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Facilitating professionals' work-based learning with context-aware mobile system

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ABSTRACT

Work-based learning refers to the learning process occurring at workplace as acquiring knowledge and skills or developing approaches to solve problems. It is a crucial approach to promote professionals' working efficiency. However, the majority of research on professional learning concentrates on holding trainings (off-the-job or on-the-job), seminars and workshops, or on implementing systems for distributing training materials or facilitating communication. Few effort has been paid to support work-based learning which has the characteristics like informal, spontaneous, work-related and just-in-time. The purpose of our work is to facilitate professionals' work-based learning with a context-aware mobile system. This system can guide professionals to engage in work-based learning activities, which are arranged properly based on our online survey results. It can also provide learning supports which are adapted to current engaged work, professionals' learning needs, personal characteristics, environmental situations, etc. In this paper, we present successively the work-based learning activity design, the system structure design, the system technical implementation, the system functionalities and evaluation of learning achievement, and the user attitude and acceptance about this system. With the proposed system, professionals can use their mobile devices to get personalized, adaptive and just-in-time learning supports in real working environment.

1. Introduction

Learning is a process of changing or transforming, in the sense of expanding the range of possibilities and actions for individuals and groups [1]. Focusing on the learning process particularly engaged by professionals, two learning phases can be identified: (1) academic phase: the phase before starting a professional work, which happens mainly during school or university studies, or pre-professional training periods; (2) working phase: the phase during a professional occupation, which happens on the workplace. The knowledge generated and acquired in these two phases differs greatly [2]. In academic phase, learning is devoted to the assimilation of important theories and generic methodologies, which is more difficult to

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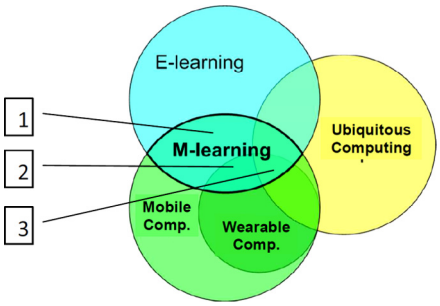

Fig. 1. Mobile learning cartography.

acquire on the workplace. On the contrary, in working phase, learning is devoted to the acquisitions of practical and precise behaviors, operations, and gestures, which is difficult to acquire at university. In our study, the professionals' work-based learning is situated in the working phase.

Workplace learning is a kind of learning happening in working phase. It is a key strategy to meet the challenges from the perspectives of both the individuals' employability and enterprise competitiveness [3,4]. Based on the degree from "learning" to "work", workplace learning can be divided into three phases [5]: (1) workplace as a site for learning, such as in-company training and work-related off-the-job training; (2) workplace as a learning environment, which should be organized and planned, for example, on-the-job training; (3) work-based learning, which is informal, spontaneous, work-related, just-in-time, and location-based.

Work-based learning refers to the learning activity that occurs on a day-to-day basis at work when professionals acquire new knowledge and skills or develop new approaches for solving problems [6]. In this process, work activities cause the occurrence of learning activities, determine the needs and provide the context; learning activities, arising from work mission, provide supports and ensure work continuation. Many research groups proposed their own definitions of work-based learning, for example, European Commission defined work-based learning as "a fundamental aspect of vocational training" [7]. However, there is no unified and acknowledged definition of work-based learning. In our study, we adopt the definition of work-based learning in reference [6]. Work-based learning is a crucial approach to increasing professionals' work efficiency by supporting them with particular knowledge and skills related to engaged work according to [8]. So far, more and more attention and efforts have been focused on work-based learning.

The majority of research in professional learning concentrates on holding trainings (off-the-job or on-the-job), seminars and workshops, or implementing systems for distributing materials or facilitating communication. The report [9] listed several learning systems which are used to help the design, development and delivery of learning programs in companies: Learning Management Systems [10], Course Management Systems [11], Learning Content Management Systems [12], Content Management Systems [13], and Talent Management Systems [14]. These systems were designed originally to support some specific aspects of professionals' informal learning, such as distributing learning materials and building communication among learners and helpers. However, few of them have capacities to provide just-in-time, personalized, contextualized and work-related learning supports in real working situations.

EPSS (Electronic Performance Support System) is also a kind of system aiming at offering professionals just-in-time information and tools to enable optimum performance when and where needed [15]. For example, PHelpS [16] is an EPSS that can support workers to solve problems encountered in their work by providing a list of peers who are ready, willing and able to help. The main problem of current EPSS systems is that they rarely consider the learning context, such as environment, personal characteristics, etc. This cannot enable EPSS to offer complete adaptive learning content according to different learning situations.

The significance of work-based learning and the limitation of current learning systems stimulate us to study on a system to facilitate professionals to achieve work-based learning. This system should be designed according to professionals' practical working processes, in order to cater to their just-in-time learning need, and to integrate adaptive learning resources, services and tools for providing proper and sufficient learning supports. With these objectives, our work focuses on studying the methodologies and technologies for designing and implementing an innovative work-based, context-aware, and mobile learning system, named WoBaLearn.

Context-aware mobile learning is the principle approach used in our research. In the previous study, we identified mobile learning cartography [17] in relation to ubiquitous computing, mobile computing, and wearable computing (shown in Fig. 1). Four essential characteristics are proposed to describe mobile learning situations: devices, mobility, context, and location. Three categories of mobile learning can be identified based on the variations of these characteristics. (1) Case 1: intersection between e-learning and mobile computing, in which mobility is much more general. Users' working/learning environment even can be accessed by devices proposed in different situations. (2) Case 2: intersection between e-learning and wearable computing, in which mobile technology is based on wearable devices (Tablet PC, Smartphone, etc.) usable anywhere in mobility. (3) Case 3: intersection between e-learning, wearable computing and ubiquitous computing, which allows ones to take into account context and location in ambient intelligence view. In our research, we consider the third case as contextual mobile learning or context-aware mobile learning.

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