DESIGNING EFFECTIVE PEDAGOGICAL AGENTS MODEL

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ABSTRACT

The purpose of this study was designing effective web-based pedagogical agent model. The research method was mixed method. There were two statistical populations in this research: a) All published pedagogical agent literature, b) E-learning experts for evaluating model reliability. There were two samples in this research. Theoretical sampling was used for quantitative content analysis and the other sample consisted of 20 e-learning experts who were randomly selected. Model was designed after data collecting. The result indicated the model was effective based on expert’s opinion.

Key words: Design model, External Properties, Internal Properties, Pedagogical agent

1. INTRODUCTION

With the emergence and development of computer technology and the Internet during 1990s, a new and powerful device were provided for educational institutions by which either they can achieve their institutional objectives or to create new and dynamic learning-teaching environments (Newman, 2003). Most obvious feature of Web pages is having powerful interface. The main goal of user interface design is to explore appropriate ways for to understand the electronic messages through the users (Skaalid, 1999) and one of the very effective ways of communication between humans and computers is the use of pedagogical agent (Holmes, 2007). Pedagogical agent, are the characters on the screen that during different parts of the e-learning program help the learning process. These agents can be cartoon characters, images or videos that speaks, or Avatars. Animated pedagogical agents have a huge potential force in support learning since they have the ability to simulate a real classroom learning environment (Woo, 2008). Through E-learning environment with pedagogical agents, an interaction between learners and pedagogical agent is formed and this interaction leads to learning (Atkinson et al 2005 and Kim et al., 2007).

In the meantime, it is important to answer this question, which pedagogical agents with what features for what group of learners should be utilized to learn efficiently?

2. STATEMENT OF THE PROBLEM

In recent years, researches have been made about the features of pedagogical agents. Most of these researches have been studied the social interactions between learners and pedagogical agents (Kim et al., 2007 and Gulz & Haake, 2006). Researches on different groups of learners indicated that learners’ characteristics such as age, sex and academic grade learners affect the selection of pedagogical agents (Craig et al., 2002 and Moreno & Flowerday, 2006). Therefore, the selection and preparation of pedagogical agents should be tailored to target groups (Moreno & Flowerday, 2006 and Kim & Wei, 2011). According to above, creating an appropriate pedagogical agent that can enhance the concentration and motivation of learners for learning is a need. Creating a pedagogical agent requires integration of knowledge and theories of many in the field of learning psychology, teaching, human relations and training that each of these items are a large and complicated category. Pedagogical agent should be highly diverse due to conditions and learning environments, also learners with different characteristics and various subjects of courses shall be studied, and combination of these factors require a great deal of analysis. Another important factor is the pedagogical agent that can be considered cartoons, animations, 2Ds or 3Ds, simple or with details, static or dynamic and each one of these factors should be combined with related factors of learning psychology. Studying the elements affect the design of pedagogical agents is the issue that this research is looking for its answer. Characteristics of pedagogical agents can be classified into internal and external features (Morey, 2008). Also; can present a conceptual model, procedure or a framework to guide the designers in creating pedagogical agents for virtual classes. Research’s objective: The
The overall goal of this research is to design an effective web-based pedagogical agent model for learning. This goal is divided into the following subobjectives that achieving to them will lead to gaining the overall goal.

1. Determining the effective internal characteristics of teaching agents
2. Determining the effective external features of teaching agents
3. Determining the dimension of effective educational factors
4. Formulating an effective model for designing educational agents
5. Determining the validity of the suggested model

3. RESEARCH METHODOLOGY

The combination of qualitative and quantitative analysis method has been used in this study. In another word by using qualitative method, model or framework of research can be found and then its validation will be investigated with quantitative method, population, sample and sampling. First in this study, to analysis the qualitative content among all published papers in scientific databases such as Science Direct, Eric, Ebsco, theoretical sampling has been done by experts’ sampling. To select a sample for the research survey and for validation, the model has been selected randomly in 20 people of these fields’ experts.

