Distance Education
Vol. 29, No. 2, August 2008, 187–198

Routledge
Taylor & Francis Group

Using email to enable e^3 (effective, efficient, and engaging) learning

ChanMin Kim*

Florida State University, Tallahassee, FL, USA

(*Received 27 January 2008; final version received 6 May 2008*)

This article argues that technology that supports both noncognitive and cognitive aspects can make learning more effective, efficient, and engaging (e^3-learning). The technology of interest in this article is email. The investigation focuses on characteristics of email that are likely to enable e^3-learning. In addition, in order to optimize the use of email for the support of e^3-learning, this article proposes a conceptual framework grounded in research that can guide the systematic design and development process in terms of (a) diagnosing learners' needs, (b) constructing appropriate email, and (c) renewing email. Further research is also discussed, especially with regard to automated systems for email use. The article concludes with the notion that email messages in support of e^3-learning may prove to be a transformative technology in distance education.

Keywords: blended learning; cognitive learning; large lecture classes; noncognitive aspects of learning; transformative technologies

Using email to enable e^3 (effective, efficient, and engaging) learning

Enabling effective, efficient, and engaging learning (e^3-learning) is a priority concern for practitioners and researchers, but it remains a constant challenge. Virtually every context requires e^3-learning, although facilitating e^3-learning is more of a challenge in some cases than in others. For instance, large undergraduate lecture classes might not permit instructors to address individual students' needs and goals due to limited personal contact (Benedict & Hoag, 2004; Buckley, Bain, Luginbuhl, & Dyer, 2004; Huang, Huang, Diefes-Dux, & Imbrie, 2006). Courses and subjects regarded as difficult by learners create a particular challenge for engaging instruction due to learner anxiety and lack of self-efficacy (House, 2001; Ironsmith, Marva, Harju, & Eppler, 2003). In some courses, learners are expected to change their attitudes and behaviors toward subject matter in addition to acquiring knowledge and skills. It is hard to provide appropriate support for change of attitudes and behavior along with acquisition of knowledge and skills (Ertmer, 1999; Peng & Fitzgerald, 2006; Watson, 2006; Zhao & Frank, 2003; Zhao, Pugh, Sheldon, & Byers, 2002). In many curricula, courses are required regardless of student interests and preferences. In these cases, students may be extrinsically motivated by credits and grades, but they may not be intrinsically motivated to acquire knowledge and skills. As a consequence, students may fail to perform to the their full potential and may not develop important self-regulation skills (Croft & Ward, 2001; House, 1995; Kim, 2007; Kim & Keller, 2008). Barriers to e^3-learning seem to be higher in many undergraduate classes than in a typical graduate seminar course, where there are fewer students, a knowledgeable professor who can provide individual support, and students who want and need to learn and who also believe that they can learn.

*Email: cmk04f@fsu.edu

ISSN 0158-7919 print/ISSN 1475-0198 online

DOI: 10.1080/01587910802154988
http://www.informaworld.com

Moreover, in distance education contexts, creating e^3-learning is especially challenging, in part due to the separation of students from each other and from the teacher or tutor. The argument in this article is that lessons learned about using some technologies effectively to engage students in a classroom context may transfer to some distance learning contexts. The technology of focus in this article is email, which is widely used in distance settings as well as in hybrid and classroom contexts.

Creating e^3-learning should take into account the intersection of cognitive and noncognitive aspects of teaching and learning. Learning is viewed as a persistent 'change in abilities, attitudes, beliefs, capabilities, knowledge, mental models, patterns of interaction or skills' (Spector, 2001, p. 313). Support for a bridge between noncognitive aspects (e.g., interest, motivation, study habits, emotions, beliefs, attitudes, efficacy) and cognitive aspects (e.g., recall, information processing, schema, mental models, scaffolding) should, therefore, help make learning more effective, efficient, and engaging. For example, when students' math anxiety is reduced, they can more easily and readily recall formulas than they would otherwise (Ironsmith et al., 2003; van Eck, 2006). When students gain interest in a given task due to its relevance to their experiences, their attention to the task typically increases, which facilitates their information processing (Driscoll, 2005). When teachers' attitudes toward technology are positive, they are generally more effective at integrating technology to support learning (Brush, Glazewski, Rutowski, & Berg, 2003; Christensen, 2002; Llorens, Sllanova, & Grau, 2002). When students have positive study habits, they have better metacognitive skills and can develop more effective self-regulatory behaviors (Gollwitzer, 1990, 1999; Gollwitzer & Brandstätter, 1997).

