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The Future Learning Environment as Perceived by Special Education Preservice Teachers*

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Recently, a wide variety of studies on future learning have appeared owing to rapid advances in information and communication technology (ICT) and increased discussion about core competencies in twenty-first-century learning. These studies, though insufficient in number, cover various fields such as architecture (design of the learning space), education (learning model), and technology (adaptation of mobile devices). However, these studies focus on mainstream students and do not discuss the future situation of inclusive education with regard to both mainstream and students with physical disabilities. Hence, in order to fill this gap, the present study explores the perceptions and ideas held by special education preservice teachers on the future learning space with regard to school design and peer-to-peer feedback. For this purpose, these preservice teachers' design proposals about future school were collected and analyzed. In conclusion, special education preservice teachers perceive the future learning space as an inclusive environment in which smart technology is incorporated. Future learning environment were categorized in terms of flexible, ubiquitous technology, physical and mental health, safety, and spaces with facilities for students with physical disabilities.

Keywords : Future school, Special education, Learning space, Students with physical disabilities

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Introduction

Future education is an ongoing project in every country. "The Partnership for 21st Century Skills (P21)," a national organization in the United States, identified six essential academic skills for students to acquire if they are to succeed as citizens and workers in the global economy of the 21st century (http://www.p21.org/). Assessment & Teaching of 21st Century Skills(ATC21S), a research project which conducted with a group of more than 250 researchers across 60 institutions worldwide categorized 21st-century skills internationally into four broad categories (http:// www.atc21s.org). Six skills of P21 and four categories of ATC21S have shared similar ingredients such as information, media, and technology skills and tools for working.

Discussions about future education drawn from information and communication technology (ICT) development, social changes, and economic trends suggested as follows: First, the development of ICT has changed our living space, since learners are liberated from physical time and space through online activity; they thus cohabit two different spaces, one online and the other offline. They expect to be able to work, learn, and study wherever and whenever they want (Johnson, Smith, Levin, Haywood , 2010).

Second, ICT places focus of learning competency from memorization to higher-order thinking. With the assistance of smart technologies serving as adjuncts to certain brain processing functions, human beings should focus on enhancing their conceptual abilities by suggesting questions, criticizing, and creating (Lanham, 1993). These high-order abilities will be the basis of production and wealth in the 21st century. The P21 indicates that the three Rs (reading, writing, arithmetic) of earlier times will be fused into the four Cs(critical thinking and problem solving, communication, collaboration, and creativity and innovation) during this century. The abundance of resources and relationships made easily accessible through the Internet is increasingly challenging us to revisit teacher and student roles (Johnson

et al., 2010).

Third, technology continues to affect profoundly the way we work, collaborate, communicate, and succeed. Technology is narrowing the physical distance in a cyber world and flattening the world. Increasingly, technology skills are also critical to success in almost every arena, and those who have the opportunity to acquire digital literacy obtain opportunities to socialize and collaborate with other people who share their interests and goals (Johnson et al., 2010). Hence, future educational curricula must include ICT so that learners may enhance their digital literacy.

Rapid development of ICT promotes an integration of ICT and curriculum. Studies and practices have been conducted in several countries with different levels for future education bonded with technology. Examples of these efforts include: Microsoft's "School of the Future", USA's "Future of the School Design Competition", EU's "School Foresight Project", UK's "Building Schools for the Future", MIT's iCampus, Japan's "Future School".

However, mainstream of studies and practices so far has focused on students in general and few attentions were paid to students with physical disabilities. According to Korea's legislative agenda "Special education laws for persons with disabilities and others", schools in general should be equipped for student with disabilities. Furthermore, almost studies on future learning have been exploded of teachers' perception and opinion. Though preservice teachers will be teacher and perform a role as a facilitator on learning environment and students, researches on preservice teachers' perception were rare. Preservice teacher's perception is needed to be explored in that opinions of various groups lead better results (Kim and Jung, 2010). Thus, this study aims to explore the future learning environment designed by preservice teachers for both mainstream students and students with physical disabilities.

Literature Review

The Concept of Future Learning Spaces

Learning is inseparable from the physical environment in which it takes place (Jetsonnen, Johansson, Nuikkinen, Sahlberg, 2011). The interest in future education has led to studies of learning spaces.

Punie, Ala-Mutka (2007) suggest a vision of future learning spaces as personal digital spaces, creative/flexible spaces, motivating and pleasant spaces, connecting and social spaces, controllable spaces, knowledge management systems, inclusive spaces, certified spaces, trusted spaces.

