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# APPLICATION OF LEARNING STYLES FOR EFFECTIVE MOBILE LEARNING

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## ABSTRACT

Mobile technologies are increasingly used for learning, both individually and collaboratively, and supported by wireless connectivity, mobile devices have succeeded in achieving anywhere, anytime learning. Students learn in different ways and usually have their own styles and preferences for learning, and our understanding of these issues is supported by research which has taken place on “learning styles”. Given that mobile learning is a fairly new area, there has not been much work done on how learning styles can be incorporated into different learning scenarios facilitated by mobile devices. In this paper, we identify the Dunn and Dunn Learning Style model as one which is appropriate for mobile environments, and explain these reasons.

## 1. Introduction

In recent years, mobile technologies such as mobile phones, smartphones and personal digital assistants (PDAs), Pocket PCs or Palmtop devices, have been used to aid learning and these can be used to facilitate different scenarios of learning including *Collaborative Learning* (Hine *et al.*, 2004), *Independent Learning* (Bull and Reid, 2004) and *Lifelong learning* (Attewell and Savill-Smith, 2004). Mobile learning can increase and maintain the students’ motivation and allows a more efficient use of time and resources, hence students are more likely to learn more effectively and learning at a time or location that they need and/or want, and in particular, can enhance the learning process in situated learning scenarios (Munoz and Kloos, 2005). The learning environment can be more easily tailored to each student, focusing on each individual learning style (Muir, 2001).

## 2. Learning Styles

Educationalists introduced the concept of learning style as a “*description of the attitudes and behaviours that determine our preferred way of learning*” (Honey, 2001). Keefe (1979) defined a learning style as “*characteristics cognitive, affective and psychological behaviours that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment*”. There are a number of different learning style models, for example, Felder and Silverman Learning Style Theory (Felder and Silverman, 1988), Gardner’s Multiple Intelligences (Gardner, 1993) and Kolb’s Learning Style Theory (Kolb, 1984).

Three major learning styles categories are *Instructional and Environmental Learning Preferences*, *Information Processing Learning Preferences* and *Personality Related Learning Preferences* (Curry, 1987). The Dunn and Dunn Learning Styles Model (Dunn and Dunn, 1978) consists of five components

which were formed under the above three categories. The following lists the components along with their factors.

- *Environmental* – Sound/Noise Level, Temperature, Light, Seating, Layout of Room/Location.
- *Emotional* – Motivation, Degree of Responsibility, Persistence and Need for Structure.
- *Physical* – Modality Preferences i.e. for visual, auditory, kinaesthetic/tactile learning, Intake (Food and Drink), Time of Day, Mobility.
- *Sociology* – Learning Groups, Help/Support from authoring figures, working alone/with peers, motivation from parent/teacher.
- *Personality* – Anxious/Depressed, Somatic Complaints, Aggressive Behaviour, Attention Problems, Thought Problems, Delinquent Behaviour (Cheats, Lies, Play Truant), Social Problems.

These factors seem appropriate to be taken into consideration when designing mobile learning material.

### **3. Incorporation of Learning Styles in Mobile Learning**

According to Stern (2004), not many studies have concentrated on matching learning styles with particular technologies to enhance the students' learning experiences. Kinshuk and Lin (2004) noted that mobile learning has potential for providing a mechanism where each learner will have their own individualised learning process. Their web-based intelligent tutoring architecture consists of: *Student Module*, *Tutorial Module*, *Learning Style Analysis Module* and *Access Device Analysis Module*. The 'Learning Style Analysis Module', using the Felder-Silverman Learning Style Theory, handles the students learning styles and communicates with the Student Module. The 'Access Device Analysis Module' identifies the type of device that the student is using and sends this information to the Tutorial Module. Based on the Student Module and Access Device Type, the Tutorial Module generates for the student individualised learning content.

Kinshuk and Lin (2004) have identified a number of adaptive web-based learning environments, where the students are presented with their individualised learning paths based on their preferred learning styles. However, none of these have been made available or developed in a mobile learning environment. "mLearning is causing educators to rethink how learning happens and how specific learning needs and styles are expanded and enabled with multifunctional hand-held devices" (Valentine, 2004). It appears that many of the considerations, which we have to take into account when designing learning material for learning on a mobile device and learning in a mobile environment, are comprised within the five categories of the Dunn and Dunn Learning Styles Model.

- The learning impact may be affected by the location of where the learning is taking place e.g. whether in a classroom, on a train/bus, or in a restaurant, etc.; the level of noise in the mobile learning environment may also affect the student's concentration. The Environmental category of the Dunn and Dunn model explicitly covers these two issues – Location and Noise Level.
- Mobile learning sometimes involves learning on one's own and may require a lot of discipline and/or motivation. The Emotional category covers these two issues – Motivation and Degree of Responsibility.
- There is evidence that suggests that, whilst using instructional technologies to learn material, a student's performance is affected by their preferred learning styles, and visual learners are positively affected (Hall and Pittman, 2005); kinaesthetic learners may also prefer to learn in the situational context. Concentration levels may be different depending on whether the study period is before, during, or after intake of food and drink. The time of day can determine the location which can affect learning, for example, in the bedroom when getting up in the morning or in a restaurant after an evening meal. Some students may prefer learning whilst they are on the move. The Physical category covers the above five issues – Visual, Kinaesthetic, Intake (Food and Drink), Time of Day and Mobility.

- Some students work best when they work in a group situation, and some prefer to work alone or with one or two peers. The Sociology category covers these two issues – Learning Groups and Working alone/With Peers.
- Our attention may be affected more easily in a mobile environment because there are usually elements of noise and movement, and the Personality category covers this Attention issue.

## 4. Conclusion

We have identified the Dunn and Dunn Learning Style Model as one in which the categories of the model mirror closely the considerations to be addressed when designing learning tools for use on mobile devices, and we are currently investigating how this model might be applied to mobile technologies, and in particular how software for mobile devices might make effective use of the model to support adaptive learning tools.

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