An adaptive teaching strategy model in e-learning using learners’ preference: LearnFit framework

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Abstract: Personality and individual differences are effective parameters in human activities such as learning. Since the learning style of each learner is different, we must fit learning to the different needs of learners. In this paper, an innovative learning approach is proposed by considering the learner’s preferences. Using the Myers-Briggs Type Indicator’s (MBTI) tools, a framework for adaptive teaching strategies has been developed in e-learning context. Moreover, an experiment was conducted to evaluate the performance of our approach. The results of the system tested in real environments show that considering the learner’s preferences increases learning quality and satisfies the learner.

Keywords: adaptive learning; Myers-Briggs Type Indicator; MBTI; learning style; teaching strategy; personalisation.


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1 Introduction

Nowadays, development of searching technology provides learners a new way to break free with the more traditional educational models. In response to individual needs, personalisation in education not only facilitates students to learn better by using different strategies to create various learning experiences, but also teachers’ needs in preparing and designing varied teaching or instructional packages.

It is commonly believed that each learner has a preference for a teaching style that allows him to learn better. Indeed, most people prefer some kind of interaction such as processing stimuli or information or simply using a visual medium. So to learn effectively and better, the learner has to be aware of his preference that makes it easy to manage his own way of learning. This information will enable the learner to improve the effectiveness of his learning experience and to perform better in his academic achievement. Cooper and Miller (1991), report that the level of learning style or teaching strategy congruency is related to academic performance and to student evaluations of the course. Furthermore, Jungian-based psychologists add that people’s personality preferences influence the way they may or may not want to become more actively involved in their learning, as well as take responsibility for the self-direction and discipline (Myers, 1993; Myers et al., 1998). So, we may to identify a student’s individual learning style and then adapt instruction toward that person’s strengths and preferences. In fact, adjusting instruction to accommodate the learning styles of different types of students can increase both the students’ achievement and their enjoyment of learning.

Until today, a lot of research works have been done about personality type and instructional strategies but its still very difficult to draw a definitive idea on the relationship between them (Matta and Kern, 1991; Crosby and Stelovski, 1995; Bishop-Clark and Wheeler, 1994; Gurka and Citrin, 1996; Chalfoun et al., 2006; Chaffar and Frasson, 2004; Chaffar et al., 2007; Marin et al., 2006). Abrahamian et al. (2004) designed an interface for computer learners appropriate to their personality types using MBTI model. Using learner’s personality Maldonado et al. (2005), Fatahi et al. (2009) proposed an Expert system for virtual Classmate Agent.

This paper focuses on design, implementation and evaluation of a personalised educational framework-based learners’ preference which can help learner and also teacher to achieve a positive educational experience.

2 Background

In the past decades, various issues concerning adaptive learning have attracted the attentions of researchers from the fields of computer science and education. In the meantime, various ways of measuring learning styles have been proposed to assist
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instructors or educational researchers to more realise the characteristics of learners. In the following subsection, relevant studies addressing learning styles and the Myers-Briggs Type Indicator (MBTI) model are given.

2.1 Learning styles

In his work, Keefe (1979) described the learning style as both a student characteristic and an instructional strategy. As an instructional strategy, it informs the cognition, context and content of learning. It can also be defined as the way a person collects processes and organises information.

There are many models of learning styles existing in literature. Individual learning styles differ, and these individual differences become even more important in the area of education. Learning style may be defined as “the attitudes and behaviours which determine an individual’s preferred way of learning” (Logan and Thomas, 2002). The learning style provides educators an overview of the tendencies and preferences of the individual student (Keefe, 1979). Several studies show that students learn in different ways, depending upon many personal factors and everyone has a distinct learning style (Honey and Mumford, 1992; Montgomery, 1995). Therefore, when an instructor’s style matches a learner’s learning style this affects the learner’s experience and ability to do well. Until today, a lot of research works have been conducted about learning styles and developed a good deal of learning style models but there does not seem to be any agreement of acceptance of any one theory (Bishop-Clark and Wheeler, 1994). There have been several models for defining and measuring learning styles proposed, such as Kolb’s (1995) questionnaire, honey’s questionnaire (Honey and Mumford, 1992), Keefe’s (1979) questionnaire, MBTI’s questionnaire (Myers, 1993). Felder and Solman (2003) proposed a psychometric questionnaire ILSQ.

