SEAAIR 2022
The 22nd ANNUAL CONFERENCE

Annual SEAAIR Conference Proceedings

Volume 2
(November 2022-November 2023)

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SEAAIR 2022: New Normal Education: Transitioning, Transforming, and Technologies Agenda
September 28-30, 2022

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MESSAGE FROM PRESIDENT OF SEAAIR

SEAAIR greets you and warmly welcomes you all with great pleasure to our SEAAIR 22nd Annual Conference in Seoul, South Korea. We thank our distinguished speakers and participants for joining us this year, and to many of our participants and presenters, we say "for joining us again." Indeed, we are very grateful to Sungkyunkwan University (SKKU) with the Korean Association for Adult and Continuing Education (KACE) for accepting the enormous task as this year's Local Organizing Committee (LOC) and in making this scholarly event happen.

For more than two decades, SEAAIR remains steadfastly committed to its purpose. That is, "to benefit, assist and advance research leading to improved understanding, planning, and operations of HEIs in the South East Asia." We firmly believed that SEAAIR has flourished through the years because of its unrelenting focus on its reason for being and for consistently upholding the wisdom and history established by the founding members. It has become a conduit of academic and cultural platforms.

As a maturing organization, SEAAIR has advanced in its desire to become more inclusive …. into SEAAIR Plus through partnerships with other countries like China, Korea, and Taiwan, with key participations from Japan and Australia, and other frequent nationalities' involvements.

This year's theme "New Normal Education: Transitioning, Transforming, and Technologies Agenda" is not only appropriate but very timely when practically HEIs all over the globe continue to grapple with digitization in transitioning from the pandemic era that created for us the aftermath of what we call now as the New Normal.

We received a total of 99 abstracts, with 75 full papers submitted for review and , 73 or 78% of which were accepted. However, to be presented in this year's conference are 44 papers or more than 58%, which are spread quite well in the four sub-themes.

Joining a face-to-face conference after the pandemic proved to be very challenging. But many of us made possible what seemed impossible…we were willing to go through the hurdles, notwithstanding the paper refinement, ….but for most of us, we can't believe we are finally here, after the entry challenges of uncertainties.

The new normal has painted a more convoluted travel landscape that can be very dispiriting, but yes…we were able to put up with the complexities. Is this not one good reason to cheer that our being here is more of a personal victory? Let's claim our personal victory! Cheers!
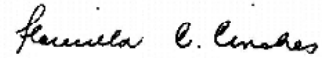
We sincerely commend our LOC headed by Prof. Jang Wan Ko with his dynamic team. The very fast responses to additional participants/presenters' document requests were catalysts to have found many of us here now joining.

We thank our Keynote Speakers for setting the tone of our Conference. Likewise, we are also very grateful to our Plenary Speakers, whose inputs greatly widened our perspective on our conference Theme.

Our LOC took to the task of creating for all of us, not only this academic experience but also enjoyably meaningful and memorable experience through their warm hospitality and the rich traditions and cultures of Seoul. Let's join the tour of what they have prepared for us.

Thus, we look forward for everyone to enjoy the conference as a conduit of both academic and cultural platform in addition to your life's journey, that is not only memorable but a rich experience.

We reiterate our sincere gratitude to SKKU, the LOC members and team for taking up meaningfully the 22nd SEAAIR Annual Conference. We also thank everyone for your interests in joining the Conference. Thank you.

Prof. Ma. Florecilla C. Cinches, PhD
President

WELCOME MESSAGE FROM ORGANIZER

Welcome to the SEAAIR2022 annual conference in Seoul, Korea. It is our pleasure to meet all the distinguished Professors, Speakers, Presenters and also experts and scholars in this SEAAIR Conference.

The SEAAIR2022 Conference is hosted by Institute of Educational Research at Sungkyunkwan University and Korean Association for Adult and Continuing Education, jointly by South East Asian Association for Institutional Research (SEAAIR). Also we would like to thank Sungkyunkwan University for its generous support.

