



The effects of adopting the innovative dynamic product design method on the performance of students of different learning styles



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ABSTRACT

The innovative dynamic product design (IDPD) method has been proposed and proven to be effective in diversifying how designers think. To further understand the influence of learning styles on the applications of the IDPD method, this study recruited student designers to actually employ this method in designing products, and the effects of the method on the performance of the students with different learning styles were analysed. This study contains three stages. In the first stage, we divided the 16 industrial design students into 4 groups according to Kolb's learning style inventory, and every group was required to attend a product development workshop and apply the IDPD method. In the second stage, we conducted a questionnaire survey on the users who had used the products of the students and evaluated the performance of the student groups. In the third stage, the students evaluated and provided feedback regarding the IDPD method. The research results showed that the products yielded significantly different user evaluations based on student learning style: the accommodators garnered the highest score, followed by the assimilators, divergers, and convergers. The information processing method of accommodators and convergers were identically active experimentation. However, the difference in information perceptions of these two types of learners resulted in considerable difference in evaluations on design works. User evaluations on works by divergers and assimilators had little difference, which indicated that regardless of the methods to receive information the reflective observation information processing method did not pose extreme evaluations on student performance.

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1. Introduction

The key to being a successful teacher involves determining and utilising students' learning styles because students exhibit superior learning effectiveness and learning attitudes when teaching methods and resources are compatible with their learning styles (Dunn, Dunn, & Perrein, 1994). Students in product design courses are usually divided into teams to conduct design activities. According to a previous study, teachers should consider learning styles when students are in groups (Matthews, 1996). Studies on architectural design have also indicated that a substantial correlation exists between learning styles and academic achievements (Kvan & Jia, 2005), which explains why the performance of industrial design students can also be

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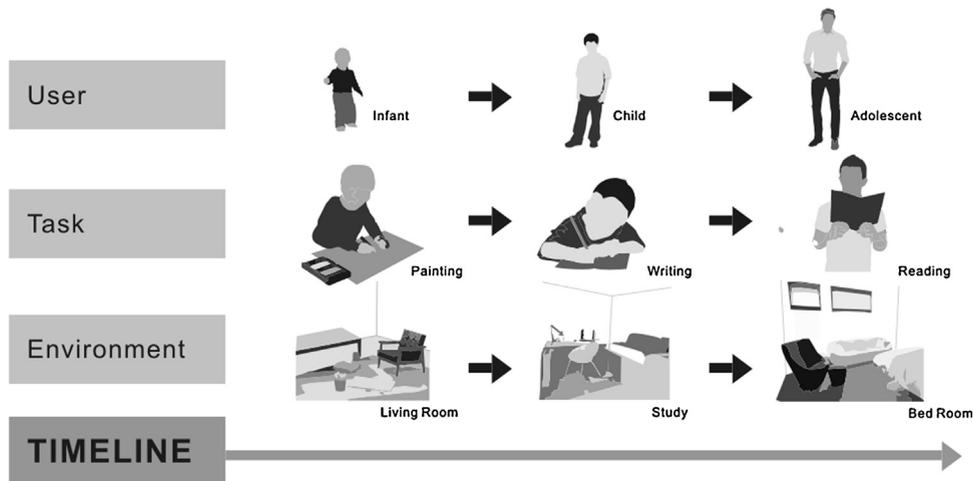


Fig. 1. In the design process of user-centred design (UCD), the conditions of user, task, and environment must be analysed. IDPD adds a timeline concept into the UCD process. When designing a product, the designer must consider the dynamic user scenario and define in detail and analyse the possible situations within the three conditions. For example, the user scenario in a furniture design process is defined to be dynamic. In a period of 10–20 years, the user grows from an infant or child to a youngster. The task of using the desk and chair set is changed from drawing pictures and writing to reading. The environment may also be changed from a living room or book room to a bedroom.

affected by different learning styles. Therefore, scholars of design education must devote additional attention to students' learning styles.

Previous studies have preliminarily proposed the concept and method of innovative dynamic product design (IDPD; Chang, Chen, & Yang, 2012; Chang & Wang, 2013). Having student designers actually employ the IDPD method proved that the method enhances the systematic thinking of designers, assists student designers apply logical and diverse thinking when developing design ideas, and is suitable when design concepts are divergent during design processes. However, in a previous verification experiment, Chang and Wang (2013) incorporated the IDPD method into teaching without further examining the effectiveness of this method among students with different learning styles.

International studies have increasingly focused on the learning styles of students. Students learn in various ways, and a single method of teaching does not apply to every student or most students (Hawk & Shah, 2007). If we plan to introduce the IDPD method into design education, we must first ascertain the effectiveness and reception of the method among students with different learning styles in order to adjust teaching methods to satisfy all students.

1.1. The innovative dynamic product design method

The concept of IDPD is based on the discovery that the need for a certain product changes with time. For example, changes in the body size of children and adolescents caused by growth and development, physiological changes of pregnant women during different periods of pregnancy, and physiological decline through ageing all result in different user needs. Therefore, the concept of IDPD was proposed to render products suitable for user needs throughout different periods, which not only fulfils the idea of user-centred design (UCD), but also extends product life cycle (Chang et al., 2012).

The IDPD method is based on the theory of UCD. According to the ISO 13407 standard for development processes of UCD activities, UCD comprises four elemental steps: (1) understand and specify the context of use, (2) specify the user and organisational requirements, (3) produce concept designs and prototypes, and (4) user-based assessment. Numerous recent studies on user-centred concepts have focused on understanding and specifying the context of use (the first step) and have proposed to identify user needs through experiments (Lin, Yang, Li, & Wang 2012; Teixeira, Ferreira, & Santos, 2012), ethnographic observations (Montignies, Nosulenko, & Parizet, 2010; Teixeira et al., 2012), and questionnaires (Smith & Smith, 2012). Designers can obtain firsthand data regarding user needs through experiments, observations, and questionnaires. However, the greatest problem student designers frequently encounter is how to analyse the collected data and transform them into information to reach the second step of UCD. As explorers, student designers frequently encounter frustration during learning processes because of a lack of experience and guidelines.

The IDPD method involves a novel concept and a guiding model for use scenarios, whereas the IDPD concept denotes adding a timeline into the UCD process (Fig. 1) through which designers estimate dynamic user needs during different periods; the IDPD method is a form of systematically collating and analysing needs that provides designers 8 situational models of user needs. After enumerating the three conditions (user, task, and environment), designers obtain 8 situational models for guiding design thinking by determining the variable and invariable scenarios of each condition and mutually combining the variable (dynamic) and invariable (nondynamic) scenarios of each condition (Table 1). By following the

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