However, time and curriculum constraints in some courses limit an instructor's ability to provide proper support for the aforementioned cognitive and noncognitive aspects of teaching and learning. Methods to supplement what an instructor can do are needed. This article reports one way of using one technology – email – to enable e^3-learning. Email is considered in the context of a reusable motivational object (see Keller, this issue) that is scalable in terms of instructional efficiency, in distance education as in other contexts.

Email is widely used in everyday life as well as in teaching and learning contexts, for example, online classes, face-to-face classrooms, and in hybrid learning environments. In fact, use of email technology has been studied in a variety of contexts. For example, email has been used to facilitate class activities (Davenport, 2006; De Montes & Gonzales, 2000; Lawrence, 2002; Poole, 2000), mentoring activities (Boxie, 2004; Brown & Dexter, 2002; Burgstahler & Cronheim, 2001; Cascio & Gasker, 2001; Cifuentes & Shih, 2001; Cook-Sather & Mawr, 2007; Harris & Jones, 1999; Siegle, 2003), and collaborative work (Davis & Resta, 2002; Grünberg & Armellini, 2004; van der Meij & Boersma, 2002).

However, many studies have focused on the delivery of course-related information or assignments by email (Boxie, 2004; Cascio, & Gasker, 2001; Harris & Jones, 1999). Such studies have described email use rather than analyzed its conceptual basis and effectiveness on learning outcomes (Alexander, Zhao, & Underwood, 2002; Burgstahler & Cronheim, 2001; Clingerman, & Bernard, 2004; Overbaugh, 2002). Other studies have reported on the general effect of email on learning, most typically in the context of course evaluation. There have been few investigations of the specific components of email messages that contribute to improved course designs and more effective courses (Davis & Resta, 2002; Hodges, 2008; Jacobson, 2005; Keller, Deimann, & Liu, 2005; Kim, 2007; Kim & Keller, 2007, 2008; Spittaels, De Bourdeauhuij, Brug, & Vandelanotte, 2007).

This article describes a framework for using email to make learning effective, efficient, and engaging. The intention is to provide practitioners and teachers with guidelines for the design and development of effective email messages for use in the intersection of cognitive

and noncognitive aspects of teaching and learning. In order to do so, this article investigates the following questions:

(1) In what ways has email been utilized for learning and instruction and especially for the intersection of its cognitive and noncognitive aspects?
(2) What characteristics of email are likely to help enable e^3-learning?
(3) What design aspects should be considered to optimize the use of email for the support of e^3-learning?

In order to investigate answers to these inquiries, this article will review and synthesize empirical studies on email use.

Studies on email use for students' cognitive and noncognitive aspects of learning

Email has been used in a variety of instructional contexts. Obvious benefits of email include efficiency, convenience, and cost. However, academic use of email is often limited; for example, when Alexander et al. (2002) analyzed educators' email messages, they found only half of the messages contained course-related information and most were used only for coursework assignments instead of for more purposeful academic communications (e.g., encouragement of collaborative work, discussion of individual performance). They indicated that there should be more studies to identify teaching strategies in order to harness the potential advantages of email for learning and instruction.

Some studies have addressed the use of email for specific academic purposes, such as mentoring, collaboration, counseling, and supervision. For example, De Montes and Gonzales (2000) investigated the effectiveness of email in an online course of professional development for K-12 teachers. They found that email allowed the instructor to maintain close relationships with learners and provide ongoing support. Grünberg and Armellini (2004) examined the potential of email for the exchange of professional resources and information and for the formation of collegiality. They found that email was used more for sharing information than for requesting it and private exchanges were more frequent than public ones. Van der Meij and Boersma (2002) utilized email for elementary school students collaborating on a project. They found that email stimulated reflection on the assigned tasks probably as a result of a time lag between receiving a message and developing and sending a response.

Clingerman and Bernard (2004) conducted a study using email as a supplemental method of supervision in a college counseling practicum course. They analyzed students' weekly email messages to instructors. The email messages were found to have and retain a personalization focus, often reporting personal experiences and feelings with regard to the counseling practicum. The researchers concluded that email encouraged intimacy between instructors and students, which was a result of 'a sense of psychological safety' (p. 82). Also, they reported email increased the students' thoughtfulness, interest in the class, awareness of others' attitudes, and active participation in the course.

Overbaugh (2002) analyzed the patterns of conversations on an electronic mailing list in a teacher education course on instructional technology. He reported that electronic mailing lists were an efficient way to communicate with and among groups. He also argued that email communication can improve 'reflective and critical thinking' (p. 119) because of more time for reflection and permanence of the written words. Interestingly, he reported levels of cognitive engagement from his analysis of individual student email messages.