The SEAAIR conference aims to facilitate international exchange in IR, to transform the wisdom in IR research into action in order to advance the development of teaching and learning in higher education. This year's conference is particularly meaningful in two ways. This is the first on-site conference after outbreak of pandemic. The theme of the conference is "New Normal Education: Transitioning, Transforming, and Technologies Agenda". Hence, the main theme of the conference is indeed a timely one. We are sure that this conference will deeply discuss a way to adapt and succeed in the new normal. In addition, discourse of institutional research in Korea started here at Sungkyunkwan University. The first official IR office in Korea was Center for Institutional Effectiveness established in 2010 at Sungkyunkwan University. Since then higher education communities in Korea have adapted IR functions to support decision-making processes.

We would like to thank the keynote speakers, all presenters, session chairs, and participants for their active involvement, and personally thank the staff and members of local organization committee for their hard work. Wish to meet you again on the next conference. Thank you!

Jang Wan Ko, Ph.D.
Chair, SEAAIR2022 Local Organization Committee
President, Institute of Educational Research, SKKU
President, Korean Association for Adult and Continuing Education

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SEAAIR 2022 22nd Conference Schedule
28-30 September, 2022

DAY1   Wednesday, 28th September, 2022

Time	Activities			
9:00-9:30	Registration			
9:30-9:50	Welcome performance			
9:50-10:00	Break			
10:00-10:30	**Opening Session** *Opening Remarks:* Dr. Ma. Florecilla C. Cinches, President of SEAAIR *Welcome messages:* Dr. Dong Ryeol Shin, President of SKKU Dr. Jang Wan Ko, President of KACE Dr. Byoung-Joo Kim, President of KAIR Exchange of tokens: **20th Anniversary Celebration of SEAAIR**			
10:30-11:00	Group Photo Taking / Coffee Break			
11:00-12:00	**Keynote Speech I** **Creating new & better normal of future higher education in the transforming era: Digitization and data-centric innovation** **Dr. Jong Chul Jung, Chair Professor** Seoul National University of Science & Technology, Former Vice Minister of Education)			
12:00-13:15	Lunch Break			
13:15-13:30	Coffee Break			
13:30-15:00	**Parallel Session I**			
	Session I-1 Room A	**Session I-2** Room B	**Session I-3** Room C	**Session I-4** Room D
15:00-15:15	**Coffee Break**			
15:15-16:45	**Parallel Session II**			
	Session II-1 Room A	**Session II-2** Room B	**Session II-3** Room C	**Session II-4** Room D

DAY2   Thursday, 29th September, 2022

Time	Activities		
9:00-9:30	Registration		
9:30-9:45	Coffee Break		
9:45-10:45	**Panel Session** **Institutional Research in New Normal Education** **SEAAIR**: Dr. Teay Shawyun **Korea**: Dr. Giljae Lee **Taiwan**: Dr. Sophia Shi-Huei Ho **Moderator:** Dr. Seon Joo Kim(Pukyong National University)		
10:45-11:00	Coffee Break		
11:00-12:30	**Parallel Session III**		
	Session III-1 Room A	**Session III-2** Room B	**Session III-3** Room C
12:30-13:30	Lunch Break		
13:30-14:45	**Parallel Session IV**		
	Session IV-1 Room A	**Session IV-2** Room B	**Session IV-3** Room C
14:45-15:00	Coffee Break		
15:00-16:00	**Keynote Speech II** **The challenge and prospect of Asian university** **in the digital age** **Dr. Seyeoung Chun, Emeritus professor of Education,** (Chungnam National University, Former President of KERIS)		
16:00-17:00	**Poster session**	**General Meeting**	
17:00-17:30	**Old Campus Tour**		
17:30-18:00	**Break**		
18:00-20:00	**Cultural Night & Dinner**		

