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Trends of Educational Technology in Korea and the U.S.: A Report on the AECT-Korean Society for Educational Technology (KSET) Panel Discussion

Eunsoon Cho[1] · Young Hoan Cho[2] · Michael M. Grant[3] · Donggil Song[4] · Yeol Huh[5]

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Abstract
The Korean Society for Educational Technology (KSET) hosted its second panel discussion partnering with the Association for Educational Communications and Technology (AECT) at the 2019 AECT Convention in Las Vegas, Nevada. A total of four panelists, two from Korea and two from the U.S., participated in the discussion on the trends of educational technology in Korea and in the U.S. for one hour. The topics covered were smart schools in a smart city of Korea, characteristics of mobile learning environments, learning analytics for instructional design, and artificial intelligence for learning sciences research.

Keywords Smart school · Mobile learning · Learning analytics · Artificial intelligence

The Korean Society for Educational Technology (KSET) has long been a major partner of the Association for Educational Communications and Technology (AECT). KSET continuously seeks for an opportunity to collaborate with AECT and lead the new changes in the educational technology field in both Korea and the U.S. As one of these such efforts, KSET has initiated a panel discussion inviting experts in the educational technology field representing both countries since the 2018 AECT convention. The first panel discussion was held under the theme, "Current Trends of Learning, Design, and Technology (LDT) in South Korea: The KSET Community's Perspective" (Lim et al. 2019). It was a huge success, attracting a sizeable audience and receiving positive feedback from session attendees. Impressed by the success, KSET decided to make this panel discussion a legacy session for the annual AECT convention, and the second panel discussion was held at the 2019 AECT convention in Las Vegas, Nevada. The presidents of KSET and AECT were first asked respectively to take part in the panel discussion to present the trends in Korea and the U.S., and then other two panelists (e.g. one from Korea and the other from the U.S.) were determined by the KSET planning body using the following criteria: 1) who could physically attend the AECT 2019 convention, and 2) whose established research agenda fell into one of the educational technology trends (Alexander et al. 2019).

The second panel discussion sought to explore answers to the following question: What are the current trends of the educational technology field in Korea and the U.S., specifically in the areas of smart schools, mobile learning environments, learning analytics, and artificial intelligence? Four experts representing both counties were invited as panelists, and the following section summarizes each panelist's discussion.

✉ Yeol Huh
yhuh@emporia.edu

Eunsoon Cho
echos@mokwon.ac.kr

Young Hoan Cho
yhcho95@snu.ac.kr

Michael M. Grant
michaelmgrant@sc.edu

Donggil Song
song@shsu.edu

[1] Department of Education, Mokwon University, 800 Doan-dong, Seo-gu, Daejon 35349, South Korea

[2] Department of Education, Seoul National University, 1 Gwanak-ro, Gwanak-gu, Seoul 08826, South Korea

[3] Department of Educational Studies, University of South Carolina, Wardlaw College 133, Columbia, SC 29208, USA

[4] Instructional Systems Design and Technology, Sam Houston State University, 1908 Bobby K Marks Drive, Huntsville, TX 77340, USA

[5] Department of Instructional Design and Technology, Emporia State University, 1 Kellogg Circle, Emporia, KS 66801, USA

Panel Discussion Topics

Smart School in a Smart City of Korea (by Dr. Eunsoon Cho)

The concept of Industry 4.0, as known as the fourth Industrial Revolution, envisions decentralized decision making and active communication between technologies and with humans in real life based on automated and digitized technologies such as the Internet of Things (IoT), artificial intelligence, and machine learning (Morrar et al. 2017). The idea of Industry 4.0 not only applies to manufacturing but also to other disciplines such as education where the core technologies can be applied. To prepare for Industry 4.0 in Korea, the 6th Educational Informatization Plan for the next 5 years presented an idea of digital convergence in educational environments (Ministry of Education and Korea Education Research and Information Service 2018). Recently, a new approach, "smart school", has initiated a reform effort for existing school environments, classroom activities, and educational outcomes (Ministry of Land, Infrastructure, and Transport, and Korea Education Research and Information Service 2019). This effort runs parallel with a government-driven "smart city" construction initiative for the national industry 4.0 future plan. More specifically, the smart school initiative deals with school space renovation, school curriculum redesign, educational technology, and a lifelong career development support system. Educational technology researchers in academia and practitioners, especially government officers, will play a significant role in this by collaborating with start-up technology companies in establishing the system for supporting not only smart schools but a smart city itself. The government's vision of "smart school and smart city" is to set up a model that can be expanded to other cities in Korea and even to other countries who are interested in this concept for industry 4.0 (Cho 2019; Ministry of Education and Korea Education Research and Information Service 2018).

The first step was an assessment for feasibility, profitability, and sustainability. The next step is devising action plans for each area of the smart school (Cho 2019). They can be accomplished by design and development of a platform and learner-centered practices such as adaptive learning, collaborative learning, and authentic project-based learning.

However, the most urgent agenda for the smart school initiative is to provide teachers with training to guide their students in the smart school system. The goal of this smart school is to develop competencies of future teachers and students through a formal education system so that they can improve the quality of their lives and wellness.

Characteristics of Mobile Learning Environments (by Dr. Michael Grant)

It is argued that the variety of definitions for mobile learning environments (MLEs) has offered little to educational technology research (Grant 2019), insufficiently explaining the active ingredients (Clark 1983) and ineffectually identifying their unique affordances (Reeves and Reeves 2015a, 2015b). Instead, seven design characteristics of MLEs (Grant 2019, p. 369–375) that exist on continua were proposed: (1) A learner is employing key learning characteristics. (2) A mobile computing device may act as a scaffold for social, metacognitive, or cognitive tools. (3) Persistent data and network services are in use. (4) Formal instruction, informal learning, and performance and decision supports aid learners. (5) A more knowledgeable other is available to the learner synchronously and/or asynchronously. (6) A description is included for how physical and networked cultures and contexts are critical or irrelevant to the learner and learning. (7) The method(s) for how formal, informal, or semi-formal learning occurs is described.