Harris and Jones (1999) researched e-mentoring during a 15-week period in an academic enrichment program on research topics of special interest in a high school where face-to-face mentoring was impractical. They reported on the flow and functions of the email messages between teachers and subject matter experts (SMEs) – there were many informal conversations in addition to academic correspondences regarding class project inquiries and reports. They found that a prominent benefit from the email messages was fostering more social exchanges than face-to-face interactions typically allow. This free flow of personal as well as content information enabled SMEs to provide effective individual help to teachers.

Brown and Dexter (2002) utilized a mentoring program for teachers to help improve fifth and sixth graders' writing skills through email conversations. They found that students' interpersonal skills were improved in addition to their writing skills. Boxie (2004) also introduced an e-mentoring writing project between high school students and preservice teachers. The preservice teachers were trained in advance to provide strategic student feedback via email, such as 'social acknowledgement, cognitive task structuring, explanations, and elaborations, fostering reflections, etc.' (p. 134). The students became enthusiastic about schoolwork, showed better attendance, planned about colleges, in addition to appreciating the quality of writing. In Davenport's study (2006), preservice teachers were partnered with second graders to communicate via email with regard to writing projects. Her study also showed increased development of students' writing skills as well as their motivation, self-esteem, enthusiasm, and self-confidence. In addition, she found that preservice teachers' knowledge in teaching writing was also improved.

Cifuentes and Shih (2001) conducted an e-mentoring project between American preservice teachers and Taiwanese students of English. The project, based on social constructivist foundations, focused on preservice teachers' facilitative role, students' authentic experiences of English writing, and collaborative learning about culture. They found that the email correspondences allowed individualized instruction leading to students' improvement of English, communication skills, and cultural understandings. Likewise, Lawrence (2002) also found that email could be an effective teaching tool in learning foreign languages – French in his study – because interactions with native speakers via email maximized authentic, interpersonal, and learner-centered context with comfort due to the asynchronous nature of email.

Cascio and Gasker (2001) studied the effectiveness of mentoring in a social work program. They put master's program students and undergraduate students in pairs and had them communicate with each other via email for a semester. The students discussed social work as a profession, their schoolwork, and field experiences as well as personal lives. The study showed that the undergraduates changed, to being able to identify personal values in social work. Cascio and Gasker concluded that mentoring was a process of finding and satisfying 'mutual needs and desires' and the semester-long email interactions successfully facilitated the process (p. 285).

Poole (2000) used email to help reduce the levels of preservice teachers' anxiety about teaching mathematics and develop their teaching strategies through conversations on problem-solving activities with elementary school students. His study was based on the assumption that novice teachers with little background knowledge tend to use a behaviorist pedagogy. Poole found that email could be an effective tool for the novice teachers to improve their teaching skills through the acquisition of authentic experiences and social interactions with the students, which were grounded in a constructivistic viewpoint.

Cook-Sather and Mawr (2007) also utilized email to give a chance for preservice teachers to experience pedagogical practices through communications with teachers and high

school students. The participants were required to exchange email messages weekly. Dialogues about viewpoints, challenges, and issues in learning and teaching permitted teachers 'immediate, frequent, individualized communication, careful analysis and reflection, and insights into others' perspectives' (p. 11). The researchers concluded that such email interactions had the potential to narrow the gaps between the knowledge and skills learned from college and actual teaching contexts, in a convenient way that was achieved without class observations and visits.

In summary, researchers have described the following advantages of email use along with contributions to academic achievement:

- Enabling immediate, frequent support for individual needs; learner-centered context; individualized instruction; exchange of resources and information (Cascio & Gasker, 2001; Cifuentes & Shih, 2001; Cook-Sather & Mawr, 2007; Davenport, 2006; Grünberg & Armellini, 2004).
- Fostering psychological comfort; intimacy; expression of personal ideas, opinions, and emotions; informal conversations; social content exchanges; interpersonal context (Clingerman & Bernard, 2004; Davenport, 2006; Harris & Jones, 1999; Poole, 2000).
- Building interpersonal skills; collegiality; awareness of others' attitudes; insights into others' perspectives; close relationship (Brown & Dexter, 2002; Clingerman & Bernard, 2004; Cook-Sather & Mawr, 2007; De Montes & Gonzales, 2000; Grünberg & Armellini, 2004; Overbaugh, 2002).
- Developing thoughtfulness; cognitive task structuring; careful analysis; critical thinking; reflection; planning (Boxie, 2004; Cook-Sather & Mawr, 2007; Overbaugh, 2002; van der Meij & Boersma, 2002).
- Encouraging interest; enthusiasm; motivation; self-esteem; self-confidence; change in personal values; active participation (Boxie, 2004; Cascio & Gasker, 2001; Clingerman & Bernard, 2004; Davenport, 2006; Overbaugh, 2002).
- Permitting authentic but convenient context; gap reduction between knowledge and practice; real-world anxiety decrease (Cook-Sather & Mawr, 2007; Davenport, 2006; Poole, 2000).