Therefore, in this study we have adopted the MBTI’s model as one the well-known source information for personalisation

2.2 MBTI

The Myers-Briggs inventory is based on Carl Jung’s theory of types, outlined in his 1921 work Psychological Types (Myers et al, 1998). Jung’s theory holds that human beings are either introverts or extraverts, and their behaviour follows from these inborn psychological types. He also believed that people take in and process information different ways, based on their personality traits. The MBTI reports a person’s preferences on four scales: extraversion/introversion (E/I), sensing/intuition (S/I), thinking/feeling (T/F) and judging /perceiving (J/P). The various combinations of these preferences result in a total of 16 personality types and are typically denoted by four letters to represent a person’s tendencies on the four scales as shown in Table 1.

Table 1 Personality types of MBTI

<table>
<thead>
<tr>
<th>ISTJ</th>
<th>ISFJ</th>
<th>INFJ</th>
<th>INTJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISTP</td>
<td>ISFP</td>
<td>INFP</td>
<td>INTP</td>
</tr>
<tr>
<td>ESTP</td>
<td>ESFP</td>
<td>ENFP</td>
<td>ENTP</td>
</tr>
<tr>
<td>ESTJ</td>
<td>ESFJ</td>
<td>ENFJ</td>
<td>ENTJ</td>
</tr>
</tbody>
</table>
For example, ISFP stands for introversion, sensing, feeling, and perceiving. This does not mean that a person possesses only four preferences, but that the four preferences show a greater presence than their counterparts.

The MBTI assessment can not only indicate the learner’s preferences, but also indicate, how clear in expressing the preference for a particular pole over its opposite.

2.3 Clustering of learners using MBTI Dominant preferences

Type theory (Bayne, 1995) asserts that one of the four preferences, sensing, intuition, thinking or feeling, usually dominates the others. In fact, we all have an aspect of our personality which dominates or governs us. It gives direction to the personality and shapes the motives and goals for learners. This is called the dominant process or dominant function. For example, a person uses the dominant type the most and feels most comfortable when using it. There is also an auxiliary or secondary process which should be the second in strength and is the necessary assistant to the dominant. As with the dominant type, the auxiliary is readily used and a person will unconsciously shift back and forth between the two. If the learner is extravert, then this guiding preference is most typically used in an open/easily apparent manner, dealing with the outside world. However, if the learner is introvert, then this guiding preference is most typically used internally and more privately in reflection and consideration.

To design and develop 16 teaching styles for the same course can be a complicated task for educational designers to meet the needs of the learner. Therefore, in our approach we consider only the dominant preference since it’s the key of our learning process and also to simplify our framework for a first evaluation. Table 2 shows our suggested learner’s classification based on dominant function. For example, $\hat{S}$ denotes a set of all learners which have ISTJ, ISFJ, ESP or ESTP types.

<table>
<thead>
<tr>
<th>Myers Briggs type</th>
<th>Dominant preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISTJ, ISFJ, ESTP and ESFP</td>
<td>$\hat{S}$</td>
</tr>
<tr>
<td>INFJ, INTJ, ENFP and ENTP</td>
<td>$\hat{N}$</td>
</tr>
<tr>
<td>ISFP, INFP, ESFJ and ENFJ</td>
<td>$\hat{F}$</td>
</tr>
<tr>
<td>ISTP, INTP, ESTJ and ENTJ</td>
<td>$\hat{I}$</td>
</tr>
</tbody>
</table>

We will use this classification to suggest teaching strategies (TS) and thereafter to design and develop an adaptive learning management system: LearnFit.

3 Adaptive TS suggested

It is extremely difficult for a teacher to determine the optimal learning strategy for each student in the same classroom. Even he is able to determine all strategies, it is even more difficult to apply multiple TS in a real learning environment.