DAY3   Friday, 30th September, 2022

Time	Activities
10:00-15:00	**City Tour**

Oral Presentation Program

DAY1 Wednesday, 28th September, 2022

Parallel Session I 13:30–15:00			
Session I-1 **Room 9B320** **(Dr. Jung-Won Suh)**	**Session I-2** **Room 9B321** **(Dr. Dongho Kim)**	**Session I-3** **Room 9B316** **(Dr. Jiye Hong)**	**Session I-4** **Room 9B318** **(Dr. JeongA Yang)**
Self Efficacy and Supervision Practices among Guidance Directors in Higher Education Institutions (Calvin Dave Ganub)	A sustainable human capital process of Rajamangala University of Technology in Thailand (Krisda Tanchaisak, Rungnapa Lokessathian, Siriphun Thongsai and Duangduen Chancharoen)	The Teaching and Learning Outcomes of Singapore Polytechnic Media, Arts & Design Students From Common Foundation(CFP) Studies (Yanzo Pang and Clarice Sim)	Conversion from physical assessment to online assessment: A Case Study at the Newcastle Australia Institute of Higher Education (Yit Yan Koh and Yaw Long Chua)
New Normal Education: Designing a preferred transformation Jay Somasundaram, Patrick Danaher and Mohammad G Rasul	An examination of the essential competencies among support personnel of an international private university in Bangkok (Krisda Tanchaisak, Pannapat Puvanont and Duangduen Chancharoen)	The Human Capital Empowerment of Lao Krang Ethnic in Suphanburi Province for Cultural Tourism (Chiranuch Sopha, Kanjanarat Rattanasonthi, Rungroj Yenchaipruek, Rugsiri Chunhaphantarak and Proudteema Srirathu)	Problem-Based Online Learning Through Multidisciplinary Studies To Enhance Chemistry Literacy and Improve Environmental Awareness (Familia Novita Simanjuntak and Riska Septia Wahyuningtyas)
Does Institutional Governance Matter in Academics' Job Attitudes? A Comparative Study in Taiwan, Japan, and Korea (Sophia Shi-Huei Ho, Robin Jung-Cheng Chen and Ying-Yan Lu)	An investigation of the human resource management practices at Rajamangala University of Technology in Thailand (Narat Wattanapanit, Rungnapa Lokessathian and Busara Niyomves)	The Assessment of Non-Formal and Informal Educational Standard (Staporn Tavornativat and Pattaraporn Kitchainukoon)	Correlates of Pre-Service Teachers' 21st Century Skills and Mentoring Practices of Supervising Instructors in the New Normal Education (Anally Villanca)
	Essential competencies of support staff in private universities in Thailand: A factor analysis study (Narat Wattanapanit, Pannapat Puvanont and Bongkoch Thongciam)		Analysis of Technological and Pedagogical Knowledge (TPK) on Prospective Biology Teachers to Welcome the Era of Society 5.0 (Riska Septia Wahyuningtyas, Janed Lauren and Familia Novita Simanjuntak)

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Parallel Session II 15:15–16:45			
Session II-1 Room 9B320 (Dr. Jung-Won Suh)	Session II-2 Room 9B321 (Dr. Hyunyoung Choi)	Session II-3 Room 9B316 (Dr. Jiye Hong)	Session II-4 Room 9B318 (Dr. JeongA Yang)
Artivism, Art for Social Transformation (Visual Analysis of Student Curated Artworks) (Ma. Cecilia Alimen, Rolando Alimen and Rowena Vargas-Isidro)	Developing the Process of Standardized English Proficiency Test and Mapping onto the Common European Framework of Reference (CEFR) (Kwanhathai Choedchoo, Nutthaporn Owatnupat and Sudsawad Chandum)	The Extent Implementation of the Community Outreach Programs and Activities (Medania Malagsic, Mylene Jainga and Jeffrey Ledesma Jr.)	Guidelines for Development of Graduate Curriculum in Early Childhood Education Management (Bongkoch Thongeiam, Krittrin Tumat and Narat Wattanapanit)
Learning Development for Early Childhood by 5-STEPs learning process following King Rama IX's Philosophy regarding Early Childhood Inclusive Education (Chadtharawadee Boonthanom)	The Result of Cooperative Learning Approach Emphasizing on Team-Pairs-Solo Teaching Method for the English-speaking Skill (Saowapan Palasuwan)	Tertiary Education Readiness Assessment of the Pioneering Senior High School Graduates of the Philippine K-12 Program (Jo Niza Mortiz and Jayson Digamon)	The development of the STIs & HIV and contraception virtual classroom (SHCVC) program on early childhood pre-service teachers (Chitraporn Boonthanom, Thitinun Teravecharoenchai and Junthanee Teravecharoenchai)
Re-Discovering Online Learning Situation and Teaching-Engagement toward Institutional Development of Private Maritime University in the Philippines (Rolando Alimen and Ma. Agnes Regina Torres)	Do I know as much as I think I know?: The effect of the test on Thai EFL undergraduate students' perceived grammatical knowledge (Ekamorn Iamsirirak and Pariwat Imsa-Ard)	A Pathway Toward Happiness for Thai Undergraduate Students during the COVID-19 Outbreak: The Role of Perceived COVID-19 Stressors and Cognitive Flexibility (Manika Wisessathorn, Sawian Kaewwongsa, Kamonrat Thirapong and Ekamorn Iamsirirak)	Weathering the Pandemic: The 'What If' Experience in Scenario Planning (Ma. Florecilla C. Cinches)
	Various Online Learning in Academic Reading Class as the Efforts to Increase Students' Motivation (Masda Surti Simatupang and Ramot Peter)	Measurement Of Psychometric Trait Of Athletic Identity, Mental Health and Perceived Social Support On Career Planning Among Student-Athletes (Kai Yan Wong, Tajularipin Sulaiman and Wan Marzuki Wan Jaafar)	SEAAIR 20/20: A Review of SEAAIR Annual Conferences 2000 – 2020 (Koh Yit Yan and Chua Yaw Long)

