Chapter 36
Design and Implementation of an E-Learning Model by Considering Learner’s Personality and Emotions

S. Fatahi, M. Kazemifard, and N. Ghasem-Aghae

Abstract Emotion, personality and individual differences are those effective parameters on human’s activities such as learning. People with different personalities show different emotions in facing an event. In the case of teaching and learning, personality difference between learners plays an important role. In virtual learning projects this point should consider that the learners’ personalities are various and the teaching method used for each learner should be different from the other learners. In this chapter, a new model presented according to the learning model based on emotion and personality and the model of virtual classmate. Based on their knowledge base, the virtual teacher and classmate express suitable behaviors to improve the process of learning according to the learner’s emotional status.

Keywords E-Learning · Learners Personality · Emotion · Implementation · virtual classmate

36.1 Introduction

E-learning is usually defined as a type of learning supported by information and communication technology (ICT) that improves quality of teaching and learning. E-learning system is a powerful tool for achieving strategic objectives of the university (teaching, research and serving the society) [1]. E-Learning like all other tools offers advantages such as: access to differentiated online resources, Self-directed learning, and Learning matches learners’ lifestyles, etc. Despite of all the advantages this kind of learning lacks the necessary attractiveness most of the time. It seems that regarding the human characteristics and inserting them in virtual learning environments, it would be possible to show these environments more real.
Emotion, personality and individual differences are those effective parameters on human’s activities such as learning. People with different personalities show different emotions in facing an event. Difference in the characteristics of the individuals is reflected in their daily activities and their works. In the case of teaching and learning, personality difference between learners plays an important role. The learner’s personality will be effective in his learning style [2]. In virtual learning projects this point should consider that the learners’ personalities are various and the teaching method used for each learner should be different from the other learners.

36.2 Previous Works

In virtual learning systems created up to now, the learner’s emotions received much more attention and the emotional agents were more employed. In a few of these systems personality drew our attention as an independent parameter that some of them are mentioned here:

In ERPA architecture by using ID3 algorithm, the learner’s emotional reaction towards an event is predicted (for example, taking an exam score) [3]. Chaffar and his colleagues used the Naïve Bayes Classifier method to predict the learner’s emotions [4]. In ESTEL architecture, the Naïve Bayes Classifier method is used to predict the optimized emotional status. In this architecture, in addition to emotion, the learner’s personality is also considered. In this system, a module tries to create and induce an optimized emotional state. For instance, when the learner enters the system, after the identification of learner’s personality, for example extrovert, and recognition of optimal emotional state, such as happiness, an emotion is induced to that learner by showing various interfaces (e.g. music, picture, and etc.) to him [5].

In Passenger software designed by German researchers, cooperative learning methods are used. This software examines a series of emotions for the virtual teacher that is present in the system based on OCC model, and invites the learners to group work. The virtual teacher traces the learners’ activities and helps the learners who are not able to do cooperative activities [6]. Abrahamian and his colleagues designed an interface for computer learners appropriate for the type of their personality using MBTI test and concluded that learning through this interface as a result of using personality characters leads into developments in learning process [7]. In implementation performed by Maldonado and his colleagues, a virtual classmate agent is used. This agent is placed beside the learners, and mostly plays the role of a co-learner and a support. In this project each of the teacher, learner, and classmate has own emotions and the learner’s emotions affected his/her classmate [8].

36.3 Psychological Principles

Emotion, personality and individual differences are those effective parameters on human’s activities. Everybody needs special learning style according to his/her personality characteristics. Some tools are used to evaluate the different learning style
to determine the learner’s learning style. MBTI is the well-known questionnaire used for personality and learning style determination [9, 10]. According to MBTI classification, every individual has a set of instinctive preferences that determine how he or she behaves in different situations [9]. This questionnaire helps to identify personality characteristics and learning preferences of the individuals and to elicit the suitable learning styles from these characteristics [11].

