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Integrating knowledge management into the instruction of creativity in a blended learning environment

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Introduction

Creativity has been regarded as one of the key abilities leading to success in this dynamic society. A recent consensus regarding creativity is that originality (novelty) and appropriateness (usefulness or value) are two indicators of a creative product (Mayer, 1999, Yeh, 2011). To ensure originality or novelty, it has been proposed that appropriateness and convergent thinking, as well as divergent and productive thinking, are necessary for creativity (Dineen, Samuel, & Livesey, 2005); moreover, creative production requires both imagination and divergent thinking, which is based on knowledge-based thought (Cropley, 2006; Gabora & Kaufman, 2010). Knowledge management (KM), which emphasizes the competencies of knowledge acquisition, knowledge sharing, knowledge internalization, and knowledge creation (Yeh, 2012), may provide an effective approach for building a knowledge base for creativity.

Because information technology (IT) is developing rapidly, e-learning has become popular in all education levels. Gasson and Shelfer (2007) proposed a knowledge-as-process perspective of knowledge management and suggested that IT provides practical support for this strategy. Over the past decade, KM has triggered a significant increase in publications across a diverse range of research areas. However, only a few studies have discussed how to integrate e-learning and KM and then employ such an integration into the instruction of creativity in school settings. In addition, although e-learning has many advantages, learning effects realized through face-to-face interactions can never be replaced by IT. The integration of e-learning and classroom teaching—blended learning—would provide a more effective learning approach than a pure e-learning approach. Research findings have suggested that the use of blended learning in training programs can effectively improve creativity (Yeh, Huang, & Yeh, 2011). This chapter thus aims to first illustrate the relationship between KM and creativity and then propose an instructional model for implementing KM in blended learning of creativity.

KM, e-learning, and creativity

KM and e-learning

KM is commonly described as the competencies of knowledge acquisition and storage, knowledge application, knowledge sharing, and knowledge creation (Ungaretti & Tillberg-Webb, 2011). Ragab and Arisha (2013) analyzed 350 articles published in peer-reviewed journals over the last decade and suggested that KM research falls into the following categories: ontology of knowledge and KM, KM systems, role of information technology, managerial and social issues, and knowledge measurement. Past researchers have found that KM practices (i.e., knowledge sharing, knowledge application, and knowledge storage) are positively related to technological innovation (i.e., product and process innovation) (Lee et al., 2013). Along the same lines, many researchers have proposed that KM and technologies should be integrated (Gurteen, 1998; Schmidt, 2005). For example, Gasson and Shelfer (2007) proposed a knowledge-as-process perspective of KM and argued that IT provides practical support for this strategy. Mahesh and Suresh (2004) also claimed that tool-focused technological approaches could be used to enhance knowledge sharing and creation. Accordingly, IT and KM are closely related.

In the past decade, most KM models have developed based on industrial contexts, and many IT industries have integrated blended KM models into their human resources training programs. Among the proposed models, most models emphasize either knowledge sharing (e.g., Alony et al., 2007; Gagné, 2009) or knowledge creation (e.g., Imani, 2007). Knowledge sharing refers to the process of exchanging and converting knowledge, including skills, experiences, and understanding (Van de Hooff, & de Ridder, 2004). On the other hand, knowledge creation involves the analysis, application, and expansion of knowledge; it encourages individual learning and confidence, lifelong learning, and learning within communities (Swirski, Wood, & Solomonides, 2008).

Although several studies have investigated the effects of integrating KM into curriculum design (e.g., Kidwell, Van Der, & Johnson, 2000; Rees & Lu, 2009) or KM's effects on professional development and self-efficacy (e.g., Endres et al., 2007; Sammour et al., 2008), only a few studies have integrated KM and the instruction of thinking skills (e.g., Yeh, 2012; Yeh et al., 2011; Yeh, Yeh, & Chen, 2012). Because e-learning and blended learning have become commonly used strategies in educational settings and because the advantages of KM and e-learning are evident, developing more instructional models that integrate KM with e-learning to improve creativity in school settings is essential. In addition to developing such instructional models, more related instruments should also be developed. Recently, a measuring tool to assess KM in e-learning (Inventory of Knowledge Management in E-learning, IKME) was developed (Yeh, Yeh, & Lin, 2013). The IKME is a four-point Likert-type questionnaire; it includes four factors: knowledge acquisition and storage, knowledge application, knowledge sharing, and knowledge creation. Cronbach's α values for the IKME and the four factors are .942, .886, .897, .827, and .878, respectively. The test items are described in Table 16.1.