Several researchers have used the MBTI to determine preferred teaching styles in relation to distance education (Ehrman, 1990), willingness to use technology in teaching
(Fuller et al., 2000; Grant and Cambre, 1990; Knupfer, 1989; Pfeifer, 1983; Pitt and Clark, 1997), and willingness to embrace innovation and change (Hetrick, 1993).

Ehrman (1990) builds upon the previous work of Lawrence (1984) to chart preferred teaching models of the four scales of the MBTI. In this section, properties of each learner’s preference, pertaining to education and learning, were collated from this literature.

Figure 1 TS designed for each group (see online version for colours)

In the following subsections, we present our adaptive teaching strategy for each learner’s group.

3.1 Sensing students

Sensing students rely heavily on their five senses to take in information: to hear, touch and see what they are learning. They enjoy hands-on activities, computer-assisted instructions, materials that can be handled and audio-visual materials, provided they are relevant. They learn best when material is tied in with ‘real life’ situations. Sensing types will learn easier if facts and skills presented have relevance to their present lives.

They like concrete facts, organisation, and structure. They are good at memorisation, usually realistic, and relatively conventional. Sensing students are ‘why before what’ learners. That is, the educator must get them to see the material’s relevance before actually teaching the subject matter. Since they often have difficulty with theory, some research studies suggested for sensing students the application-theory-application (ATA) approach. The students attempt to analyse and solve the problem without the benefit of the upcoming course’s theory. Therefore, the teacher presents the chapter’s theory or ideas, and then applies it to the original application. Afterwards the teacher presents additional applications to make the learning process easier. Table 3 provides an overview of preferred learning characteristics and electronic media relationships for sensing students in e-learning environment.

Table 3 Preferred learning characteristics and electronic media relationships for sensing students

<table>
<thead>
<tr>
<th>Preferred learning characteristics</th>
<th>Electronic media</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Preferring step-by-step and traditional curricula</td>
<td>• Chat</td>
</tr>
<tr>
<td>• Using past experience and standard ways to solve problems</td>
<td>• E-mail</td>
</tr>
<tr>
<td>• Liking suggestions that are straightforward and feasible</td>
<td>• Forums</td>
</tr>
<tr>
<td>• Liking realistic applications</td>
<td>• Animation</td>
</tr>
<tr>
<td>• Applying what is already known by giving examples and details</td>
<td>• Pictures</td>
</tr>
<tr>
<td>• Liking to follow an agenda.</td>
<td>• Internet research</td>
</tr>
<tr>
<td></td>
<td>• Simulation</td>
</tr>
<tr>
<td></td>
<td>• Webblog</td>
</tr>
<tr>
<td></td>
<td>• Wikis</td>
</tr>
</tbody>
</table>
3.2 Intuitive students

Intuitive students see the world through intuition. They want to know the theory before deciding that facts are important. They are creative, innovative, and work with bursts of energy. Their focus is on conceptual information. Since they see the big picture, they often ignore the details. Intuitive students want to know the theory before deciding that facts are important, focusing on general concepts more than details and practical matters. They quickly see associations and meanings, relying more on insight than observation. They desire only a general outline, and enjoy new material. They are best with tasks that appeal to their intellectual interests and call for grasping general concepts, seeing relationships, and using imagination. They can remember specifics when they relate to a pattern. They will always ask ‘why’ before anything else. They want to clarify ideas and theories before putting them into practice. They do well with opportunities for self-instruction, both individually and with a group.

Many studies have suggested for intuitive students the theory-application-theory (TAT) (Figure 1). Teacher starts by presenting the chapter’s theory or idea before application related. The students attempt to analyse and solve the problem using the course’s knowledge. The teacher can reuse the theory to facilitate the learning process. This approach (TAT) is also used for the traditional face-face learning. Intuitive students like also the TAT approach. Table 4 provides an overview of preferred learning characteristics and electronic media relationships for intuitive students in e-learning environment.