MBTI uses four two-dimensional functions according to the Jung’s theory. According to the theory that Jung proposed the four functions of mind are thought, emotion, comprehension, and exploration. These functions are the main ways for understanding, and they explain the truth. These functions are related to each other and they simulate one another. Nevertheless, one of the functions is often dominant and that dominant function inclines the person to a state. The Jung theory distinguished three dimensions of Extroversion/Introversion (E/I), Sensing/Intuition (S/N) and Thinking/Feeling (T/F), but in MBTI another dimension of, Judging/Perceiving (J/P) also was added [7, 11]. Irrational mental functions, Sensing (S) or Intuition (N), relate to how an individual perceives information, while rational mental functions, Thinking (T) or Feeling (F), provide insight into how one makes judgments or decisions based upon their perceptions. Mental functions of Extrovert/Introvert and Judgment/Perception are related to how individuals interact with the external environment and the around world. Sixteen personality types are resulted from mixing these 4 two-dimensional functions that each learner would be placed in one group [11, 12].

36.4 Proposed Model

In this paper, a new model presented according to the learning model based on emotion and personality [13] and the model of virtual classmate [14] in previous our studies. The outline of the improved model is shown in Fig. 36.1. The model contains six major modules:

**Personality identification module**: In first step, learner comes across MBTI questionnaire and his personality will be identified (for example ISFJ, ESTP, INTJ, etc.).

**Module of choosing a learning style commensurate with learner’s personality**: Generally, there are three kinds of learning environment: individual, competitive and collaborative [15]. System based on the identified personality of learner, put him in one of three groups of independence, contribution with virtual classmate or competition with virtual classmate [16].

**Module of choosing virtual classmate agent**: If the learner is put in the independence group the process of learning and education will be started, otherwise the system at first chooses a virtual classmate that matches the type of learner’s personality, then the process of learning and education will get started. This module will explain at the next section with more details.
**Education module:** In this module, lesson’s points are presented to learner as exercises.

**Module of emotion evaluation:** When doing exercises and evaluating the extend of learning, there are some emotion expressed in learner which are relevant to level of learner’s learning and the events happen in the environment (as have liking for virtual classmate, be disappointed in doing exercises, etc.). According to the performed studies, we found out only special emotions are effective in the process of learning [17, 18]. Accordingly, the first and the third branch of emotions in OCC model are used. The first branch of emotions in OCC model are the effective emotions in process of learning and the third branch are those emotions that a person shows them when facing the others (for example virtual classmate agent).

**Module of choosing behavior and updating the learning style:** The module changes the style of education according to the events happen in the environment that cause changes to the learner’s emotion and also the learner’s personality characteristics.

Based on their knowledge base, the virtual teacher and classmate express suitable behaviors to improve the process of learning according to the learner’s emotional status.
36.5 Virtual Classmate Model

In this section we explained module of choosing virtual classmate agent with more details. This module is displayed in Fig. 36.2. The module includes three main parts, each of them described below:

*The part of personality generation:* In this part, using the MBTI questionnaire, the personality of the learner is recognized. In this paper we only considered two dimensions of E/I and S/N which are important in learning process [7]. Considering two dimensions, four types of personality that are EI, EN, IS, and IN would be resulted.

*The part of classmate selection:* In this part, a VCA appropriate for the learner’s personality is selected. Selected VCA is completely opposite in his MBTI dominant with learner. Based on research, the opposite personality displays a higher performance than the similar personality [19–21]. The personality selection for the VCA is so that it would result in improvements in learning process.

*The part of classmate behavior selection:* During the learning process, regarding the events that happen in the environment and the learning situation of the individual, the VCA exhibits appropriate behaviors. Tactics knowledgebase is used to interact with the learner.