DAY2 Thursday, 29th September, 2022

Parallel Session III 11:00-12:30		
Session III-1 **Room 9B318** **(Dr. Hyunyoung Choi)**	**Session III-2** **Room 9B316** **(Dr. Jiye Hong)**	**Session III-3** **Room 9B215** **(Dr. Jang Wan Ko)**
Assessment of Professional Learning Teams: The College of Education Experience (Ma. Cecilia Alimen and Ma. Delsa Gange)	Risk Analysis and Mitigation Learning from Home During the COVID-19 Pandemic: An Effort to Transform the Quality of Education (Imeldha Putrianti and Ktut Silvanita Mangani)	A Causal Model of Organizational Culture, Psychological Attributes, School Environment and Performance of Faculty in Higher Education Institutions (Albert Villanca)
Teachers' Psychological Factors And Teachers' Work Motivation During Movement Control Order (MCO) (Abdul Aziz Ismail, Kai Yan Wong and Tajularipin Sulaiman)	Analysis of University's Globalization Discourse Using News Big Data Focusing on Topic Modeling Analysis Methods (Jiwoo Park and Jang Wan Ko)	Children of Ofws and Overseas Parents: An Assessment of the USLS GEC-Chipa Support Group Program (Lota Largavista, Rowena Bañes, Mary Grace Bañares and Joyce Benedicto)
Creating a Research Culture in a Dominican University: Perspectives and Productivity of University of Santo Tomas-Legazpi Faculty (Jet Guerrero, Christine Grace Azul and Jason Carmona)	The Lifelong Learning Management Model for Good Agricultural Practice (GAP) Skills based on the Intelligence Agricultural Demonstration Farm for Farmers and Students at Suan Dusit University, Thailand (Nuttabodee Viriyawattana, Tipawan Wannakan and Surachat Sinworn)	A Study of Adult Learners in Taiwan Community Universities on Grit and Learning Engagement: Psychological Capital and Learning Empowerment as a Mediator (Po-Lin Chen)
Connectedness Matters: Exploring Psychological Distance in Online Education · (Angelica Panique and Coolen Joy Nebreja)		A social critical analysis on Philippine higher education in the time of covid-19 pandemic towards a framework on flexible learning (Alvin Sario)