Studies have suggested that email use enables psychosocial, academic, and professional development and, further, that it can support the important interaction between cognitive and noncognitive aspects of learning (Burgstahler & Cronheim, 2001). Nonetheless, it should be acknowledged that to date these studies have not provided sufficient information about how to design and develop email to exploit such interactions. For example, although students' email messages have been comprehensively analyzed, instructors' responses to specific students' email messages have not been examined (Clingerman & Bernard, 2004; Poole, 2000). Information about how instructors respond to certain email messages is necessary for the design and development of effective interventions to facilitate learners' psychosocial, academic, and professional development. Similarly, specific strategies that emerged during the process of email communications were not investigated (Cascio & Gasker, 2001; De Montes & Gonzales, 2000; Harris & Jones, 1999; Overbaugh, 2002). Although this was not the interest of the researchers, such an investigation would help teachers and designers develop guidelines and principles for the use of email to support learning and instruction.

Consequently, there should be an attempt to search for specific components contributing to the design and development of email use to support e^3-learning. Moreover, in studies addressing psychological and emotional benefits, in the absence of a preliminary

analysis of levels of motivation and interest (for example, Davenport, 2006), there was no information about whether or not students might have already been motivated, interested in the course, or had strong self-confidence before email was used. Accordingly, it is necessary to confirm students' development due to the intervention of email by means of proper measures for individual needs and optimal use of email for the needs. Since improvement is considered a process from a current state to a desired state, email implemented to support both cognitive and noncognitive aspects of learning should take into account the learners' current state. Therefore, the conceptual framework reported in this article implies a systematic design and development process of email, including diagnosis of students' needs.

A conceptual framework for email use for e^3-learning

The barriers to e^3-learning in many cases include a lack of personal interaction between instructors and students, lack of knowledge about students' needs, and, as a result, fewer opportunities for individualized instruction, often resulting in a loss of interest, enthusiasm, and active participation (Benedict & Hoag, 2004; Buckley et al., 2004; Huang et al., 2006). In order to overcome such barriers, instructors should make efforts to build and maintain close relationships with students. Email can support such efforts, as discussed earlier (Clingerman & Bernard, 2004; Davenport, 2006; Harris & Jones, 1999; Poole, 2000).

With regard to low motivation in required courses (Croft & Ward, 2001; House, 1995; Kim, 2007; Kim & Keller, 2008), email can be a tool to provide individualized support for motivation (Boxie, 2004; Cascio & Gasker, 2001; Clingerman & Bernard, 2004; Davenport, 2006; Overbaugh, 2002). For students with low levels of volition, self-regulation, and self-efficacy in difficult, challenging courses, email use has the potential to help students build positive strategies to surmount these barriers (Boxie, 2004; Cook-Sather & Mawr, 2007; Overbaugh, 2002; van der Meij & Boersma, 2002).

It is a challenge for teachers to promote attitude change and also facilitate learning (Ertmer, 1999; Peng & Fitzgerald, 2006; Watson, 2006; Zhao & Frank, 2003; Zhao et al., 2002). Email can again be used to support changes in personal values and attitudes outside of the class (Brown & Dexter, 2002; Clingerman & Bernard, 2004; Cook-Sather & Mawr, 2007; De Montes & Gonzales, 2000; Grünberg & Armellini, 2004; Overbaugh, 2002). Moreover, when there is limited practical experience in contexts where meaningful learning is desired, email can provide a bridge to the practical world (e.g., email conversations between preservice teachers and elementary school students; second-language students and first-language users) (Cook-Sather & Mawr, 2007; Davenport, 2006; Poole, 2000).

The following section presents a conceptual framework grounded in the research review that can guide the systematic design and development process in terms of (a) diagnosing learners' needs, (b) constructing appropriate email, and (c) renewing email. Figure 1 illustrates how the systematic design and development process is integrated into the conceptual framework for email use for e^3-learning.

Diagnosis of learners' needs

In order to construct email to support e^3-learning, learners' needs for cognitive and noncognitive aspects of learning should first be diagnosed. Studies on email use have shown there are two ways to diagnose learner needs: one is an investigation of the status of the whole group; the other is an individual examination of each learner (Davis & Resta, 2002; Hodges, 2008; Jacobson, 2005; Keller et al., 2005; Kim, 2007; Kim & Keller, 2008;