Creativity definitions and constructs

The scientific study of creativity has continued for over 60 years since J. P. Guilford's appeal in 1950. Over the past few decades, numerous definitions of creativity have been proposed (e.g., Kampylis, Berki, & Saariluoma, 2009; Simonton, 2012). The proposed definitions of "creativity" have changed from unidimensional (e.g., person, process, product, or press/place) to multidimensional (e.g., confluence models) perspectives. Well-known confluence models (e.g., Csikszentmihalyi, 1999; Sternberg & Lubert, 1996) emphasize that multiple components must converge in order for creativity to occur.

Table 16.1 IKME Test Items (N = 1017)

Test item		*Factor*
In an e-learning environment, I am used to . . .		
1	downloading static information (e.g., words and figures) from the reviewed websites.	knowledge acquisition and storage
5	acquiring information through search engines (e.g., Google, Yahoo, etc.).	
9	recording the reviewed websites (e.g., adding the websites to My Favorites)	
13	downloading dynamic information (e.g., videos) from the reviewed websites.	
17	organizing My Favorites to conveniently search information.	
20	actively joining e-learning communities (e.g., Bulletin Board System (BBS), Facebook, etc.) to acquire important and updated information.	
22	categorizing information and saving it to my computer.	
2	providing related information or experiences to support my own arguments.	knowledge application
6	employing integrated and internalized knowledge to solve problems.	
10	employing self-knowledge to help others solve everyday problems.	
14	analyzing or evaluating problem-solving alternatives proposed by others.	
18	employing static information (e.g., words or pictures) to express my opinions.	
21	clearly pointing out the core problems and systematically stating the main points of the problem.	
3	expressing self-opinions via dynamic information (e.g., video or Flash).	Knowledge sharing
7	using interfaces of co-creation (e.g., Google or Wiki interfaces) to share experiences or knowledge.	
11	employing converted knowledge to form creative products.	
15	providing solutions for problems.	
19	actively joining or creating e-learning communities (e.g., BBS, Facebook, etc.) to increase opportunities for interactions.	
4	producing creative ideas through interactions with others.	Knowledge creation
8	integrating and internalizing discussed information.	
12	producing innovative ideas via knowledge integration.	
16	revising self-concepts or ideas through interactions with others.	

A recent consensus about creativity is that creativity is the ability to produce responses that are novel and appropriate (Mayer, 1999; Shamay-Tsoory et al., 2011). However, whether creativity is domain-general (e.g., Baer & Kaufman 2005; Plucker 2005) or domain-specific (e.g., Glaveanu et al., 2013; Simonton 2012; Reiter-Palmon et al., 2009) remains a debate. Supporters of hybrid models (e.g., Silvia, Kaufman, & Pretz, 2009) suggest that domain-general factors are required for creativity development and domain-specific factors are critical

for certain creative activities. This chapter supports the hybrid model perspective and suggests that creativity is a process in which one generates a culturally "original" and "valuable" response or product within a certain domain.

According to the *Ecological Systems Model of Creativity Development* (Yeh, 2004), four systems are important for creativity development: the microsystem, the mesosystem, the exosystem, and the macrosystem. The microsystem specifies inherent and learned personal characteristics, particularly knowledge, dispositions, and skills; these personal characteristics are most fundamental to creative product generation, and they directly affect all stages of the creative process. The mesosystem comprises family and school experiences. These subsystems greatly influence the creative potential of an individual throughout his or her childhood. The exosystem consists of organizational factors that relate to an individual's work within an organization. Finally, the macrosystem refers to a social milieu within a culture. The four layers of the system interact with one another and influence an individual's performance of creativity.

In analyzing the elements of creativity, Sweller (2009) claimed that a comprehensive knowledge base is essential for creativity. Crawford and Brophy (2006) also declared that creativity requires a basic level of expertise within a specific knowledge domain as well as deep subject knowledge. With regard to dispositions, nine personality trait categories pertaining to creativity have been identified (Yeh, 2006): tryout, joy in work, adaptive cognition, multidimensional reasoning, independence, problem solving, interaction and prudence, interest, and intuition and imagination. As for abilities, both cognitive and metacognitive abilities are required. These abilities may include recognizing information patterns, organizing content into conceptual frameworks, problem-solving skills, planning and self-regulation, being judicious in solving problems, and staying sensitive in observation, which all are positively related to creative performance (Crawford & Brophy, 2006; Yeh, 2004).