Long, Ehrmann (2005) present typologies for specialized learning spaces as thinking/conceiving spaces(spaces for deliberating), designing spaces(spaces for putting structure, order, and context to free-ranging ideas), presenting spaces (spaces for showing thing to a group), collaborating spaces(spaces for enabling team activities), debating or negotiating spaces(spaces for facilitating negotiations), documenting spaces(spaces for describing and informing specific activities, objects, or other actions), implementing/associating spaces(spaces for bringing together related things needed to accomplish a task or goal), practicing spaces(spaces for investigating specific disciplines), sensing spaces(spaces for pervasively monitoring a location), operating spaces(spaces for controlling systems, tools, and complex environments).

According to the report of the Joint Information Systems Committee (2009), learning spaces should motivate learners and promote education as an activity, support collaborative as well as formal practice, provide a personalized and inclusive environment, and be flexible in the face of changing needs.

Jetsonnen, Johansson, Nuikkinen, Sahlberg (2011) suggest that Finnish school-aged children's high performing in all subjects is caused by the Finnish school system and the building which serve as learning environments. Johansson quotes guidelines for learning environment of the Finnish National Board of

Education. Moreover, they suggest additional criteria after school design competition.

Learning environment includes everything from the physical setting of individual classrooms to the school's natural and communal surroundings. The quality of any learning environment ultimately depends not only on its standard of amenities but the overall functionality of the whole school setting. A school should be a place that physically, psychologically and socially safe, promoting the child's growth, health and learning as well as their positive interaction with teachers and fellow pupils. A sound learning environment is founded on good design and the healthy interaction that this fosters. Moreover, learning space must adapt to the changing need of new generations (Jetsonnen et al., 2011).

Table 1. Elements of future learning

Category	Elements of future learning
Jetsonnen, Johansson, Nuikkinen, Sahlberg (2011)	A place that physically, psychologically and socially safe, A place promoting the child's growth, health and learning as well as their positive interaction with teachers and fellow pupils, A place that must adapt to the changing need of new generations.
Joint Information Systems Committee (2009)	Mobile learning, Connected learning, Visual & Supportive learning
Kang et al. (2007)	Motivating space, Flexible space, Collaborative space, Reflective space, Community space, Arts space
Punie, Ala-Mutka (2007)	Personal digital spaces, Creative/Flexible spaces, Motivating and pleasant spaces, Connecting and social spaces, Controllable spaces, Knowledge management systems, Inclusive spaces, Certified spaces, Trusted spaces
Long, Ehrmann (2005)	Thinking/Conceiving spaces, Designing spaces, Presenting spaces, Collaborating spaces, Debating or negotiating spaces, Documenting spaces, Implementing/associating spaces, Practicing spaces, Sensing spaces, Operating spaces

In summary, suggestions about future education can be organized as pedagogy, technology and institutional system Table 1. These elements are classified as technology oriented concept, learning activity oriented concept, environment oriented concept and education system oriented concept.

Key Factors of the Future Education

Learning space is not the only physical container within which learning occurs; objects and spaces themselves can provide several dimensions of support for learning, such as pedagogy, technology, environment and education system. In this regard, three dimensions have a complementary relationship, as shown in Figure 1.

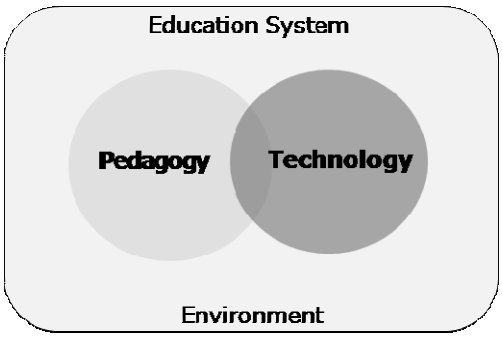

Figure 1. Pedagogy-Technology-Environment-Education System framework

Pedagogy applies technology to learning (JISC, 2009; Long & Ehrmann, 2005). The JISC(2009) presented four types of learning: mobile(table PCs, laptops, mobile phones, wireless keyboards/mice, PDAs, digital cameras), connected(wired computing, wireless networks, wireless-enabled laptops/tablet PCs, Internet-enabled PDAs, and mobile phones), visual and interactive(video conferencing, video streaming, image projection, interactive whiteboards, voting devices), and supported(assistive technologies, accessible usb ports, audio-visual prompts, video recording facilities, plasma screen information points).