<table>
<thead>
<tr>
<th>Preferred learning characteristics</th>
<th>Electronic media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focusing on conceptual understanding</td>
<td>E-books</td>
</tr>
<tr>
<td>Using of self-instructional methods and independent study</td>
<td>E-mail</td>
</tr>
<tr>
<td>Solving new and complex problems</td>
<td>Forums</td>
</tr>
<tr>
<td>Learning new skills more than using them</td>
<td>Pictures</td>
</tr>
<tr>
<td>Willing to follow their insights and relies on imagination</td>
<td>Recorded live events</td>
</tr>
<tr>
<td>Liking novel and unusual suggestions</td>
<td>Simulations</td>
</tr>
<tr>
<td>Liking to do innovative things</td>
<td>Tutorial systems</td>
</tr>
<tr>
<td>Preferring global schemes</td>
<td>videoconferencing</td>
</tr>
</tbody>
</table>

3.3 Thinking students

Thinking students emphasise logic and objectivity in reasoning. They follow their head rather than their heart, value truth over tact, and sometimes appear uncaring about the feelings of others. They excel in inductive reasoning, logical problem solving, case studies, planned interactive activities and tests to progress. They may have difficulty with instructors who do not present material in a logical order. They like clear course and topic objectives that are precise and action-oriented. When dealing with the abstract, they need to have the logic in the material pointed out. According to these characteristics we may suggest for thinking students the approach T-A-PS (Figure 1). The teacher starts by presenting the chapter’s theory or idea before examples related. The students attempt to
analyse and solve the practical exercises using the course’s knowledge. Afterwards the
teacher presents additional applications-based logic and problem-solving. Table 5
provides an overview of preferred learning characteristics and electronic media
relationships for thinking students in e-learning environment.

**Table 5** Preferred learning characteristics and electronic media relationships for thinking
students

<table>
<thead>
<tr>
<th>Preferred learning characteristics</th>
<th>Electronic media</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Using logical analysis to reach conclusions</td>
<td>• Chat</td>
</tr>
<tr>
<td>• Using teacher-directed instructional approaches and peer tutoring</td>
<td>• E-mail</td>
</tr>
<tr>
<td>• Working without harmony</td>
<td>• Forums</td>
</tr>
<tr>
<td>• Being firm-minded and having little trouble giving criticism</td>
<td>• Online learning</td>
</tr>
<tr>
<td>• Feeling rewarded when task is done</td>
<td>• Pictures</td>
</tr>
<tr>
<td>• Seeking involvement with tasks</td>
<td>• Simulations</td>
</tr>
<tr>
<td>• Presenting goals and objectives first</td>
<td></td>
</tr>
<tr>
<td>• Tending to be brief and concise.</td>
<td></td>
</tr>
</tbody>
</table>

### 3.4 Feeling students

Feeling students follow their heart rather than their head. Feeling students look for a
personal connection in classroom material, seeking to relate ideas and concepts to
personal experiences. They enjoy working in groups as long as individual relationships
develop. They learn well by helping others and responding to their needs, and they study
well with others. They do best with topics of study they care about and might have
difficulty with topics that do not relate to people or relationships. They need to develop a
personal rapport with the instructor and receive feedback and encouragement. They may
have difficulty with instructors who appear impersonal or detached.

**Table 6** Preferred learning characteristics and electronic media relationships for feeling
students

<table>
<thead>
<tr>
<th>Preferred learning characteristics</th>
<th>Electronic media</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Using simulations and case studies together with small group work</td>
<td>• Chat</td>
</tr>
<tr>
<td>• Using values to reach conclusions</td>
<td>• E-mail</td>
</tr>
<tr>
<td>• Working best in harmony</td>
<td>• Forums</td>
</tr>
<tr>
<td>• Feeling rewarded when people’s needs are met</td>
<td>• Animation</td>
</tr>
<tr>
<td>• Seeking involvement with people</td>
<td>• Online learning</td>
</tr>
<tr>
<td>• Being sociable and friendly.</td>
<td>• Podcast</td>
</tr>
<tr>
<td></td>
<td>• Internet research</td>
</tr>
<tr>
<td></td>
<td>• Simulation</td>
</tr>
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<td></td>
<td>• Weblog</td>
</tr>
<tr>
<td></td>
<td>• Wikis</td>
</tr>
</tbody>
</table>
According to these characteristics we may suggest for feeling students the approach T-A-PS with focusing on collaborative work. Indeed, student classroom activities may require small groups for projects or instruction. The teacher starts by presenting the chapter’s theory or idea before examples related. The students attempt to analyse and solve the practical exercises using the course’s knowledge. Afterwards the teacher presents additional applications-based problem-solving, simulations or simulations with small group work.