The outcome of this study was a model which in order to be validated should be approved by the experts of the field, for this purpose the framework of the model with a validation questionnaire has been sent to the experts. Before sending the model, validity and reliability of the questionnaire re-examined through experts’ ideas and the way of predetermining the validity was assessed. To determine the validity of the questionnaire, the tool of the researcher was based on the idea of 5 experts in the field of e-learning and the validity has been confirmed. In addition, in order to determine the reliability of the questionnaire, it was sent to 20 experts of e-learning and their responses were collected. Then, after a week the questionnaire was resent to the same experts and the correlation of the initial examination results with the retest results were studied. Pearson correlation was used to determine the reliability of the two tests Result at level of 0.05 was significant.

| Table 1. The correlation between the first and second test results |
|------------------------|------------------|---------------------|------------------|
| row | Test | Mean | Level of significance | Standard deviation |
| 1 | First | 40.95 | 0.499 | 2.91 |
| 2 | Second | 41.1 | | 40.95 |

4. RESEARCH BACKGROUND

Through a tour on conducted research in this field, we find that animated pedagogical agents affect on the process and the learning results through internal and external features (Moreno, 2005). Internal feature of animated pedagogical agent includes teaching methods, which are used to improve learning by pedagogical agent. Features like directing learner’s attention in multi-media learning environment (Moreno, 2004), providing feedback, modeling, model processing and guidance (Moreno et al., 2001), enhancement of active learning and providing opportunities for accomplishment of such issue (Moreno & Mayer, 2000).

On the other hand, effective external features of animated pedagogical agent on social features of learning process which are combined like picture and sound. Although, increasingly this issue that the internal features of animated pedagogical agent have solely a high effect on learning, but the more controversial dimension of animated pedagogical agent in the field of instructional design is the external dimension of pedagogical learning. In the case of pedagogical agents, there have been many studies in the last decades. The researchers reported here are mainly considered both internal and external features of pedagogical agents. In this research, the effect of animated pedagogical agent on the learning, facilitating learning and learning motivation in science course is studying, which was made with the purpose of studying the influence of animated pedagogical agent on the roles of instructor and expert, the target sample size was 40 which were selected randomly from four classes and each class were randomly subjected to a different learning method. In order to teach through multimedia, a training based on animated pedagogical agent has been made that is used for both sample groups during two consecutive weeks (two one-hour class). The first group was trained by multimedia learning based on instructor’s pedagogical agent and the second group was trained by multimedia learning based on expert’s pedagogical agent. The obtained outcomes of this research indicates that instructor’s animated pedagogical agent has more effect on learning, facilitating learning and learning motivation of science course rather than expert’s pedagogical agent (Gharabaghi, 2010). The research the impacts of pedagogical agents as a social model for learning, keep remembering and learners (Ramazan & Kicik-Cakmak, 2012) was made which in this study seventy students of elementary school were randomly exposed to one of four experimental situations (Similar to human, cartoon character, user interface along with the voice, user interface along with the writing). Results indicate that the students of second grade of guidance school exposed to pedagogical agent of similar to human have gained better results in educational improvement, keep remembering and attitude rather than other groups.

The research ‘Educational influence on learners’ motivation and facilitate the learning with an emphasis on the sound and appearance of pedagogical agent (Domagk, 2010) were studied on 174 college students, which it’s results indicate that, only pedagogical agent cannot enhance learning and motivation and if the pedagogical agent appearance be acceptable. The learning will enhance and if both sign, the sound and appearance to be
The study of validating pedagogical agent roles by Baylor and Kim (2003) shows the designing and empirical validity of three separate role of educational agent (expert, motivator and coach) for College Students. In this Research environment based on Multiple Intelligent Mentors Instructing Collaboratively (MIMIC). The roles of educational agent were made by images, animations, collisions, sound and text in 4 software and were run by Microsoft operating software. By applying 2 controlled tests, the three mentioned roles validated based on perceived levels of learners (n=78) and specially its real effect on motivation and Individual amount of learning (n=71) has been validated. Results showed that roles of agents, do not perceived just for reaction of students against desired goals. However, they will lead to meaningful changes in learning and their motivation as they are designed. Particularly, the expert agent led to increased access of information and the motivational agent led to increased self-efficacy, and coach agent led to better learning.