Technology promotes pedagogy (Punie & Ala-Mutka, 2007; Long & Ehrmann, 2005). Learning spaces should be flexible, relying on both lectures and cooperative and self-directed resource-based learning. Learning models for future classrooms have been discussed in the perspective of constructivism. Song (2008) develops an instructional design model, conceived for ubiquitous learning in future classrooms. In this model, instructional processes and strategies are suggested. An instructional process concerns cognition in a given situation; the collection, analysis, conception, and generalization of solutions through self-directed and collaborative learning. Instructional strategy is suggested according to learning tasks, media, and interactions. Thus, along with lectures, which focus on the teacher, small group activities must also take place, in which students can communicate and share information. ICTs support the sharing of opinions and resources for personalization, they enhance the search for and the creation and storage of information, as well as the expression of opinions for guidance, ICTs sustain the presentation of various examples and learning contents.

Environment stimulates pedagogy (Jetsonnen et al., 2011; Kang et al., 2007). To foster learning activities, environment should provide safety, healthy for physical and emotional and comfortable space with proper lighting and temperature.

Education systems provide certification and encourage participation (JISC, 2009; Punie & Ala-Mutka, 2007).

Methods

A qualitative approach was conducted. The participants of this study were 21 preservice teachers who majored in Special Physical Education.

They were grouped into five teams in an "educational technology and methods" course. A cooperative activity was based on the project learning model. Topic of project was design of the near future school as instructional designer. The projects

included five visualized maps, the presentation of a 125-minute video file, and the creation and collection of 126 reflection journals. The five visualized maps and the 125-minute presentation video were analyzed for this study.

Since visualized learning space maps contained a variety of content and was of varying quality, the KJ method was used to analyze them. The KJ method reveals the structure of the information and organizing those that are related (Ouchi, Yamada, Ohuchi, 2007). The actual application of the KJ method involves four essential steps 1) label making, 2) label grouping, 3) title making, 4) written or verbal explanation (Scupin, 1997).

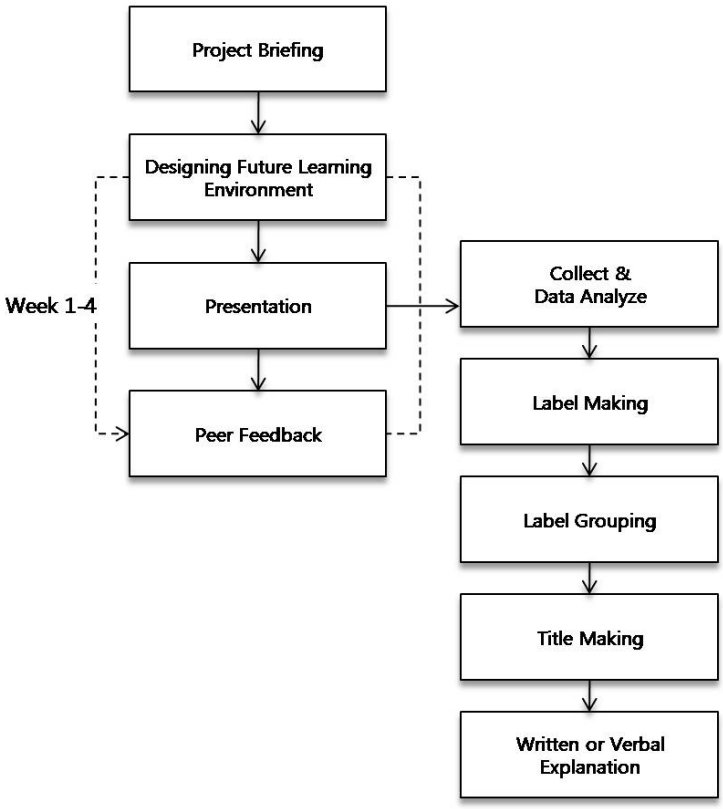

Figure 2. Research Flowchart

Visualized learning space maps were made into PowerPoint slides for presentation. To analyze maps, every space and facility in presentation files was classified. First, all spaces and facilities were placed on each card. Second, similar cards were grouped according to related items. Pedagogy-Technology-Environment-Education System framework was applied in order to grouping. Third, categorized cards were named. Fourth, naming and organizing was reviewed by one doctor of philosophy. Five presentation videos in 125 minutes produced by each team were transcribed and used as support materials to analyze map.