The role of KM in the learning of creativity

Martensson (2000) also claimed that to successfully create and implement KM strategies, creativity must be included. In the same vein, Tsui and colleagues (2006) suggested that a community of practice approach that examines knowledge and illuminates gaps can promote and develop creativity as a graduate capability. Accordingly, KM is critical to creativity development.

In empirical studies, Gloet and Terziovski (2004) found that KM is positively related to creative performance. Recently, a few studies have integrated KM and e-learning into the creativity instruction (Yeh, 2012; Yeh et al., 2011; Yeh et al., 2012). These studies found that integrating KM with blended learning effectively improved pre-service teachers' professional knowledge and personal teaching efficacy in creativity instruction; moreover, such an integration significantly improved college students' dispositions, knowledge, and creative abilities. These findings suggest that KM, combined with e-learning, can be an effective approach for teaching creativity.

A KM-based model for creativity learning in a blended learning environment

Asgarkhani (2011) suggested that as more industries and educational institutes are integrating e-learning into KM, a strategic framework for integrating these two concepts should consider the overall direction of e-learning and KM. In the teaching of creativity, an integrative strategic framework is especially important due to its complexity. Before introducing the proposed model, some KM model applications are briefly introduced in the following paragraph.

Among KM theories or models, the SECI model (Nonaka & Takeuchi, 1995) is well-known and commonly used. The SECI includes four stages of knowledge transformation: (1) socialization: emphasizing the sharing of tacit knowledge; (2) externalization: emphasizing the conversion of tacit knowledge into explicit knowledge; (3) combination: emphasizing the integration of diverse types of explicit knowledge; and (4) internalization: emphasizing the transformation of explicit knowledge to tacit knowledge (Nonaka & Takeuchi, 1995). Extending from the SECI model, many researchers have argued that knowledge sharing and knowledge creation (co-creation) are key components of successful KM application (e.g., Swirski et al., 2008; Yeh, 2012, Yeh et al., 2011). Moreover, recent studies (Yeh, 2012; Yeh et al., 2012) have proposed that internalization is critical to the successful integration of KM into the teaching of thinking skills in blended learning. Integrating KM theories and empirical findings, this article proposes that four components are required for a successful creativity training program in which KM and blended learning are integrated. The four components are knowledge acquisition, knowledge sharing, knowledge internalization, and knowledge creation/co-creation.

Knowledge acquisition and the learning of creativity

A sound knowledge base is fundamental to the development of creativity. Based on KM and e-learning theories, some researchers (e.g., Craft 2005; Paavola, Lipponen, & Hakkarainen, 2004) have also defined creativity as a knowledge-building process via new technology or designed media. As e-learning applications have become a popular trend in schools, knowledge acquisition relies on the efficient use of search engines (Lau & Tsui, 2009), spaces for personal KM that enable an individual to build a personal portfolio of learning processes (Novak et al., 2004), critical reading that helps identify useful and valid information, and categorization and storing of acquired information (Yeh et al., 2013). On the other hand, systematic lectures are also important for knowledge acquisition in a blended learning environment (Yeh et al., 2012).

Knowledge sharing and the learning of creativity

The success of KM initiatives depends on knowledge sharing (Wang & Noe, 2010). According to Nonaka and Takeuchi (1995), knowledge sharing is essential for converting common ideas into innovative products. Similarly, Martins and Terblanche (2003) claimed that creativity and innovation are derived from shared visions and missions. Knowledge sharing may occur within and among diverse disciplines; any activities that aim to share knowledge may help promote evidence-based practice and decision making. Moreover, knowledge-sharing situations may not have an explicit goal, but knowledge and expertise are shared, nonetheless. Therefore, knowledge sharing can be an implicit or an explicit process (Tsui et al., 2006).