Parallel Session IV 13:30–14:45		
Session IV-1 **Room 9B313** **(Dr. Hyunyoung Choi)**	**Session IV-2** **Room 9B316** **(Dr. Jiye Hong)**	**Session IV-3** **Room 9B321** **(Dr. Tajularipin Sulaiman)**
Political Education Design with the Penta Helix Model in the New Normal Era (Putri Hergianasari and Rizki Amalia Yanuartha)	Digital Inclusion among educators: An examination of salience in Public and Private Schools within Metro Manila (Mateo Borbon, Maria Loida Faye Borbon and Evelyn Lagang)	Ambidextrous Chair: Design Solution For Both Right And Left Handed Persons Mary Grace Sabadisto
Transforming Education: Utilization of New Media as a Means of Political Participation of Beginner Voters in Indonesia (Rizki Amalia Yanuartha and Putri Hergianasari)	A Scientometric Analysis on Chinese Higher Education Informatics (Ting Liu and Jang Wan Ko)	Promoting Tourism Using Digital Technology at Archaeological Sites for Students with Disabilities (Keyoon Wongkorm)
Use of Technology-Enabled Teaching-Learning among Library and Information Science (LIS) Faculty in a Private University (Cozette Gregorios and Ma. Cecilia Alimen)	Conducting Research: Experiences, Challenges, and Benefits towards Institutional Development Activities in the Private Maritime University, Philippines (Rolando A. Alimen and Marie Bella N. Estores)	Digital Technology for Learning Vocabulary for Students with Disabilities (Kanvipa Hongngam and Sucheera Polrachom)
Flexible Learning in CASE UST Legazpi in the time of COVID-19 Pandemic (Alvin Sario, Lalaine Valladolid, Patrick Joseph Secillano)		

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Theme II:
Re-Discovering Teaching &
Learning Practices & Protocols

Analysis of Technological and Pedagogical Knowledge (TPK) on Prospective Biology Teachers to Welcome the Era of Society 5.0

Riska Septia Wahyuningtyas[1], Janed Lauren[2], Familia Novita Simanjuntak[3]

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ABSTRACT

The era of society 5.0 was a human condition and technology will coexist in creating a better living condition. In this era, technology would also affect the world of education. Technology would affect the way a teacher teaches and the way students learn. How to teach a teacher must be developed in accordance with technological developments. The era of society 5.0 would greatly affect the pedagogical ability of a teacher. Teacher's pedagogical knowledge and teacher's technological knowledge must be analyzed whether it is in accordance with the demands of this era or not. This research aimed to determine the level of Technological and Pedagogical knowledge (TPK) of students of biology education at the Christian University of Indonesia. This research was a qualitative descriptive study. Data collection was carried out in two ways, namely by conducting a survey of respondents about pedagogic knowledge and technological knowledge in the era of society 5.0. Data collection was also carried out by observing the learning implementation plan document which was assessed by two panelists. The population in this study were students of the Biology Education study program at the Christian University of Indonesia. The conclusions of this study were 1) The level of Technological and Pedagogical knowledge (TPK) of biology education students is sufficient in terms of written test results 2) Technological and Pedagogical knowledge (TPK) of students fit into the criteria enough in terms of the results of observations of the learning implementation plan document.

Keywords: technological, pedagogical, knowledge, era of society 5.0, students

INTRODUCTION

Technological and Pedagogical knowledge (TPK) is a very important thing to be mastered by a prospective teacher. Technological and Pedagogical knowledge (TPK) is a combination of pedagogical knowledge (PK) and knowledge of information technology in the era of society 5.0 (TK). Pedagogical knowledge is one of the knowledge that explores the competencies that a teacher must have in addition to professional, social and personality competencies, which are aspects that cannot be ignored if a teacher wants to build student knowledge (Purwianingsih, 2010). Pedagogical ability is how teachers understand students, design and implement lesson plans, evaluate learning outcomes, and develop students to actualize their various potentials.

Pedagogical skills are needed in dealing with this era of society 5.0. The era of society 5.0 is an era where the use of technology will be applied in all activities in the world of education (Ratnanenci, 2021). To face the era of society 5.0, a teacher must be able to have deep and mature pedagogical knowledge so that teachers can master students and learning that is surrounded by rapid technological advances. Advanced technology must always be involved by teachers in understanding students, designing learning, implementing learning, evaluating learning, and developing student potential. All of this means that technological knowledge will support the pedagogical abilities of a teacher in the era of society 5.0.

Technological knowledge here means Technological Knowledge (TK) is knowledge of standard technologies, such as books, chalk and whiteboards, and more advanced technologies, such as the internet and digital video. This involves the skills that needed to operate certain technologies (Oktamersetyayani, 2018). Knowledge of technology here can be interpreted as all things technology related to the pedagogical ability of teachers in preparing learning, conducting learning, and evaluating learning. This technology includes learning media applications, lesson plans design applications, concept map making applications, learning outcomes evaluation applications, e-rapot applications, two-way learning implementation applications, and so on.