For two personality dimensions considered in this paper four parameters are elicited. Independence and replying speed parameters for the E/I dimension and detail-oriented attitude and attention for the S/N dimension, now based on the extent of these parameters in each type of personality, the VCA exhibits a certain behavior. These behaviors are shown separately for each dimension in Table 36.1 and Table 36.2. Mixing the two dimensions’ functions, four personality types would be resulted, that are IN, IS, EN, and ES. A sample of these tactics is presented in Table 36.3.
Table 36.1 The VCA behavior with E and I personality dimensions

<table>
<thead>
<tr>
<th>Learner's personality</th>
<th>VCA's Characteristics</th>
<th>Independence parameter</th>
<th>Characteristic</th>
<th>Replying speed parameter</th>
<th>Events and VCA tactics (solving problem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>E</td>
<td>The introvert person mostly acts independently and is inclined to do the exercises alone. The extrovert person is interested in group work and rarely acts lonely.</td>
<td>The E VCA decreases the independence of I.</td>
<td>The introvert person takes a lot of time solving the problem, the extrovert person mostly acts without thinking and replies.</td>
<td>1. The E VCA tries to cooperate with I. 2. The E VCA tries to activate I by announcing the remaining time so that I answer the questions sooner.</td>
</tr>
<tr>
<td>E</td>
<td>I</td>
<td>The I VCA increases the independence of I.</td>
<td>The I VCA tries to decrease the speed of I.</td>
<td>1. The I VCA do not cooperate with E so that he act independently. 2. The E VCA tries to make I more relaxed so that he thinks more on problems.</td>
<td></td>
</tr>
<tr>
<td>Learner's personality</td>
<td>VCA's characteristics</td>
<td>detail-oriented attitude parameter</td>
<td>Characteristic</td>
<td>Attention parameter</td>
<td>Events and VCA tactics (solving problem)</td>
</tr>
<tr>
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<tr>
<td>S</td>
<td>N</td>
<td>The S person mostly pays attention to details, while N pays attention to the relation in the problems, and the result is important to him</td>
<td>The N VCA tries to explain the relation between the problems for S</td>
<td>The N person never pays attention to your words and predicts the words you want to say. The S person if there was any need to ask for help asks N and do not react negatively to his mistaken views</td>
<td>1. The N VCA tries to shed some light on the relation between problems for S, clarify the problem to S and explains the general points to the learner. 2. The N VCA helps and cooperates with the learner if he asks for that</td>
</tr>
<tr>
<td>N</td>
<td>S</td>
<td>The S VCA tries to decrease the amount of attention N pays to the details</td>
<td>The S VCA tries to attract the N's attention to himself</td>
<td>The N VCA pays attention to S and helps him if necessary</td>
<td>1. The S VCA reminds the details to N 2. The S VCA tries to convey his views to N</td>
</tr>
</tbody>
</table>
Table 36.3 VCA tactics

<table>
<thead>
<tr>
<th>Learner’s personality</th>
<th>VCA’s personality</th>
<th>Events and VCA tactics (solving problem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS</td>
<td>EN</td>
<td>1. The E VCA tries to cooperate with I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. The E VCA tries to activate I by announcing the remaining time so that I answer the questions sooner</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. The N VCA tries to shed some light on the relation between problems and explains the general points of the exercise for S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. If the learner asks for help, the N VCA helps and cooperates with him</td>
</tr>
</tbody>
</table>

36.6 Simulation of Proposed Model

In our educational environment two agents – VTA and VCA – are used. These two agents with identifying the learner’s emotions after each event, choose suitable tactics when are face to face with the learner. In this environment the way of choosing the tactics to face the learner is related to the learner’s type of group. Depending on the point that which groups the learner belongs to, special tactic is chosen.

Knowledge base of this system contains 65 rules (Table 36.4): 16 rules are to identify the learner’s group, 10 rules for independent learning group, 20 rules for collaborative learning group and 19 rules for competitive group. Four examples of these rules are in the following:

The first rule is an example of learner’s classifying into learning groups. According to the first rule, system groups the learner with ISFJ personality that is “Introvert”, “Sensing”, “Feeling” and “Judging” groups in independent group. The second rule is an example of the rules of teacher’s dealing in a situation that the learner is in independent group. The third and fourth rules are examples of situations that the learner is in collaborative and competitive groups respectively. As the rules shows in these two situations relevant to the learner’s emotions the virtual teacher and classmate use special tactics in interaction with learner.