Table 6 provides an overview of preferred learning characteristics and electronic media relationships for feeling students in e-learning environment.

4 Implementation of the system

Our proposed framework LearnFit is an Add-On to the popular Moodle Learning Management System to provide adaptivity learning experience. The tool is a web-based application having three tiers and has been implemented with PHP, MYSQL Server, CSS and AJAX on Linux environment.

The main purpose of LearnFit system is to recommend useful and interesting materials prepared within appropriate course to learners based on their preferences in e-learning context. The system was organised in the form of three basic components: learner model, domain model and pedagogical model. These three components interact to adapt different aspects of the instructional process.

Figure 2 System architecture of LearnFit (see online version for colours)
Figure 2 illustrates the system architecture. The following subsections will briefly explain the framework.

4.1 Learner model

The model represents various learner characteristics (identity, preferences, etc.), which can be used to adapt TS and learning environment.

This component stores all user-related data, i.e., the users’ profiles, including personal information and preferences. It enables the system to deliver customised instruction on the basis of the individual student’s learning style or the student group’s. In our work, we consider only personal identities and learning styles to represent the learner profile since they are the most effective parameters in human activities. Figure 3 shows the structure of the learner’s profile according to MBTI model.

![Learner’s profile diagram](image)

The learner profile is composed of two parts. The first part is related to personal identities such as name, age, educational level and languages. The second describes the learning style according the MBTI test and which can be defined as followed:

$$U = \left\{ u \in [0, 1] \right\}^8 / u = \left\{ u_E, u_I, u_S, u_N, u_T, u_F, u_J, u_P \right\}$$

Each component $u_i$ of the vector $u$ element of $U$ represents the priori probability of preference at $i^{th}$ MBTI dimension. Using the MBTI questionnaire, we may explicitly evaluate the $u$ value for each learner on numerical values in an interval $[0, 1]$ such that 0 indicates a minimal satisfaction and 1 indicates a maximal satisfaction.

4.2 Domain model

A domain model contains the knowledge about the curriculum structure and its built on a conceptual network of concepts. Each course includes an outline at the beginning, presenting all chapters with finally a conclusion summarising the highlights of the course.
A chapter can be represented as a tree of learning units or concepts. A learning unit holds one unit of knowledge and presents different aspects of it with different types of learning object which constitutes multiple external representations such presentations, questions, activities, examples, exercises, glossary (Papanikolaou et al., 2003).

In this research, the selected domain is ‘Introduction PHP Programming’, one topic which is currently being taught at FSSM, UCAM Morocco. Six chapters of this course were adopted to develop an adaptive teaching style approach that is: CH1: ‘Primitive data type’, CH2: ‘Array declaration’, CH3: ‘Conditional statements’, CH4: ‘Loops’, CH5: ‘Class and Object declaration’ and CH6: ‘Databases’. Figure 5 shows the structure of our suggested domain model.
4.3 Pedagogical model

The pedagogical model represents the teacher’s knowledge of how to teach each concept. The teacher can also use different strategies to teach the same concept. As it was mentioned in previous section, personality plays an important role in learning process, and learners with different personalities need special TS. This cognitive knowledge guides the teacher into making good decisions when choosing learning goals for a learner and re-structuring LO(s) to achieve these goals.