Technological and Pedagogical knowledge (TPK) is the right answer to prepare prospective teachers for the era of society 5.0. A deep TPK analysis needs to be done to answer all of that. TPK analysis can be used to evaluate courses that should be given mandatory and even developed to make teacher candidates more aware of pedagogical abilities and technological knowledge. Pedagogical knowledge that must be mastered includes understanding students, designing and implementing lesson plans, evaluating learning outcomes, and developing students to actualize their various potentials.

The reality on the ground, especially at the Indonesian Christian University, shows that there is a lack of information or description about Technological and Pedagogical knowledge (TPK) from prospective biology teachers. The application of the principles of Technological and Pedagogical knowledge (TPK) is one way that is considered effective to achieve graduate competence, especially knowledge and skills. Teachers in the future need to master a good understanding of how to use pedagogical knowledge and technology effectively in the learning process in the classroom. To answer this need, Koehler and Mishra (Nordin, et al, 2013: 2) introduced a conceptual framework called Technological and Pedagogical knowledge (TPK) which was obtained from the addition of technology to Pedagogical Knowledge (PCK) which is a conceptual framework built by Shulman (1986). According to Qudus (2020) the concept of Technological and Pedagogical knowledge (TPK) is the ability of teachers to use technology that will be used in the procedures and implementation of learning planning, so that the use of this technology can make it easier for teachers to teach and change teacher teaching every day so that teaching is not monotonous for students.

Technology that collaborates with good pedagogical skills will be able to help make learning interesting. If students are already interested in the learning brought by the teacher, it will be easier for students to understand the material because there is a desire from within students to follow the flow of learning and teaching materials. Creativity in the delivery of teaching materials, if you get a touch of technology, the creativity will not be limited.

Technological and Pedagogical knowledge (TPK) contains two main components, namely Technological Knowledge (TK) and Pedagogical Knowledge (PK). First, Kindergarten describes the knowledge of prospective teachers regarding knowledge of technology for making learning devices. Second, PK describes the knowledge of prospective teachers about practical mastery, processes, strategies, procedures, and methods in the teaching and learning process (Shulman, 1986). Technological and Pedagogical knowledge (TPK) can also increase knowledge and skills including the ability to think critically, creatively, communicate and collaborate (Berber and Erdem, 2015). Teachers who master Technological and Pedagogical knowledge (TPK) are believed to be able to create a pleasant learning atmosphere and make it easier for students to understand the material.

The material that is very important to be touched by a teacher who understands Technological and Pedagogical knowledge (TPK) is Biology. Biology is a material that gets a lot of material from the surrounding environment. Biological material is always evolving and undergoing a renewal. This material will be very suitable if the teacher who teaches always masters technological developments and has good pedagogical skills to bring their learning activities to be active, innovative, creative, and fun. Biology material is material that contains a lot of conceptual material so that if the delivery of conceptual material uses technology, the teacher and students will benefit. The teacher will be easy to convey the material, the students will more easily understand the material.

Biology education is a study program that will graduate prospective biology teachers. Preparing students as teacher candidates to educate well requires teaching practice by providing opportunities for prospective teachers to appear in front as a form of practice. Teaching practice in front of the class is very important in the lecture process. This teaching practice begins when students take biology and microteaching methodologies courses. In biology learning methodology lectures and microteaching prospective teachers can actualize pedagogical abilities, actualize technology, know the ability to master theories in learning. As prospective teachers, students must master and understand technology in the era of society 5, if teachers can't understand technology, then learning will be very boring because it's only based on books and paper. What's interesting about today's sophisticated applications.

Based on the above background, information is needed regarding the Technological and Pedagogical knowledge (TPK)) of education students. To find out, it is necessary to conduct an analysis by observing or observing lesson plan documents, and a written test of Technological and Pedagogical knowledge (TPK) on students in the biology education study program at the Christian University of Indonesia on the grounds that the study program has never conducted research with the same problem. so it is hoped that this research will be information for students as prospective teachers and provide information to study programs to help prepare and improve the quality of undergraduate biology education students.