Baylor and Kim were indicating the study of Pedagogical Agent Design, Impact of Agent Realism, Gender, Ethnicity and Instructional Role (Baylor & Kim, 2003). In the first study of two experimental studies, 312 students were in one of the 8 experimental condition randomly in which agents were different in terms of their Race, Gender, and images (the actual /cartoon) But they had the same sound, and this sound was produced by a computer. In the second study, 229 students were randomly assigned to one of 12 conditions in which agents were different in terms of displaying different educational roles (expert, motivator, and coach) and from race and gender. Generally, it became clear that when agents are more photorealistic and the agent displays role of expert, which being implemented unconventionally (e.g. Black vs. White) so, students are more capable of transmitting learning. The results also generally confirm the preliminary study, which had shown that where the agents were perceived as little smart, self-efficacy was significantly, was increased. Providing motivational messages, such as using motivational roles and coach, led to increase of self-efficacy and self-regulation of students. The study of the pedagogical agent split-persona effect by Baylor and Ebbers (2003) Proceeded to examine the question whether having an educational agent of coaching that is combination of specialized and motivational support is more effective or the existence of two distinct agents one with expertise (Expert) and another motivational supports (motivator). Results showed that having two distinct training agents that have two mentioned roles have a significant positive impact on each learning and conceptual value of agents. It would provide preliminary evidence regarding the effectiveness of distinct personalities of training agent and suggests that, two separate agent that provide different functional role are preferable that an agent which display both roles.

The study of the impact of image and voice with pedagogical agents has been done by Kim, Baylor and Reed (Kim et al., 2003), which its objective was investigating the effect of Image and voice of training agent on learner’s perceptions and learning. This study had 109 participants who were students of computer literature. These participants were randomly assigned to one of six positions. Educational factors were designed with different images and sounds. The image was designed in expert and coach species and voice was designed in three strong, slow and computerized types. However, they were designed equal in terms of gesture, behavior, speech and gender. Results showed that agent image has a significant effect on the perception of the role, so as it was assumed, the image of coach had more motivational effect. Generally, strong voice was more encouraging, whereas both human voices, strong and slow were more emotional, more welcoming and more facilitating that computer sound. Another result was that the picture and sound training agent did not have significant effect on learning.

Baylor, Ryu and Shen has done the research of the effects of pedagogical agent voice and animation on learning, motivation and perceived persona as 2x2 factorial designed (Baylor et al., 2003). The aim of this study was to investigate the effect of noise (human-machine) and animation (movement, lack of movement) on learning, motivation, and perceived social prestige of training agent. This study had 80 participants that were assigned randomly in four situation of human voice with movement in training agent, human voice without movement, machinery voice with movement in training agent and machinery voice without movement. Major impact animation showed that when the agent is mobile although participants known these agents less facilitation. Results showed that when agents were different in terms of displaying different educational roles (expert, motivator, and coach) and from race and gender. Generally, it became clear that when agents are more photorealistic and the agent displays role of expert, which being implemented unconventionally (e.g. Black vs. White) so, students are more capable of transmitting learning. The results also generally confirm the preliminary study, which had shown that where the agents were perceived as little smart, self-efficacy was significantly, was increased. Providing motivational messages, such as using motivational roles and coach, led to increase of self-efficacy and self-regulation of students. The study of the pedagogical agent split-persona effect

Therefore, by investigating the conducted researches, it is possible to design the optimal and effective model from training agents.

5. THEORETICAL BACKGROUND

One of the most important areas of educational technology, and especially in the field of multimedia, which is under the research and development, is animated pedagogical agent and its special features in increasing the
learning in environments based on computers. Training agent will play a very important role in the context or educational environments. Training agent mostly in educational environment is teacher and by displaying training activities makes learners to learn. In the opposite point of, learners with observing the activities that a training agent can do, they can learn it, without their being able to do it. in Educational software and e-learning environment; the content will deliver in such a way that the role teacher will be deleted. Mobile training agent is a step toward restoring the role of the teacher and kind of social interaction in these environments.

**Theory of social agent**

A conceptual framework for the deployment of mobile training agents is social agent theory. Practical implications of this theory for the design of a multimedia environment is related to the issue that, as a learner interact with individual human in a real environment, can enter into an interactive relationship with computers and multimedia environments, as well as a social agent and learn from this relationship. Based on the theory of social agent, social signs and symptoms in multimedia messages (for example providing an educational agent with human voice), caused learners consider the learning environments of computer-oriented as conversational and interpersonal environment (Mayer et al., 2003). Also according to this theory, the scheme of prior social interaction leads learner to try in a way of understanding and deep processing of educational messages of scientific issues that is provided by the computer (Atkinson et al., 2005). Mayer (Mayer, 2001) notes that the cognitive processes that the learner uses to understand the educational topic includes of

A) Selection of relevant information
B) Organizing information model
C) Combining previously learned knowledge with new information.