36.7 Implementation

For implementing the e-learning environment, a series of English language exercises were used. In this environment it was assumed that the learner has already learnt the subject and refers to this software for solving the exercises. The exercises are categorized in five levels by difficulties.

The learner begins to solve the exercises together with the VCA, and regarding the events that happen in the environment interacts with the VCA. An image of this environment is presented in Fig. 36.3. Visual C#.Net and SQL Server database were
Table 36.4 Rules

Rule 1:
If student S1 has personality ISFJ
Then his/her group is independent

<table>
<thead>
<tr>
<th>Rule 2:</th>
<th>IF</th>
<th>THEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AND Student Group</td>
<td>IS Independent</td>
</tr>
<tr>
<td></td>
<td>AND Satisfaction</td>
<td>IS High</td>
</tr>
<tr>
<td></td>
<td>OR Satisfaction</td>
<td>IS Medium</td>
</tr>
<tr>
<td></td>
<td>AND Event</td>
<td>IS Correct answer</td>
</tr>
<tr>
<td></td>
<td>AND Teacher tactic1</td>
<td>IS Congratulate student</td>
</tr>
<tr>
<td></td>
<td>AND Teacher tactic2</td>
<td>IS Change student group to competitive</td>
</tr>
</tbody>
</table>

Rule 3:
IF Student Group IS Collaborative
AND Like IS High
OR Like IS Medium
AND Disappointment IS High
OR Disappointment IS Medium
AND Event IS Wrong answer
THEN Classmate tactic1 IS Increase student self ability
AND Classmate tactic2 IS Increase student effort
AND Classmate tactic3 IS Persuade student to think more for problem

Rule 4:
IF                      | AND Student group  | IS Competitive                            |
|------------------------| AND Like           | IS High                                    |
|                        OR Like           | IS Medium                                    |
|                        AND Fear          | IS High                                    |
|                        OR Fear          | IS Medium                                    |
|                        AND Virtual classmate’s personality | IS EN                            |
|                        OR Virtual classmate’s personality | IS ES                            |
|                        AND Event         | IS While student is accomplishing to a task |
|                        AND Student’s response speed | IS Lower than threshold |
| THEN                   | Classmate tactic1 | IS Increase student effort                 |
|                        AND Classmate tactic2 | IS Notify student for deadline         |
|                        AND Teacher tactic1 | IS Increase student self ability             |
|                        AND Teacher tactic2 | IS Change student group to collaborative     |
|                        AND Classmate tactic2 | IS Notify student for deadline         |
used for implementing. Also, to show the agents – VTA and VCA – we used two present agents in Microsoft that are Merlin and Peedy respectively.

36.8 Results

We tested our model in real environment with 30 students. Students work with our system, then they answered ten questions for evaluating our learning environment. We got rate of learner satisfaction Based on four question of our questioner (Fig. 36.4).
Results show that learners are satisfied of learning environment based on learner’s emotion and personality.

We got rate of presence effect of VCA Based on six question of our questioner (Fig. 36.5).

The results show that the presence of the VCA leads advancements in the learning process and attractiveness of e-learning environment.

### 36.9 Conclusion and Future Works

In this paper a model for using in e-learning was presented. In this model some modules for personality recognition and selecting an appropriate VCA for the learner’s personality, were considered to develop the interaction with the learner. The behavior of VCA saved in knowledgebase of system. The results show that placing the learner beside an appropriate VCA, lead to improvement in learning and makes the virtual learning environment more enjoyable.

In the future we will try to improve the system with considering the parameters of culture, case based reasoning and agent’s learning and also makes the virtual teacher and classmate agents more credible for the user.

### References