RESEARCH METHODS

This research is a qualitative descriptive study with a survey method. According to Moleong (2005:4), a qualitative descriptive approach is a research approach where the data collected is in the form of words, pictures and not numbers. These data can be obtained from interviews, field notes, photos, video

tapes, personal documentation, notes, or memos and other documentation. The research focuses on analyzing the ability of Technological and Pedagogical knowledge (TPK) in Biology Education students at the Christian University of Indonesia in semester 2, 4, 6, and 8. Data were collected through observation of lesson plan documents (RPP), and written tests. The survey was conducted on all students who had received the Biology learning design and strategy course. The survey was conducted by providing a google form containing questions about technological knowledge and pedagogical knowledge. Then students are asked to fill in the google form with the specified time. The instrument used is an instrument that has been validated by previous research conducted by Oktamersetyani 2018. The instrument consist of Goal Formulation Learning, Selection of Teaching Materials, Media Selection Learning, Methods/approaches/models Learning, Steps Learning, and Assessment Design Learning (Oktamersetyani, 2018)

Place and Time of Research

The research was carried out at the Biology Education Study Program, FKIP, Indonesian Christian University. Research time will start from March to August 2021 for classes entering the even semester of the 2020/2021 academic year.

Population and Research Sample

The population in this study were all students of the biology education study program at the Christian University of Indonesia, where all members of the population were sampled, this is due to the characteristics of different population members, so that a sample of 57 students was obtained. Thus this research is a purposive sampling research. The selected sample is a sample that has received a biology learning methodology course as well as a biology learning design and strategy course.

Research variable

The variable in this study is the ability of Technological and Pedagogical knowledge (TPK) in Biology Education study program students at the Christian University of Indonesia which includes the ability of Technological Knowledge (TK) and Pedagogical Knowledge (PK).

Data collection

Data collection techniques used in this study were written tests, lesson plans observations, and documentation. Observations are made by assessing the lesson plans or lesson plans that have been made by students. RPP is assessed based on the RPP assessment observation sheet which contains the formulation of learning objectives, selection of teaching materials, selection of learning media, methods/approaches/learning models, learning steps, learning assessment design.

Data analysis technique

The data that has been obtained from the Research on Technological and Pedagogical Knowledge (TPK) Ability Analysis of Biology Education Students at the Christian University of Indonesia is qualitative data from the observations of research subjects. Data analysis was carried out descriptively qualitatively to find out a general description or description of the level of Technological and Pedagogical knowledge (TPK) abilities of biology education students.

RESULTS AND DISCUSSION

Technological and Pedagogical knowledge (TPK) is a very important thing to be mastered by a prospective teacher. Technological and Pedagogical knowledge (TPK) is a combination of pedagogical knowledge (PK) and knowledge of information technology in the era of society 5.0 (TK). Pedagogical knowledge is one of the knowledge that explores the competencies that a teacher must have in addition to professional, social and personality competencies, which are aspects that cannot be ignored if a teacher wants to build student knowledge (Purwianingsih, 2010). Pedagogical ability is how teachers understand students, design and implement lesson plans, evaluate learning outcomes, and develop students to actualize their various potentials.

Pedagogical skills are needed in dealing with this era of society 5.0. The era of society 5.0 is an era where the use of technology will be applied in all activities in the world of education (Ratnanenci, 2021). To face the era of society 5.0, a teacher must be able to have deep and mature pedagogical knowledge so that teachers can master students and learning that is surrounded by rapid technological advances. Advanced technology must always be involved by teachers in understanding students, designing learning, implementing learning, evaluating learning, and developing student potential. All of this means that technological knowledge will support the pedagogical abilities of a teacher in the era of society 5.0.

Technological knowledge here means Technological Knowledge (TK) is knowledge of standard technologies, such as books, chalk and whiteboards, and more advanced technologies, such as the internet and digital video. This involves the skills needed to operate certain technologies (Oktamersetyayani, 2018). Knowledge of technology here can be interpreted as all things technology related to the pedagogical ability of teachers in preparing learning, conducting learning, and evaluating learning. This technology includes learning media applications, lesson plans design applications, concept map making applications, learning outcomes evaluation applications, e-rapot applications, two-way learning implementation applications, and so on.