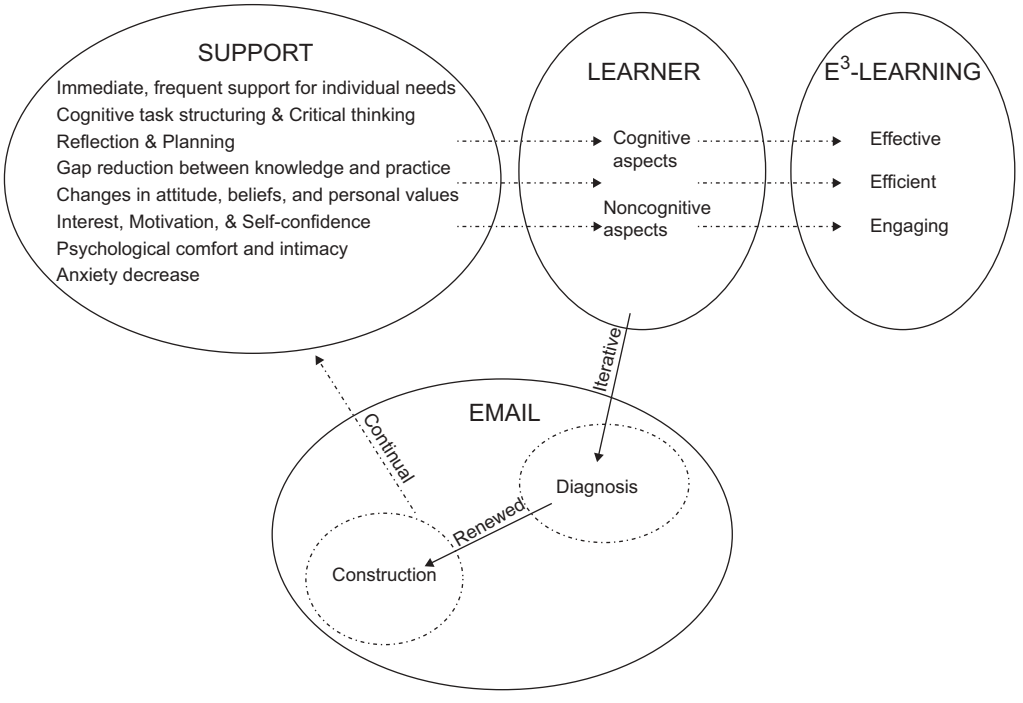

Figure 1. Conceptual framework for email use for e^3-learning.

Spittaels et al., 2007). Each one requires a combination of some of the following methods: (a) a literature search; (b) an interview of previous course instructors and students; (c) a preliminary examination of current students; and (d) periodic survzeys and reviews of coursework.

Hodges (2008), in his study using email to help students improve self-efficacy and self-regulation in a college mathematics course, first reviewed literature to see what components needed to be addressed in email to serve the purpose of his study. He also interviewed instructors and students and found out the kinds of feedback provided to students and the perceptions of instructors and students about the feedback. In addition, he used students' scores of weekly quizzes as a basis to decide on which of the components of enhancing self-efficacy and self-regulation were to be included in email.

Kim (2007) researched email use to change learners' motivation, volition, and beliefs toward mathematics. She conducted a preliminary examination of current students with a survey constructed based on a literature review of general problems in learners' attitudes, study habits, and achievement in mathematics courses. In addition, she periodically surveyed their current levels of motivation, volition, and beliefs in order to construct email reflecting their changes.

Before Keller et al. (2005) started sending email messages to encourage college students' motivation, volition, and achievement in an archeology class, they conducted an interview with the course instructor and gathered information about general levels of students' motivation, study habits, and achievement as well as characteristics and difficulties of the course and coursework. Every week they also asked students about the time they spent studying and any motivational and emotional problems they encountered. In addition, they monitored students' exam and assignment scores.

Spittaels et al. (2007) evaluated an online intervention for physical activity advice as adult health education and one of their experiment groups had supplemental advice via email. The online intervention was developed based on formative evaluation in laboratory settings so that it consisted of generally necessary tips about physical activity. Also, for the supplemental advice, they emailed questions to the adults for eight weeks to get information on how individuals changed their physical activity so that the advice could correspond with changes.

Davis and Resta (2002) described the effectiveness of email on novice teachers' sustained efforts in their online collaborative projects throughout three years. In order to construct email with scaffolding, they sent teachers a set of questions regarding their successes, concerns, and challenges in the projects; teachers' responses were reflected in the scaffolding components. Kim and Keller's study (2007) on preservice teachers' attitude changes toward technology integration also used email messages weekly to ask teachers about their concerns, feelings, and emotions in addition to the coursework.