Classification of Visualized Maps

Type 1: Flexible spaces

Preservice teachers divided spaces in two ways, integration and separation. In type 1, flexible space means both various activity and flexible arrangement. General teaching spaces have been dominated in the last century by one type of design: tutor-focused, one-way facing and presentational, with seating arranged in straight rows.

Preservice teachers suggested flexible activity. In classroom, lecture, personalized study, group study, collaboration, searching information, presentation was presented. In ecological park, walking and crop production is suggested. In gymnasium, coexistence on gymnasium for physical education and auditorium for performance was proposed. In art room, chorus, chamber, handicraft activity was suggested.

Learning activities were conducted in flexible arrangement. As for integration, listening to lectures and collaborating and presenting educational products took place in the same space. As for separation, space was divided according to teaching and learning processes and to self and cooperative study. However, if soundproof dividers were equipped, separation and integration could be flexible.

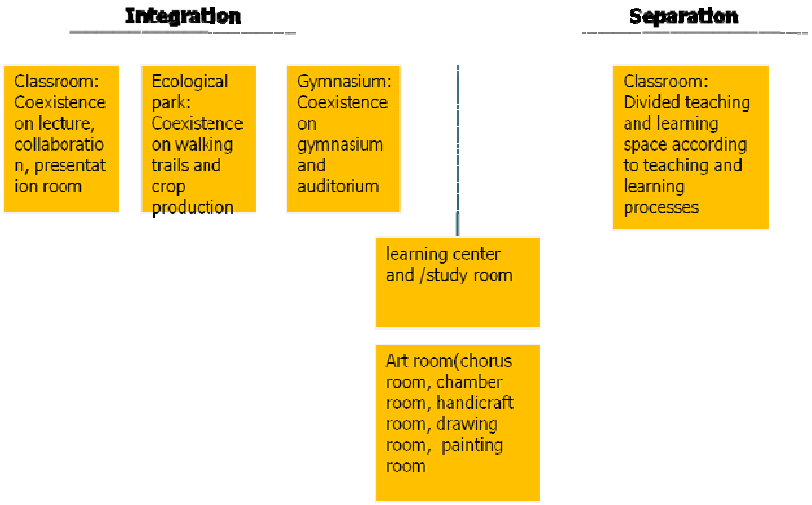

Figure 3. Type 1 Facilities

Figure 4. Type 1 slides

Type 2: Ubiquitous technology spaces

Preservice teachers suggested spaces with everywhere technologies. In the learning space, preservice teachers suggested various technologies from the entrance to e-test room. In the classroom, they arranged classroom access cards, three-dimensional screen, magic mirror, personal tablet PCs with teachers' subtitles and voice, display panel, and observation camera. Students can play golf, tennis and

bowl through virtual reality in simulation room.

In the gymnasium, they proposed a swimming pool with an automatically controlled water level, electronic movable hoops, and electronic rails. Moreover, electronic stands and a stage changed the gymnasium into an auditorium.

In infirmary, body scanner was proposed for diagnose the condition of body.

For all spaces, preservice teachers suggested an automatic ventilation system and a temperature control system.