The factors that influence knowledge sharing may include individual factors (e.g., trust, power, and leadership), organizational factors (e.g., social network, reward system, and sharing opportunities), and technological factors (e.g., information technology systems and member training) (Riege, 2005). It has been suggested that trust, cooperative team perceptions, socialization, climates that encourage new ideas, and high levels of team cohesiveness are important for knowledge sharing (Cummings, 2003; Wang & Noe, 2010). In addition, as technology transfer and innovation are becoming an essential trend, the nature of the knowledge being shared, the strength of relationship ties between parties, the recipient's learning mindset and capability, and the transfer activities undertaken are also critical (Cummings, 2003). In a SECI-based study, Yeh et al. (2011) also found that building a learning community, engaging in observational learning, and participating in both class and online group discussions contributed to knowledge sharing.

Knowledge internalization and the learning of creativity

While knowledge sharing and knowledge creation are commonly emphasized in KM applications, knowledge internalization is seldom emphasized. Knowledge internalization refers to the degree to which an individual obtains ownership of, commitment to, and satisfaction with the transferred knowledge (Cummings, 2003). Ownership relates to the investment of energy, time, effort, and attention in the knowledge. Commitment helps individuals see the value of the knowledge, maintain a working relationship or interaction with the knowledge, and be willing to contribute extra effort to work with the knowledge. Finally, satisfaction encourages knowledge re-creation and application (Cummings, 2003). Nonaka and Takeuchi (1995) identified internalization as the key process of transforming explicit knowledge into tacit knowledge.

The following factors have positive influences on knowledge internalization: socialization, the relationship between the source and the recipient, the form of the knowledge, the recipient's learning predisposition, the source's knowledge-sharing capability, and the broader environment in which the sharing occurs (Cummings, 2003). KM-based training also found that internalization processes can be effectively facilitated in a blended learning environment using the following strategies: giving feedback on performance, providing guided practices, enhancing self-reflection, facilitating knowledge sharing, and encouraging participation in both in-class and online discussions (Yeh, 2012; Yeh et al., 2011).

Knowledge creation/co-creation and the learning of creativity

Knowledge creation is the capability to analyze, apply, and expand knowledge; it often starts with shared experiences in socialization, which is the process of converting new tacit knowledge through shared experiences in day-to-day social interaction. It has also been suggested that community building (Swirski et al., 2008), practice, reinforcement, and in-class and online discussions (Yeh, 2012) contribute to knowledge creation.

As collaboration is greatly emphasized in this IT society, co-creation, rather than individual creation, is gaining importance. The concept of co-creation, though seldom proposed, has been stressed in the SECI model as "shared creation" (Baskerville & Dulipovici, 2006). In the same vein, it has been suggested that knowledge becomes a group resource during the knowledge creation process and social interactions are critical for successful knowledge creation (Cecez-Kecmanovic, 2004; Baskerville & Dulipovici, 2006). Recently, Yeh et al. (2011) found that knowledge co-creation contributed to knowledge building, sharing, and integration as well as self-reflection. Similarly, Yeh et al. (2012) found that co-creation assignment improved self-reflection capacity, multi-perspective thinking, collaborative learning, co-creation topic knowledge, and motivation toward the achievement of creative products. Accordingly, knowledge acquisition, knowledge sharing, knowledge internalization, and knowledge co-creation are interactive, and knowledge co-creation can be more multifunctional than individual knowledge creation.

An integrated model for implementing KM in blended learning of creativity

Blended learning refers to a redesign of the instructional model with the following characteristics: (1) a shift from teacher-centered to student-centered instruction; (2) increased student-instructor, student-student, student-content, and student-outside resource interactions; and (3) integrated formative and summative assessment mechanisms for students and instructors (Dziuban, Hartman, & Moskal, 2004). Based on these principles of blended learning and the

aforementioned KM theories and findings, this article suggests the following four components are required for developing a KM-based instructional program for improving creativity in a blended environment: knowledge acquisition, knowledge sharing, knowledge internalization, and knowledge creation/co-creation.

This model's central idea is that KM processes interactively influence personal creativity in knowledge, dispositions, and abilities (see Figure 16.1). To effectively improve learners' creativity, instructors must continually scaffold learners in knowledge acquisition, sharing, internalization, and creation/co-creation by employing effective teaching strategies (see Table 16.2). Moreover, it has been found that e-learning platforms contribute to knowledge sharing, knowledge creation, observational learning, and online discussions, whereas classroom instruction contributes to building a knowledge base, learning basic skills, and conducting in-depth discussion (Yeh et al., 2012). Accordingly, both e-learning and in-class learning contribute to all KM processes, which further enhance learners' knowledge, dispositions, and skills related to creativity in different ways.