Email construction

The approach to email construction that informs the framework presented in this article is based on theoretical and empirical foundations found in the research literature. Keller et al. (2005) aimed to implement Keller's ARCS model (1987) as a framework to support learners' motivation. They diagnosed overall levels of motivation with Keller's course interest survey (CIS) developed within the model and applied the four categories of the model (i.e., attention, relevance, confidence, and satisfaction) to message construction. The *attention-enhanced message* incorporated a tactic to stimulate a sense of inquiry about archeology in students. The *relevance-enhanced message* used a tactic to relate archeology to students' own situations. The *confidence-enhanced message* utilized a tactic to convince them that they would achieve their goals once they carefully read the strategies given and used them. The *satisfaction-enhanced message* implemented a tactic to show what they would get after accepting the strategies given and using them. The *satisfaction-enhanced message* implemented a tactic to show what students would get after accepting and using the strategies given to them.

Likewise, Kim (2007) used Schommer's model (1990) of multidimensional epistemological beliefs for the diagnosis of learners' beliefs toward mathematics knowledge acquisition. She applied the questions of Schommer's epistemological belief questionnaire (EBQ) to a checklist for email construction supporting positive changes of learners' beliefs; that is, she utilized the statements for the EBQ questions, for example, 'Some people are born good learners, others are just stuck with limited ability,' for constructing email such as 'Do you believe that a person has to have a natural ability for math in order to be good at calculus? If so, please read the story below. It might help you change your mind.'

Hodges (2008) focused on self-efficacy as a social–cognitive construct and implemented the concept of verbal persuasion as a basis for the diagnosis of learners' needs and email construction; that is, elements of verbal persuasion were included in email to help learners develop self-efficacy. For example, email reflecting the results of quizzes was based on Bandura's notion (1977) that verbal persuasion happens when it is tied to performance.

In summary, email should be constructed for its unique purposes according to unique contexts of learning and instruction. Diagnosis of learners' needs as well as applications of theories and models can make the process of email construction systematic and efficient. Meanwhile, as there are two ways to diagnose learners' needs (i.e., individual and overall), there are two methods of email construction: one to target individuals, the other to target the whole group. Studies specifically investigating differences between the effects of the two

have found more positive impact in the former (Kim, 2007; Kim & Keller, 2008). In addition, many studies where email use was found to be effective included personalized email, although they did not have a comparison group with general email only (Davis & Resta, 2002; Hodges, 2008; Jacobson, 2005; Kim & Keller, 2008; Spittaels et al., 2007).

However, both methods seem to be worthy to be implemented, in that email construction based on individual diagnosis could be effective and message construction based on general diagnosis could be efficient. Nonetheless, considering that email messages appearing irrelevant could be viewed as useless and the whole content could be easily discarded by receivers, email with general diagnosis might need to be improved in a way to include prompt questions that give choices to receivers to select the most relevant ones from the whole content. As long as email explicitly accounts for both cognitive and noncognitive aspects of learning, the choice of either method or both depends on researchers and practitioners who best understand their own contexts of learning and instruction.

Iterative measures and renewed, constant email

All of the studies reviewed in this section involved continual diagnosis of learners' needs and implementation and refinement of email messages for a longer period of time than in many studies (i.e., five weeks to three years). In addition to incorporating a process of systematic design and development of email use shown above, the persistent efforts of the instructors might be a possible reason for the positive effects of email use found. Iterative measures and renewed, constant email messages can enable instructors to remain accessible (from the learners' perspectives), check regularly on learners' needs for both cognitive and noncognitive aspects of learning, and avoid sending email containing unnecessary support.

Conclusion

Up to now, as one possible way to facilitate e^3-learning in contexts with particular barriers, this article has described a framework for using email to enable e^3-learning. Especially, considering the intersection between cognitive and noncognitive aspects of learning as important, this article has reviewed studies utilizing email for both cognitive and noncognitive aspects of learning. The intention was to provide practitioners and researchers with guidelines for the design and development of effective email to improve in classroom-based learning situations. Thus, based on the review of previous studies, this article investigated the characteristics of email and advantages of its use as well as design aspects to optimize email use for the support of e^3-learning.

Although the rationale and suggestions for email use for the support for e^3-learning research have been made, a few practical tasks still remain. Considering many studies using personalized email were found to be successful, future research should investigate ways of making the process more efficient for its design and development (Davis & Resta, 2002; Hodges, 2008; Jacobson, 2005; Kim, 2007; Kim & Keller, 2008; Spittaels et al., 2007). For instance, automated systems with a complete database of email messages targeting as many cases as possible might be a tool for instructors to easily access and refer to for their students' specific problems. If research could be done in this regard, practical issues might be solved. For example, instructors with busy schedules and without expertise in certain cognitive or noncognitive aspects of learning could make use of automated systems for diagnosing learners' problems and designing and implementing email messages to improve their teaching and learning environments.