The ability of Information processing with deep levels of understanding makes the learner capable of transition of Exchanging experiences and previous knowledge to the problem solving situations (Mayer, 2001).

**Cognitive theory of multimedia learning**

Designing multimedia environments, whether on the Internet or CD must be according to the scientific principles, and be based on principles of information processing by human (Clark & Mayer, 2008). Multimedia message with regards to the way that human brain are designed, has more possibility of significant and meaningful learning than those, which are not designed based on cognitive theory of multimedia learning. Mayer stated 7 principle in preparing multimedia messages, that one of the principles of multimedia learning is principle of making personality, which consists of three sub principles:

A) Provide the Verbal content as an interactive style
B) Use the on screen characters to increase the level of learning
C) Making the content writer visible to increase the level of learning (Clark & Mayer, 2008)

Moreno depicts theory of multimedia learning due to the combination of these agents with a multimedia learning environment (Figure 1) (Moreno, 2005).

**Social Agency Theory**

Another theoretical basis that checks the necessity of using such training agents in a multimedia environment is Social Agency Theory. Based on this theory, Human beings interpret computers social company (Louwerse et al., 2005). The theory claim that brings verbal Social cause and nonverbal (e.g. gestures, gaze and movement), can simulate human-human communication in a multimedia environment and thus contribute to facilitate the involvement of learners in the learning process (Moreno et al., 2001 and Dunsworth & Atkinson, 2007). In fact, a Gesture, Gaze and Nod in mobile training agent can provide environment in computer in which the human communication can be seen as well (Atkinson, 2002).
The Social Agency Theory, claimed that using Visual and verbal social cues in computer-based environments may encourage learners to reflect on their relationship with the computer, and foster a sense of community participation. According to this view, the scheme of social interaction, leading to learner efforts for understanding and deep processing computer training message associated with scientific topics Learners’

Perception of the computer as a social company with the human voice and friendly behavior involves learners in the process of making sense and concept that will increase the Transfer of learning. Foregoing discussion, by this theory combining a multimedia learning environment and mobile agents is considered as visual and verbal social cues and Virtual communication between agent and the learner as a substitute for human interaction (Atkinson et al., 2005).

Cognitive load theory
Cognitive load theory is a theory of instructional design, which aims to reduce the cognitive load (Sweller, 1994) because an active memory can process limited amount of new information. If the task of learning were very complex, it can make an extra burden. This is the main assumption in Cognitive Load Approach. Research in the field of cognitive load will offer that combination of Audio-visual speech of dynamic educational agent will encourage students to deep processing of information in comparison with the time that Speech or text being placed alone without the presence of agent on the screen (Sweller, 2004). According to the training agent of cognitive load theory that assumed that the training agent’s information are around the content. Like superfluous phrases that have little educational purpose increases the external cognitive load and makes learner to process the information and try to recognize the thing that there is no reason for doing that. Woo (2008) and Clark and Choi (2005) express that the training agent may even to increasing the cognitive load and that’s the reason for making learners to divide their attention to lots of visual items (such as gesture and mimic) or between agent and information on screen (like text associated with speech). As an example when training agent use both the visual and audio information simultaneously, so learner’s attention dividing is take place. Therefore, training agents should be provided in a way that does not lead to increasing the cognitive load (Kim et al., 2003).

Social–Cognitive Theory/ Bandura (1977)
Based on this theory, most human learning is gained from the experience of succession. He knows further learning through observation in his theory. Observations of events and activities that person doesn’t have any role on that but achieved Many of the events them from rules and knowledge from their observation. By substitution, Bandura means that although the individual does not experience activity it, by observing that activity from others can learn it. Attention to this agent remembering the use of training agent in another word, learners can learn many of principles merely by observing another person. Attention to this agent will remember the use of training agent as well, in another words, learners will learn many of principals just with other’s observation (Bandura, 1977).