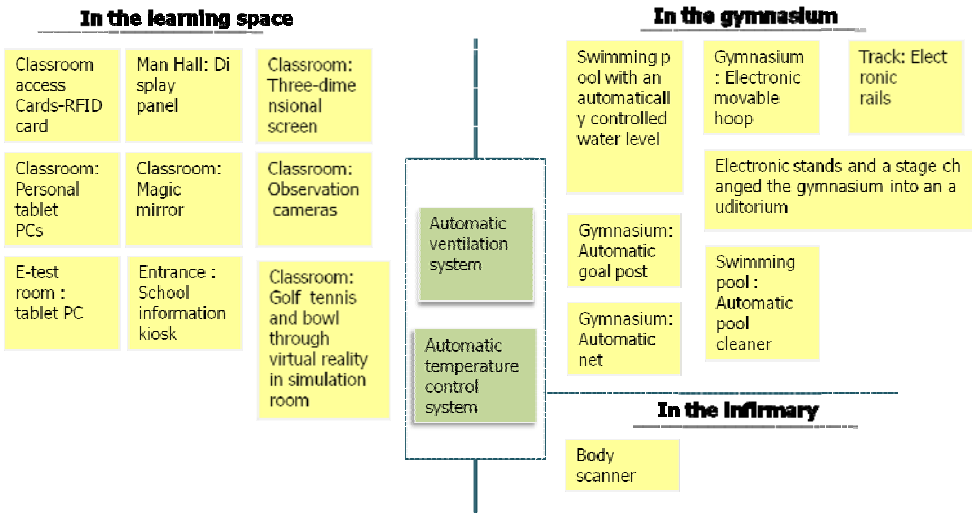

Figure 5. Type 2 Facilities

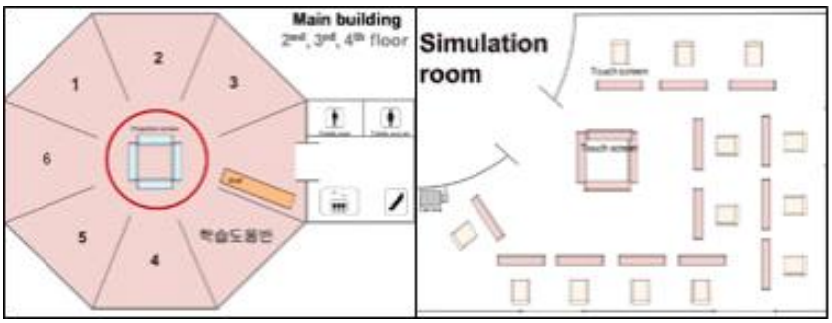

Figure 6. Type 2 slides

Type 3: Spaces for physical and mental health

For physical health, preservice teachers recommended environments optimized for teaching and learning through the use of automatic temperature control systems and ventilation systems. In infirmary room, they suggested a fitness room and physical therapy room. For mental health, the preservice teacher advised a room for meditation and audio-video room, in addition to counseling room. For physical and mental health, ecological park was suggested.

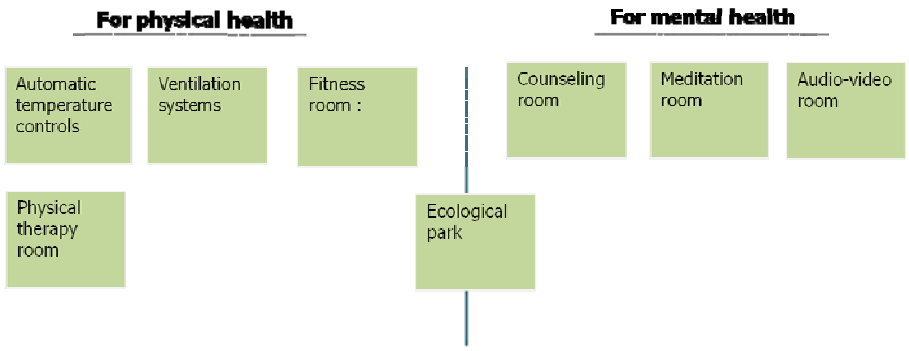

Figure 7. Type 3 Facilities

Figure 8. Type 3 slides

Type 4: Safety spaces

The preservice teachers suggested safe classrooms and safe environments. To avoid physical injury, they suggested rubber mat flooring to reduce the shock on

joints and leg muscles. To prevent classroom accident and permit observation by parents and peer teachers, they proposed cameras capable of monitoring students, campus police.

To enhance safety, the teachers requested that almost all activities take place within the building. Moreover, they advised separate entrances for cars and learners to prevent injuries.