In spite of practical issues to be resolved to improve the framework for email use to facilitate e^3-learning, the framework presented here can serve to provide future research directions and initial design guidelines for email use in distance education. As a concluding remark, again, the use of email as one of the digital technologies discussed in this article was to show possibilities to enhance the landscape of learning, instead of to transform the landscape of learning. As Kozma (1991) said, 'Our ability to take advantage of the power of emerging technologies will depend on the creativity of designers, their ability to exploit the capabilities of the media, and our understanding of the relationship between these capabilities and learning' (p. 206). With understanding of the relationship between the capabilities of email and learning, we can maximize capabilities of email for learning and we can help learning move up to e^3-learning.

Notes on contributor

ChanMin Kim is an assistant in research at the Learning Systems Institute at Florida State University. She is the lead instructional designer for an online curriculum in English writing and academic composition.

References

Alexander, M.W., Zhao, J.J., & Underwood, R.A. (2002). An analysis of e-mail technologies used by business educators at the secondary and postsecondary levels. *The Delta Pi Epsilon Journal, 44*(2), 110–124.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215.

Benedict, M.E., & Hoag, J. (2004). Seating location in large lectures: Are seating preferences or location related to course performance? *Research in Economic Education, 35*(3), 215–231.

Boxie, P. (2004). Making a cyber literacy connection from the storage room to the college room. *Read Horizons, 45*(2), 127–138.

Brown, R., & Dexter, S. (2002). E-mentors: Connecting caring adults and kids through e-mail. *Tech Trends, 46*(6), 60–63.

Brush, T., Glazewski, K., Rutowski, K., & Berg, K. (2003). Integrating technology in a field-based teacher training program: The PT3@ASU Project. *Educational Technology, Research and Development, 51*(1), 57–72.

Buckley, G.L., Bain, N.R., Luginbuhl, A.M., & Dyer, M.L. (2004). Adding an 'active learning' component to a large lecture course. *Journal of Geography, 103*(6), 231–237.

Burgstahler, S., & Cronheim, D. (2001). Supporting peer–peer and mentor–protege relationships on the internet. *Journal of Research on Technology in Education, 34*(1), 59–74.

Cascio, T., & Gasker, J. (2001). Everyone has a shining side: Computer-mediated mentoring in social work education. *Journal of Social Work Education, 37*(2), 283–293.

Christensen, R. (2002). Effects of technology integration education on the attitudes of teachers and students. *Journal of Research on Technology in Education, 34*(4), 411–433.

Cifuentes, L., & Shih, Y.-C.D. (2001). Teaching and learning online: A collaboration between U.S. and Taiwanese students. *Journal of Research on Computing in Education, 33*(4), 456–464.

Clingerman, T.L., & Bernard, J.M. (2004). An investigation of the use of e-mail as a supplemental modality for clinical supervision. *Counselor Education and Supervision, 44*(2), 82–95.

Cook-Sather, A., & Mawr, B. (2007). Direct links: Using e-mail to connect preservice teachers, experienced teachers, and high school students within an undergraduate teacher preparation program. *Journal of Technology and Teacher Education, 15*(1), 11–37.

Croft, A., & Ward, J. (2001). A modern and interactive approach to learning engineering mathematics. *British Journal of Educational Technology, 32*(2), 195–207.

Davenport, N.A.M. (2006). Connecting preservice teachers with students: Using email to build skills for teaching writing. *Journal of Reading Education, 31*(2), 13–19.

Davis, B.H., & Resta, V.K. (2002). Online collaboration: Supporting novice teachers as researchers. *Journal of Technology and Teacher Education, 10*(1), 101–117.

De Montes, L.E.S., & Gonzales, C.L. (2000). Been there, done that: Reaching teachers through distance education. *Journal of Technology and Teacher Education, 8*(4), 351–371.

Driscoll, M.P. (2005). *Psychology of learning for instruction.* Toronto, Canada: Allyn & Bacon.

Ertmer, P.A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology, Research and Development, 47*(4), 47–61.

Gollwitzer, P.M. (1990). Action phases and mind sets. In E.T. Higgins & R.M. Sorrentino (Eds.), *Handbook of motivation and cognition (Vol. 2,* pp. 53–92). New York: Guilford.

Gollwitzer, P.M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54*(7), 493–503.

Gollwitzer, P.M., & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology, 73*(1), 186–199.

Grünberg, J., & Armellini, A. (2004). Teacher collegiality and electronic communication: A study of the collaborative uses of email by secondary school teachers in Uruguay. *British Journal of Educational Technology, 35*(5), 597–606.

Harris, J.B., & Jones, G. (1999). A descriptive study of telementoring among students, subject matter experts, and teachers: Message flow and function patterns. *Journal of Research on Computing in Education, 32*(1), 36–53.