6. RESEARCH FINDINGS
Evaluating the research backgrounds showed that training agents have Categories such as, the best and most comprehensive classification based on internal and external features (Morey, 2008). The exterior features are the features that deals with verbal and visual presentation of agent and in internal features, the role of agent and its training methods are investigated. Despite numerous researches that have been done in the case of educational agents, full agreement and comprehensive study on the effective educational agents has not been conducted, by using resources and research conducted, firstly the research’s framework is designed at the end of educational agent and finally the current model being validated. As analysis of the contents was conducted and shown in Table 2 as well, Visual characteristics of the educational factors can be used in 4 shapes and verbal features in 5 shapes.

Table 2. Effective Internal attributes of educational agent

<table>
<thead>
<tr>
<th>Row</th>
<th>Internal attributes</th>
<th>Strategies</th>
</tr>
</thead>
</table>
2. Expressive Speech (has some pause and the tone will arise and fall) (Veletsianos, 2009)  
4. The human voice instead of the voice produced by a computer (Craig et al., 2002, Atkinson, 2002) |
| 2   | Visual              | 1. The high level of perceptual attractiveness of Educational agent in terms of appearance and sound (Domagk S. 2010)  
2. Males and a female based on a comprehensive Selection of (Domagk, 2010)  
3. Movements of head hand or agent facial expressions (Craig et al., 2002, Baylor & Kim, 2009)  
4. Real agent rather than cartoonish (Wang et al., 2008)  
5. Selection of agent’s appearance by themselves (Gutz & Haake, 2006)  
6. Anthropomorphic agent against non-anthropomorphic agent (Choi & Clark, 2006)  
After content analysis, as shown in Table 3 Characteristics of educational methods can be set in 5 shapes and the agent’s role can be used in 3 shapes.

Table 3. Effective Exterior features of educational factors

<table>
<thead>
<tr>
<th>row</th>
<th>External features</th>
<th>strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Educational method of agent</td>
<td>1. controlling the learning rate by learners (Mayer et al., 2003)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. providing descriptive feedback (Moreno, 2004)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. polite Feedback (Wang et al., 2008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. providing pre Question (Mayer et al., 2003)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. selecting answers by learners (Moreno &amp; Mayer, 2005)</td>
</tr>
<tr>
<td>2</td>
<td>Agent’s role</td>
<td>1. eficency of agents and student together (Choi &amp; Clark, 2006)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. appropriate skills with learners (Moreno &amp; Mayer, 2004)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. role of educational agents variable (Gulz &amp; Haake, 2006)</td>
</tr>
</tbody>
</table>

Agent’s Educational methods and its role are part of the exterior features of educational factors. By determining the effective external and internal features, dimensions of the proposed model are determined. Then it will conclude the effective visual features in educational factors. several research’s findings introduced different strategies but some of the, are more common and also are more effective practically, as table 4 shows, for visual factors in internal features, seven strategies are introduced that have the most effect on learning. Suggested strategies are including of high rate of perceptual attractiveness of educational agent in term of appearance and voice, gender based on selecting the learners, gestures and facial features of agent, real agent instead of cartoonish one. Selecting the appearance of agent by learners and selecting the gender by themselves. Anthropomorphic agent versus non anthropomorphic agent, dynamic agent versus static agent, in aspect of verbal factor here we have four factors and suggested strategies are as below: speech instead of text dynamic speech (rising and falling of intention by pauses) personalized speech (unofficial) human voice instead of produced voice by computer. External features of educational factors in part of educational method are including of controlling speed of learning by learners, providing descriptive feedback, polite feedback, providing prequestions and selecting answers by learners. In section of role of educational agent, strategies are nearness of agent’s efficiency and student’s efficiency, appropriate skill by learner’s skill and role of educational agent’s variable (motivator, expert and coach). Finally after determining visual and verbal feature and educational method of agent and its role, all aspects and dimensioned of pattern was determined (table 4).

