	C1, C2, C7, C8, C9, C10, C13, C14
		D	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C15, C16
		I	No preferential E-learning Contents
		SC	C5, C6, C9, C10, C11, C12, C13, C14, C15, C16
INT GLO	C1, C2, C3, C4, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16	CD	C1, C2, C3, C4, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16

Table 4 Results of study (cont.1)

Learning Styles	Preferred E-Learning Contents without Personality	Associate with Personality	Preferred E-Learning Contents with Personality
INT VIS	C1, C2, C5, C6, C7, C8, C9, C10, C13, C14, C15, C16	C	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C13, C14, C15, C16
		D	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16
		I	C3, C4, C7, C8, C13, C14
		IS	C11, C12, C15, C16
		SC	C1, C2, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16
INT VIS SEQ	C5, C6, C9, C10, C11, C12, C13, C14, C15, C16	I	C5, C6, C9, C10, C11, C12, C13, C14, C15, C16
REF	C13, C14	C	C1, C2, C5, C6, C7, C8, C9, C10, C13, C14, C15, C16
		CD	C1, C2, C3, C4, C5, C6, C13, C14, C15, C16
		I	No preferential E-learning Contents
		S	C5, C6, C11, C12
REF INT	C7, C8, C13, C14	C	C7, C8, C13, C14
REF INT VIS	C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C15, C16	S	C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C15, C16
REF SEN	C1, C2, C5, C6, C7, C8, C9, C10, C15, C16	S	C1, C2, C5, C6, C7, C8, C9, C10, C15, C16
REF SEN VER GLO	C3, C4, C11, C12	I	C3, C4, C11, C12
REF VIS	C3, C4, C7, C8, C11, C12, C13, C14, C15, C16	D	C3, C4, C15, C16
		I	C3, C4, C7, C8, C11, C12, C13, C14, C15, C16
		S	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16
REF VIS GLO	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16	C	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16
SEN	C13, C14	C	C1, C2, C5, C6, C13, C14, C15, C16
		CD	C1, C2, C9, C10, C11, C12, C13, C14, C15, C16
		DI	C9, C10
		I	C1, C2, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16
		IS	C5, C6, C7, C8, C11, C12, C13, C14, C15, C16
		S	C3, C4, C15, C16

Table 3 Results of study (cont.2)

Learning Styles	Preferred E-Learning Contents without Personality	Associate with Personality	Preferred E-Learning Contents with Personality
SEN SEQ	C11, C12	CD	C11, C12
SEN VIS	C9, C10, C13, C14	C	C9, C10, C13, C14
		IS	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16
		S	C3, C4, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16
SEN VIS SEQ	C5, C6	I	C5, C6
		S	C5, C6, C11, C12
SEQ	No preferential E-learning Contents	CD	C1, C2, C3, C4, C5, C6, C13, C14
		D	C3, C4, C7, C8, C13, C14
		I	No preferential E-learning Contents
		S	No preferential E-learning Contents
VIS	C1, C2, C7, C8, C9, C10, C15, C16	C	C7, C8, C9, C10, C13, C14, C15, C16
		CD	C1, C2, C3, C4, C7, C8, C9, C10, C13, C14, C15, C16
		D	C1, C2, C7, C8, C9, C10
		DI	C1, C2, C3, C4, C9, C10, C11, C12, C13, C14, C15, C16
		I	C1, C2, C7, C8, C9, C10, C15, C16
		S	C7, C8, C9, C10
		SC	C1, C2, C9, C10, C11, C12, C13, C14, C15, C16
VIS GLO	C1, C2	C	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C13, C14, C15, C16
		CD	C1, C2, C5, C6, C9, C10, C11, C12, C13, C14
		D	C1, C2
		I	No preferential E-learning Contents
VIS SEQ	C1, C2	C	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14,
		DI	C15, C16

4. Interpretation and discussion of results

The results show that by integrating the personality type, different e-learning course contents may be required for users with similar Learning Style in order to make them satisfied with the materials. For example, user with Active Learning style with personality type I will required additional contents: C13 (Content is organized from easy to difficult) and C14 (Learn with Logical Stepwise path to analyze the problem and find the solutions) to satisfy their interest in learning via online system. Another example is that users with Active-Sensing-Visual Learning Style with C Personality Type show that C3 (Slide show) and C4 (Let the student understanding by themselves before discuss with others) are not required to make them satisfied. These findings add several important ideas for the design and delivery of e-learning content. Previously, training designers and instructional designers have relied primarily on course content as means of determining appropriate delivery channel; this research shows that personality type and learning style needed to be in consideration to make user's satisfied. DISC personality and Felder-Silverman'sLearning Style assessment, or similar measures, may be used to help identify those learners most receptive to various delivery modes. This information may then be used to match the learners with the most appropriate learning resources and delivery modes. Learners who are knowledgeable of their personal approach to learning can make more realistic expectations for enjoyment and maximize learning outcomes.

5. Conclusions and future work

As illustrated in Table4, with users' the personality styles, different e-learning course contents are presented to users with similar learning style and yielded better learning results. Also some users with learning style such as global have no preference on e-learning contents but, in fact, they do have their preferences. This research intends to provide the contents for users to learn more effective and efficiency in the shortest possible period of time. This research introduced the concept of using student's behaviors to enhance the users' satisfaction on e-learning content. However, there are various researches on behaviors and personality, different model of user's personality may provide interesting results. Finally, from the survey and results, this framework demonstrated that e-learning content with learning style and personality help users learn more effectively and enhance users satisfactions. Training designer and instructional designer may further facilitate this framework by supplementing the traditional instructional design framework with an asynchronous design principles which designers are required to deliver what is needed when it is needed in order to provide better e-learning Environment.

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