Hodges, C.B. (2008). Self-efficacy, motivational email, and achievement in an asynchronous math course. *Journal of Computers in Mathematics and Science Teaching, 27*(3).

House, J.D. (1995). Student motivation, previous instructional experience, and prior achievement as predictors of performance in college mathematics. *International Journal of Instructional Media, 22*(2), 157–167.

House, J.D. (2001). Predictive relationships between self-beliefs and mathematics achievement of American Indian/Alaska native students. *International Journal of Instructional Media, 28*(3), 287–297.

Huang, W., Huang, W., Diefes-Dux, H., & Imbrie, P.K. (2006). A preliminary validation of attention, relevance, confidence and satisfaction model-based instructional material motivational survey in a computer-based tutorial setting. *British Journal of Educational Technology, 37*(2), 243–259.

Ironsmith, M., Marva, J., Harju, B., & Eppler, M. (2003). Motivation and performance in college students enrolled in self-paced versus lecture-format remedial mathematics courses. *Journal of Instructional Psychology, 30*(4), 276–284.

Jacobson, E. (2005). Increasing attendance using email: Effect on developmental math performance. *Journal of Developmental Education, 29*(1), 18–26.

Keller, J.M. (1987). The systematic process of motivational design. *Performance & Instruction, 26*(9), 1–8.

Keller, J.M., Deimann, M., & Liu, Z. (2005). *Effects of integrated motivational and volitional tactics on study habits, attitudes, and performance.* Paper presented at the Association for Educational Communication and Technology (AECT) International Conference, Orlando, FL.

Kim, C. (2007). *Effects of motivation, volition, and belief change strategies on attitudes, study habits, and achievement in mathematics education.* Unpublished doctoral dissertation, Florida State University.

Kim, C., & Keller, J.M. (2007). *Effects of motivational and volitional email messages (MVEM) on preservice teachers' motivation, volition, performance, and attitudes toward technology integration.* Paper presented at the American Educational Research Association (AERA) Conference, Chicago, IL.

Kim, C., & Keller, J.M. (2008). Effects of motivational and volitional email messages (MVEM) with personal messages on undergraduate students' motivation, study habits and achievement. *British Journal of Educational Technology, 39*(1), 36–51.

Kozma, R.B. (1991). Learning with media. *Review of Educational Research, 61*(2), 179–211.

Lawrence, G. (2002). The use of e-mail as a tool to enhance second language education programs: An example from a core French classroom. *The Canadian Modern Language Review, 58*(3), 465–472.

Llorens, S., Sllanova, M., & Grau, R. (2002). Training to technological change. *Journal of Research on Technology in Education, 35*(2), 206–212.

Overbaugh, R.C. (2002). Undergraduate education majors' discourse on an electronic mailing list. *Journal of Research on Technology in Education, 35*(1), 117–138.

Peng, H., & Fitzgerald, G.E. (2006). Relationships between teacher education students' epistemological beliefs and their learning outcomes in a case-based hypermedia learning environment. *Journal of Technology and Teacher Education, 14*(2), 255–285.

Poole, D.M. (2000). An email activity: Preservice teachers' perceptions of authenticity. *Journal of Technology and Teacher Education, 8*(1), 13–28.
Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology, 82*(3), 498–504.
Siegle, D. (2003). Mentors on the Net: Extending learning through telementoring. *Gifted Child Today, 26*(4), 51–54, 63.
Spector, J.M. (2001). A philosophy of instructional design for the 21st century? *Journal of Structural Learning and Intelligent Systems, 14*(4), 307–318.
Spittaels, H., De Bourdeauhuij, I., Brug, J., & Vandelanotte, C. (2007). Effectiveness of an online computer-tailored physical activity intervention in a real-life setting. *Health Education Research, 22*(3), 385–396.
van der Meij, H., & Boersma, K. (2002). Email use in elementary school: An analysis of exchange patterns and content. *British Journal of Educational Technology, 33*(2), 189–200.
van Eck, R. (2006). The effect of contextual pedagogical advisement and competition on middle-school students' attitude toward mathematics and mathematics instruction using a computer-based simulation game. *Journal of Computers in Mathematics and Science Teaching, 25*(2), 165–195.
Watson, G. (2006). Technology professional development: Long-term effects on teacher self-efficacy. *Journal of Research on Technology in Education, 14*(1), 151–165.
Zhao, Y., & Frank, K.A. (2003). Factors affecting technology uses in schools: An ecological perspective. *American Educational Research Journal, 40*(4), 807–840.
Zhao, Y., Pugh, K., Sheldon, S., & Byers, J.L. (2002). Conditions for classroom technology innovations. *Teachers College Record, 104*(3), 482–515.