Table 4. Dimensions of effective educational agent’s pattern

<table>
<thead>
<tr>
<th>Row</th>
<th>Framework’s dimensions</th>
<th>Function</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>visual features</td>
<td>Internal</td>
<td>1. high rate of perceptual attractiveness of educational agents in term of appearance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Movements of head hand or agent facial expressions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. real agent instead of cartoonish one</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. selecting the appearance of agent by learner</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. selecting gender by learners</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6. Anthropomorphic agent versus non anthropomorphic agent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7. dynamic agent versus static agent</td>
</tr>
<tr>
<td>2</td>
<td>Verbal features</td>
<td>Internal</td>
<td>1. speech instead of text</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Expressive Speech(has some pause and the tone will arise and fall)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. personalized speech (unofficial)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. human voice instead of produced voiced by computer</td>
</tr>
<tr>
<td>3</td>
<td>Educational strategies</td>
<td>External</td>
<td>1. controlling the speed of learning by learners</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. providing descriptive feedback</td>
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<td></td>
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<td>3. polit feedback</td>
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<td></td>
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<td></td>
<td>4. providing pre question</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. selecting answers by learners</td>
</tr>
<tr>
<td>4</td>
<td>Role of educational agent</td>
<td>External</td>
<td>1. nearness of agent’s efficiency with student</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. proper skill with learner’s skill</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. role of educational agent’s variable (expert, coach, motivator)</td>
</tr>
</tbody>
</table>

Regardless of the various classification and functions of educational factors, despite numerous studies no model has been provided based on the characteristics of internal and external educational factors. Most researches have focused only on one of the attributes, so in current study according to the nature and features of educational factors and based on theoretical and research foundation of this issue, it has been tried to develop the Educational factors’ framework based on internal and external features that are including visual, verbal features, role of agents and educational methods. The outcome of this research is to develop a model consistent with Figure 2.
Effective design pattern of educational factor has five stages:
A) First Stage: in the first stage, patterns and visual and verbal features of educational factors in overall level and based on Research findings have been used. The educational agent in this level is like a dynamic human, it is near to the reality, and the agent’s voice is human voice that’s completely clear and speaks unofficially. In this stage, the learners do not have any role in selecting these features.
B) Second stage: In this stage the user chooses details of educational agent such as gender, age, weight, and clothing

C) Third stage: in this stage, the selected educational agent has been entered to the user interface in previous level with the aim of creating motivation and motivation and motivational role and after test will introduce learners in three levels of Beginner, intermediate and advanced. Of course learners at this stage are not aware of grading result. Ranking or classification in this stage is only to determine the level of, skill or level of educational agent’s knowledge of expert in the next step.

D) Fourth stage: In this stage, all learners in every level according to their skills or knowledge face with the educational agent that has the efficiency or skill of them. In this level, role of motivator will change to expert, expert at first, express the pre question, and after directing students to the right content, the user can completely control the speed.

E) Fifth stage: Finally after finishing the presentation of content. The educational agent will enter as a coach or trainer; so the agent will expose the user by role of trainer and regarding to the user’s answers, will provide polite descriptive feedback. In this stage, the user answers to the question.

In order to validate the proposed model, 10-question questionnaire was designed.4 question about the whole pattern and 6 about the components of pattern. This pattern has been sent along with the complementary explanation about general framework of pattern to 20 experts in field of e-learning. According to levels of grading of questionnaire in Likert scale, the score of each expert with the assumption of answer all questions could be the last 10 and the maximum of 50. By entering scores into SPSS and calculate the mean and standard deviation, the results in Table 5 were obtained. As is clear from the table, the mean of all the questions were higher than the mean of each question (it was 3). The maximum mean is related to questions 1, 2, 7, and 8. In other words, experts in self-assessment have argued that proposed pattern is fully functional and suitable for e-learning environments and have good visual strategies for the design of educational factors.

### Table 5. Standard deviation of specialist response and variance of scores

<table>
<thead>
<tr>
<th>row</th>
<th>Question</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To what extent aspects of the proposed model is complete?</td>
<td>3.05</td>
<td>0.42</td>
<td>0.23</td>
</tr>
<tr>
<td>2</td>
<td>To what extent visual attributes of instructional factors strategies are appropriate.</td>
<td>4.05</td>
<td>0.51</td>
<td>0.26</td>
</tr>
<tr>
<td>3</td>
<td>To what extent Related strategies of verbal features of educational factors are appropriate.</td>
<td>3.55</td>
<td>0.51</td>
<td>0.26</td>
</tr>
<tr>
<td>4</td>
<td>To what extent strategies of educational agent’s role features are appropriate.</td>
<td>3.45</td>
<td>0.51</td>
<td>0.26</td>
</tr>
<tr>
<td>5</td>
<td>To what extent strategies of educational strategies in educational agents are appropriate.</td>
<td>3.15</td>
<td>0.48</td>
<td>0.23</td>
</tr>
<tr>
<td>6</td>
<td>To what extent Strategies of the proposed model is applicable.</td>
<td>3.5</td>
<td>0.51</td>
<td>0.26</td>
</tr>
<tr>
<td>7</td>
<td>To what extent pattern of educational factors is beneficial to design e-learning environment.</td>
<td>3.6</td>
<td>0.50</td>
<td>0.25</td>
</tr>
<tr>
<td>8</td>
<td>To what extent do you suggest designers can utilize this model?</td>
<td>3.6</td>
<td>0.59</td>
<td>0.35</td>
</tr>
<tr>
<td>9</td>
<td>To what extent educational factors are applicable.</td>
<td>3.4</td>
<td>0.50</td>
<td>0.25</td>
</tr>
<tr>
<td>10</td>
<td>To what extent the proposed model comprehensive.</td>
<td>3.5</td>
<td>0.51</td>
<td>0.26</td>
</tr>
</tbody>
</table>