These characteristics better define the elements at use within MLEs and the extent to which they are used. The description for how the learner is engaged, however, requires further consideration. Specifically, Banan (2014) and Bano et al. (2018) reported that studies have failed to report or adequately describe the theoretical frameworks at use within MLEs. Therefore, the design characteristic needs to be expanded to incorporate a description of any theory (e.g., activity theory; Russell 2001) and/or instructional models (e.g., cognitive apprenticeship; Wu et al. 2012) employed within MLEs.

Finally, researchers in the U.S. and Korea who will be designing, implementing, and evaluating MLEs should consider the following in their studies: (1) mobilities of technologies, including functionality and affordances (e.g., communications, curation, entertainment, personal organization); mobility of learners with plans to prevent fragmented knowledge (Traxler 2010) and scaffold learning (Hill and Hannafin 2001) through networked communities; and mobility of learning that may be place-based (Zimmerman and Land 2014) and occurring at different times and places (Tella 2003). In addition, researchers need to address current faults in existing MLE research by planning implementations with longer durations (cf. Sung et al. 2015a; Sung et al. 2015b), reporting research that fully describes pedagogical theory (Bano et al. 2018; Baran 2014), designing methods that focus on effects over perceptions (Alzahrani and Laxman 2016), and consider ethnographic studies that follow learners' everyday learning (e.g., Caron and Caronia 2007; Cui and Roto 2008).

Learning Analytics for Instructional Design (by Dr. Young Hoan Cho)

Learning analytics is effective not only for understanding how people learn but also for improving instructional practice and learning environments based on data-driven decision making. Multimodal data of learner behaviors help to analyze diverse aspects of the learning process, accurately predict learning performance, and provide learners with just-in-time adaptive supports.

A total of 24 studies of learning analytics have been published since 2015 in Korean academic journals. Although interest in learning analytics research is growing rapidly, the focus of research has a bias toward exploring student profiles and predicting learning performance (42%) as well as developing software like dashboards (33%). There is a lack of research on teaching with learning analytics (8%) despite the situation that many teachers may have difficulties in using learning analytics to improve their instructional practice. When compared to Korea, more prescriptive learning analytics to improve teaching and learning has been carried out in the U.S. Wong and Li (2020) found that 13 of 24 learning analytics intervention studies were implemented in the U.S. from 2011 to 2018.

More research is necessary to empower teachers to make an instructional decision based on learning analytics tools that constantly provides information of how students learn and what they will achieve. We should investigate how to integrate learning analytics in instructional design so that teachers can effectively and ethically use student data for adaptive instruction and personalized learning. To successfully conduct the research, we need interdisciplinary collaboration among educational technology, artificial intelligence in education, human-computer interaction, learning sciences, curriculum and instruction, etc. Data-based instructional design or prescriptive learning analytics will contribute to advancing educational technology theories and practices to the next level.

Artificial Intelligence for Learning Sciences Research (by Dr. Donggil Song)

Artificial Intelligence (AI) has been and will be widely integrated into education research (e.g., International Journal of Artificial Intelligence in Education, Journal of Educational Data Mining, and Journal of Learning Analytics), including learning performance profiling (Kizilcec et al. 2013; Vaessen et al. 2014), learning path and pattern profiling (Boroujeni and Dillenbourg 2019), learner performance prediction modeling (Mao et al. 2018), and learner retention prediction (Spoon et al. 2016). Educational big data and machine learning have been frequently addressed in the learning sciences field. Great promises on adaptive learning systems and personalized learning have been kept in the name of AI (see Colchester et al. 2017; Vandewaetere and Clarebout 2014); we may want to think about two different cases. First, AI-based research analysis might surpass researchers at subtle reasoning and judgment tasks. Second, AI-based learning support systems naturally and directly work with learners, and in some cases, surpass human tutors or instructors at instructional tasks.

The first approach (the use of AI to indirectly support the learning process through educational data analysis) was named, "Back-end AI for human learning." This approach has been used by researchers in the field of learning analytics and educational data mining. AI techniques and algorithms have been applied to investigate, examine, and analyze the learner's learning process, behavior, and performance. On the other hand, AI has shown its potential to directly teach, instruct, facilitate, and support human learning. This approach can be named as "Front-end AI for human learning." Traditional examples are answer-retrieval or information-retrieval systems. From the informal reviews on the fields of practice and research, it seems that Korea is more focused on the front-end approach while the United States is leaning toward the back-end approach.

AI learning support systems will be able to perform most of the tasks that currently have to be conducted by human instructors, teachers, tutors, coaches, trainers, and learners. Through the combination of both approaches explained above, I hope that AI systems will be capable of performing most of the personalized and individualized tasks that are traditionally and currently conducted by education practitioners.

Conclusion

Each panelist shared their expertise and knowledge of where current trends of educational technology lie in both Korean and U.S. contexts. Their insights shed light on how those four areas are interrelated and what the implication will look like. For example, one of the Korean trends, the smart school initiative, is an example of potential system in education powered by the other trends. Mobile learning, learning analytics, and artificial intelligence need to be closely tied to each other and utilized to create and support a new innovative system like smart schools. With the knowledge shared by the panelists, the audience and each panelist had a chance to reflect on the four trends and ways to prepare for the future that KSET and AECT should work toward. This new tradition of KSET-AECT will continue its appearance every year to help researchers and practitioners exchange innovative thoughts and build a vision for the future of educational technology together.

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