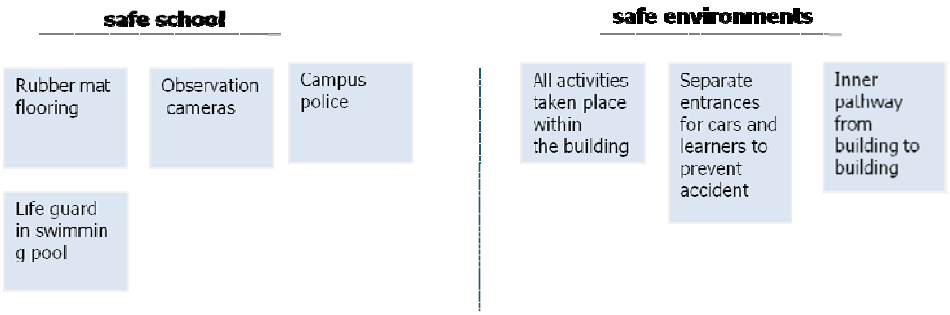

Figure 9. Type 4 Facilities

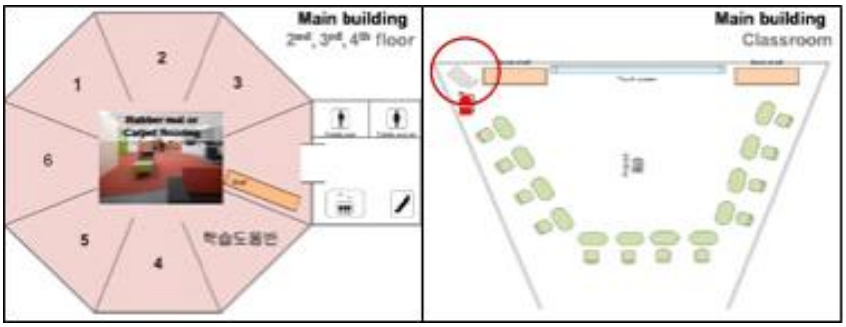

Figure 10. Type 4 slides

Type 5: Space with facilities for students with physical disabilities

For easy access and movement, preservice teachers suggested that moving walkway, automatic or sliding doors without threshold, handrails, and moving

walkways be installed.

To encourage involvement in sports, they proposed several facilities, such as underwater wheelchair, pool lift and guiding rail, sports programs and lifts that would enable students with physical disabilities to participate in sports like mainstream students.

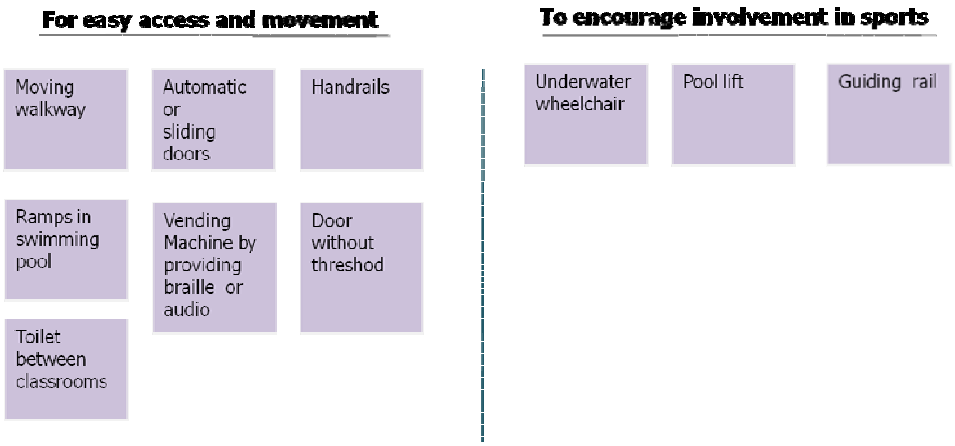

Figure 11. Type 5 Facilities

Figure 12. Type 5 slides

Conclusion

This research classified visualized maps of the future school designed by preservice teachers in special physical education. In conclusion, future learning

environment were categorized in terms of flexible, ubiquitous technology, physical and mental health, safety, and spaces with facilities for students with physical disabilities.

The results of this study provide the following implications. First, preservice teachers recognized learning room as flexible for personal activity and collaborative activity as well as for interaction with teacher-students and with students-students. According to P21 and ATC21S, communication and collaboration are ingredients of the core competencies of learners. In that respect, their recognition is inspiring thing as preservice teacher in charge of future education. Second, as Jetsonnen et al. (2011) mentioned, learning space adapt to the changing need of new generations. Preservice teachers suggested everywhere technology for learning, for comport and for safety. They have been aware how technology to be applied for specific context effectively. For example, they proposed simulation room for physical activity. Unlikely present situation in school, they don't have stereotype of physical education being conducted in schoolyard or auditorium. Third, preservice teachers recognized learning environment as not only for learning, but also for physical and mental health. In their view, learning environment is the place which promotes growth in every aspect. Fourth, without substantial change, facilities for students with physical disability could be kept. There are various levels to care student with physical disabilities such as door without threshold, handrails, vending machine by providing braille or audio, tablet PC by providing audio or typing.

This finding is expected to increase the awareness of integrated education of mainstream students and of students with physical disabilities as participants in future education.

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