7. CONCLUSION

In recent years, we have witnessed the birth of a new pattern for learning environments. Movable educational factors, these actual autonomous characters have coexistence with students in learning environment, to build face-to-face relationships. This will reveal exciting new possibilities. For example, agents can indicate complicated tasks, using Movement and gesture to attract students’ attention on the most salient aspects of a duty and transfer emotional reactions to the educational conditions. Educational agents can increase the ability of learning environments to involving student or motivate them. Approximately most of the research’s findings, have been stated the positive effect of educational agents. However no guidelines are not supplied so far that are agreed upon by all scholars. In the design of educational factors, internal and external design guidelines should be considered. Research findings with consideration of the visual features of pedagogical agent indicate that the similarity of the agent to human personality, being real, and its animation level are the matters should be considered. Always it is tried that the picture and the animation of pedagogical agent be perfect, especially from the technical point of view and in order to be more real to consider especial features such as muscle contraction, wrinkles and simultaneous movement of the lips and voice exit (Bradshaw, 1997), the agent human-like means the behavior of pedagogical agent to be natural and appropriate for the learner. It is assumed that a human-like personality is more believable and in return, an abnormal behavior of non-human personality can cause distraction and deviation of the learner\(^{45-46}\). Movement level and animation of a pedagogical agent, which has a close relationship with realness and being human-like, can include simple movements to the complicated ones. In addition, it can be designed 2D or 3D. The incomplete appearance of pedagogical agent can be specifically designed by showing agent’s head of a human-like agent (or only upper trunk). Verbal feature is one of another internal feature indicator of pedagogical agents, which the voice of human in comparison with the simulated voice by computer is more acceptable, based on the findings\(^{1}\). Pedagogical agent talks in personalized way (Unofficial). Personalized model (unofficial) facilitates the sense of community and the learning will be enhanced. In addition, effective pedagogical agent does not speak uniform; it pauses, lowers and raise its voice. Effective external features according to the findings are the role of pedagogical agent, the methods of pedagogical agent, which the

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research findings indicated that (table 3) each of these features include a number of components that were assessed effective.

As table 4 shows, the dimensions of suggested model are four, including: visual features, verbal features, the role of pedagogical agent and training approaches of agent and each dimensions of this framework consists of specific feature of pedagogical agents. For instance, pedagogical agents based on visual features include some strategies, which are in line with the internal and external features of agents. The dimensions of this framework is researcher’s suggestion, and it can be added other components. In addition, other strategies in accordance with each dimension can be determined and added. The present study, regarding to the nature, the features of pedagogical agents and based on the theoretical and research foundation topic, it is tried to develop the pedagogical agents’ framework according to the internal and external features of agents, which consists: visual features, verbal, and the role of agent and training methods. It is developed in accordance with modeling framework on figure 2 basis and then it is validated. As described in the Results Analysis totally evaluators had a positive view about the model. However, some aspects of the model were scored lower. For instance, in question 4, it is asked from the evaluators of suggested model how much the strategies related to the strategies of pedagogical agents were appropriate? Totally, the score they gave to this question compared to other questions is lower. This indicates that the suggested strategies are not suffice and more strategies should be added to.

Suggested model, is the result of researches, which are done scientifically and accurately. Numerous researchers have studied pedagogical agents, but they have not studied the internal and external features, and only considered one of its dimensions. Suggested model components are based on internal and external features effective on the researches done scientifically and accurately and has been published in scientific journals.

REFERENCES