Conclusions

Both KM and creativity are critical for personal success in this IT-driven and dynamic society. As KM and e-learning are currently fundamental to the learning of creativity, this chapter proposes an instructional model for improving learners' creativity, in which KM theories and blended learning are integrated. In educational settings, KM-based training models that focus on improving creativity are still developing. This article's proposed model can be an effective tool for the teaching of creativity. The performance of creativity is a complex process, and the teaching of creativity is indeed a great challenge. Nevertheless, when appropriate scaffolding strategies are used to guide interactions among knowledge acquisition, knowledge sharing, knowledge internalization, and knowledge creation, learners' creativity can be significantly improved.

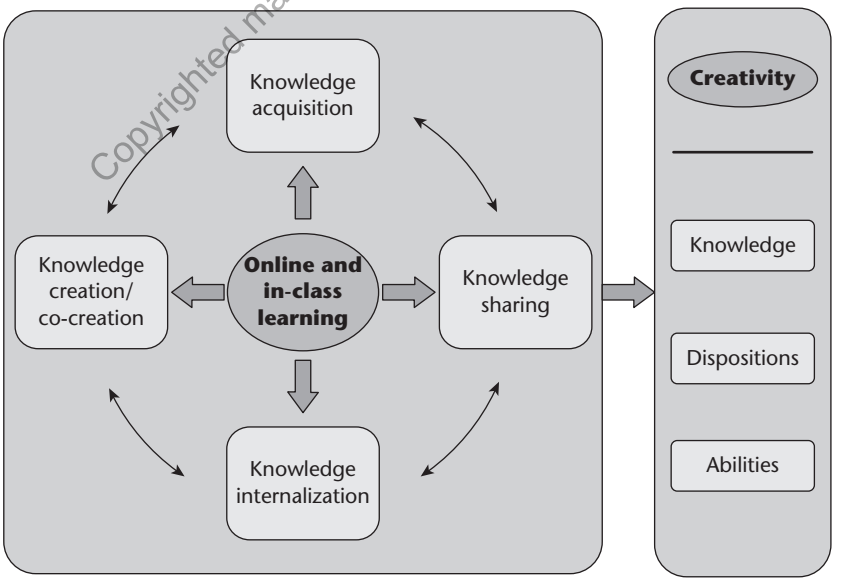

Figure 16.1 The integrated model of employing KM in the instruction of creativity in a blended learning environment

Table 16.2 KM processes and suggested teaching strategies

Knowledge acquisition
• Enhancing efficient use of search engines (e.g., Google, Yahoo, etc.). • Providing spaces to build personal portfolios of learning processes. • Enhancing critical reading skills that help identify useful and valid information. • Enhancing logical categorization and storage of acquired information. • Providing systematic class lectures.
Knowledge sharing
• Building a learning community with trusting, cohesive, and cooperative atmosphere through in-class and online group member discussions. • Facilitating observational learning through in-class presentation of personal and group assignments as well as online sharing and evaluation of peer assignments. • Encouraging both in-class and online discussions and interactions.
Knowledge internalization
• Enhancing the sense of ownership, commitment, and satisfaction with the transferred knowledge. • Enhancing self-awareness and self-reflection via tests, questionnaires, peer evaluations, and feedback on in-class and online discussions. • Providing abundant practice for creativity strategies. • Encouraging in-class and online discussions and interactions.
Knowledge creation/co-creation
• Building a learning community with a trusting, cohesive, and cooperative atmosphere. • Facilitating both online and in-class group discussion and interactions. • Providing opportunities to design individual or collaborative creative products. • Enhancing knowledge base and skills for the creation of creative products. • Encouraging integration and internalization of discussed information. • Facilitating observational learning to stimulate imitations and creative ideas.

In addition, for effective creativity instruction to occur in blended KM-based training, a series of deliberate instructional activities and effective evaluation instruments are both required. For teachers and researchers who are interested in developing blended KM-based training programs, interdisciplinary cooperation is encouraged to develop more domain-specific instructional design and instruments.

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