TS are the elements given to the students by the teachers to facilitate a deeper understanding of the information. The emphasis relies on the design, programming, elaboration and accomplishment of the learning content (Franzoni and Assar, 2009). The main objective is to facilitate the student’s learning. Our pedagogical model has two main intelligent axes: adaptive strategy module and strategy adjustment module. In the following sub-sections, these parts will be described.

4.3.1 Adaptive strategy module

When students enter LearnFit for the first time, they are asked to take a learning style test based on MBTI’s approach. This psychological questionnaire maps a set of 60 questions representing learning preferences and styles. The framework then determines the MBTI’s classification and stores the preferences in the student model for all future connexions.

Hereafter, the learner completes the educational experience for each concept; the LearnFit system evaluates the learner’s acquired knowledge. The learner’s ratings can be interpreted according to the percentage of correct answers, as follows: excellent (80% to 100%), good (70% to 79%), average (60% to 69%), passing (50% to 59%) and marginal (0% to 49%).

As it was mentioned in the previous part, based on personality recognition module, according MBTI test, the learner would be categorised in one of the four personality groups. According to this categorisation, an appropriate teaching strategy and the most suitable Electronic Medias are selected.

In fact, for each concept four TS are implemented using a set of rules to describe the runtime behaviour of the system as well as the domain model. A sample of these rules is presented below:

| Rule 1: | IF Learner group IS \( \tilde{S} \) THEN Teaching strategy IS \( T_i \) |
| Rule 2: | IF Learner group IS \( \tilde{N} \) THEN Teaching strategy IS |
| Rule 3: | IF Learner group IS \( \tilde{F} \) THEN Teaching strategy IS \( T_3 \) |
| Rule 4: | IF Learner group IS \( \tilde{T} \) THEN Teaching strategy IS \( T_4 \) |
The first rule is an example of the rules of the system dealing with the learner in sensing group. As we explained before, the suitable teaching strategy for the learner will be \( T_1 \). Indeed, these rules make the connection between the domain model and learner model provide appropriate teaching strategy and electronic learning materials.

### 4.3.2 Strategy adjustment module

Many studies indicate that learning style of an individual is not static. It may differ depending on the nature of the learning activity or change with experience. Hence, it seems counter-productive to lock the learner into a fixed learning style profile after the initial assessment. Also, the learner can give false information on his preferences when he takes the initial MBTI test. In fact, in both cases we risk falling into the traditional teaching style disadvantages. To deal with these problems, we have implemented a strategy adjustment module using a set of rules. A sample of these rules is presented below:

| Rule 1: | Learner group IS \( \hat{S} \) AND Performance IS Marginal THEN Teaching strategy IS \( T_2 \) AND LearnFit tactic IS Change student group to \( \hat{N} \) |
| Rule 2: | Learner group IS \( \hat{N} \) AND Performance IS Marginal THEN Teaching strategy IS \( T_3 \) AND LearnFit tactic IS Change student group to \( \hat{F} \) |
| Rule 3: | Learner group IS \( \hat{F} \) AND Performance IS Marginal THEN Teaching strategy IS \( \hat{T} \) AND LearnFit tactic IS Change student group to \( \hat{N} \) |
| Rule 4: | Learner group IS \( \hat{T} \) AND Performance IS Marginal THEN Teaching strategy IS \( T_1 \) AND LearnFit tactic IS Change student group to \( \hat{S} \) |

For example, assume that a student has been identified as belonging to the \( \hat{S} \) group by the student model. Observation from the student’s current performances helps us to know if this group is appropriate or not. If the performance of this learner is marginal, the
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system suggests another teaching strategy and thereafter updates the learner model. For more details about this approach see El Bachari et al. (2010).

5 Experimentation

We have set up experimentation to compare our approach with a classical one that does not use an adaptive teaching style, by measuring the student understanding after learning process. We have conducted a research on LearnFit’s effectiveness in learning the six learning chapters presented in Section 4.2. Our main research question was: “Does the teaching strategies based student’s preferences affect the learning outcome?”

Participants for this experimentation were drawn from a pool \( (n = 24) \) of Computer Information Systems Master’s Degree students at FSSM, UCAM Morocco in fall 2009. Indeed, students had to study the six learning chapters in LearnFit environment. Each unit was designed in four learning ways: S, N, F and T’s strategy. Four versions of subject material were implemented in LearnFit to provide personalised learning environments for students with different learning styles. Figure 6 provides the MBTI questionnaire results of our pool:

**Figure 6** Personality types of participants (see online version for colours)

![Personality types of participants](image)

The sessions were arranged at the beginning of the course and during eight weeks of experimentation, the students studied the learning material using one of those approaches in the same conditions. The student achievement was measured at the end of the experience using a post-test which consisted of a 60 questions multiple-choice quiz related to the presented subject mater. Scores for this experience were calculated on the scale of 0 to 20.

Figure 7 shows a typical adapted course instances for sensing learners using A-T-A approach. In this case, the concept is about the ‘for loop’ statement. LearnFit starts by presenting a mini-case study related to concept. Therefore, the system presents the concept’s theory or ideas. Afterwards the system provides the learner with many
applications to apply this theory. In fact, applications answer the question that sensing students often ask, ‘Why am I learning this material?’

**Figure 7** An example for ‘for loop’ concept fitting to the needs of sensing learners (see online version for colours)

Figure 8 shows a typical adapted course instances for thinking learners using TAPS approach. In this example, the concept learned is ‘while loop’ statement. At the beginning, the system presents the concept’s theory or ideas related this concept. Therefore, the system provides thinking learners applications to make the learning process easy. Last step, is to give a problem-solving to master this concept. The problem-solving is defined as the process of working through details of a problem to reach a solution. Furthermore, communication is an important element for learners in e-learning environment. It provides them an opportunity to work together, discuss particular issues and ask for explanations. To enable our learners to communicate each other as well as with teachers, forums and chats are integrated in this course.

6 Evaluation and discussion

Several studies suggest that students’ satisfaction is an important factor in order to measure the effectiveness success of the e-learning process. Therefore, the satisfaction
statistics are necessary to understand the perception of learners in relation to the learning process, including contents, methodology and adaptation.

Indeed, a survey was designed to evaluate the level of learners’ satisfaction about our system. It was administered for learners who participated in these experiments. The survey was conducted after students finished the six concepts and the time reserved answering was 20 minutes.

Particularly, this survey focuses on the learners’ opinion about the main features of our system in order to answer the following questions: Did the presentation of the entire content into different media presentations help you in your understanding? Did you find the adaptive framework easy to use? Is learning through preferred learning style useful? Did you enjoy learning through this adaptive system?

In Figure 9, the student’s degree of satisfaction with regard to different adaptive educational systems is reported. These results are obtained by explicitly asking them their opinion. The rating score related to our adaptive system is from 1 very low to 5 very high.

Figure 9 Learner satisfaction of learning environment (see online version for colours)

Results show that most learners think that adaptive educational system is good for learning and that their requirements are satisfied. Most of them found that the system is user-friendly. They were satisfied to learn with the preferred learning style and willing to use the system in the future.

The results seem to support earlier studies which concluded that using learning styles matching with the learners’ psychology is helpful to students in enhancing both learning efficacy and efficiency (Abrahamian et al., 2004; Siadaty and Taghiyareh, 2007, Tseng et al., 2008).

7 Conclusions

We conducted a research on the effects of student’s psychology to improve their learning performance. In this paper, we propose an adaptive learning platform, which takes the
learner’s personality into account. In this model some modules for personality recognition and selecting appropriate teaching strategy are used to achieve the learning. The results indicate that placing the learner beside an appropriate teaching style matching with learner’s preference lead to improvement and make the virtual learning environment more enjoyable. Although the innovative approach presented in this article has demonstrated its benefits, it has also depicted the limitation of actual application. The major difficulty is to develop four versions of the same course to meet the personalisation of learning process. Also, the evaluation results show that students understood the process and liked being involved in it, in spite of the fact that it was not a simple task. Finally, this study’s results should be carefully interpreted as MBTI which is only one of many popular personality assessment instruments and our approach can be altered in many different ways.

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References

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