Technological and Pedagogical knowledge (TPK) is the right answer to prepare prospective teachers for the era of society 5.0. A deep TPK analysis needs to be done to answer all of that. TPK analysis can be used to evaluate courses that should be given mandatory and even developed to make teacher candidates more aware of pedagogical abilities and technological knowledge. Pedagogical knowledge that must be mastered includes understanding students, designing and implementing lesson plans, evaluating learning outcomes, and developing students to actualize their various potentials.

Pedagogic competence is the ability of teachers to manage student learning. Pedagogic competence includes various skills, namely skills in managing learning well, starting from designing learning activities, managing learning, to evaluating and improving the learning carried out (Kurniawan, 2017). Meanwhile, Technological knowledge (TK) is Technological Knowledge, which is a science that educators must have about technology that can support learning. Kindergarten includes the understanding of educators in the use of computer elements, as well as supporting equipment and other technologies related to education and learning. In addition to being required to have knowledge related to technology, teachers are required to have the skills to adapt and learn new technologies. This ability needs to be mastered by educators considering that technological advances and changes are always evolving (Rosyid, 2016).

This study uses 2 main data to describe the Technological and Pedagogical knowledge (TPK) of prospective Biology teachers at the Faculty of Teacher Training and Education, Christian University of Indonesia. The first data was obtained from the value of Biology desert candidates answering questions related to Pedagogical Knowledge (PK) and Technological Konoweledge (TK) materials. The second data is obtained from the results of the assessment of the Lesson Plan document that has

been made by each student carried out by 1 senior teacher and 1 Education lecturer. The two data will be used to analyze the pedagogical abilities and technological knowledge of prospective Biology teachers.

The results of the average ability scores in table 1 below are obtained from student scores after working on pedagogic and technological ability tests related to learning biology in class XI which are distributed by researchers via google form. The value obtained from this test is the value of pedagogical knowledge (PK), the value of technological knowledge (TK) , and a combination of Technological and Pedagogical knowledge (TPK). These values can be seen in the table below.

Table 1: Average Technological and Pedagogical knowledge (TPK)

Aspects of Knowledge	Average Value	Conclusion
Technologisal Knowledge (TK)	51.06	GOOD
Pedagogical Knowledge (PK)	35.74	ENOUGH
Technological Pedagogical Knowledge (TPK)	43.40	ENOUGH

Description: Source: (Direktorat Pembinaan SMA, 2010)

$75 \leq M \geq 100$	= Very Good
$50 \leq M < 75$	= Good
$25 \leq M < 50$	= Enough
$0 \leq M < 25$	= Less

The data above shows that Pedagogical Knowledge or PK gets a value of 35.74. According to the Directorate of High School Development (2010) this value is in the sufficient range. While the value of technological knowledge or knowledge of technology in Biology learning gets an average value of 48.68. According to the Directorate of High School Development (2010) this value is in the sufficient range. From these results, it can be concluded that the pedagogical knowledge of prospective Biology teachers is in the sufficient category. Based on these results, the study program must multiply Education courses related to pedagogical abilities. For the value of knowledge of Biology learning technology also shows sufficient value, it is necessary to increase understanding of material related to technology related to learning.

Tabel 2: Pedagogical Knowledge dan Technological Knowledge Based on the results of the Lesson Plan Document Observation

Lesson Plan Aspects	Panelist A	Panelist B	Match Test Value	Conclusion
Goal Formulation Learning	67,00	63,00	1,00	GOOD
Selection of Teaching Materials	42,00	43,80	1,00	ENOUGH
Media Selection Learning	51,50	52,33	1,00	ENOUGH
Methods/approaches/models Learning	70,00	71,00	1,00	GOOD

Steps Learning	67,00	68,00	1,00	GOOD
Assessment Design Learning	26,00	25,50	1,00	LESS
Average	53.91667	53.93833	**1,00**	**ENOUGH**

Description: Source: (Directorate of High School Development, 2010: 60)

$81.25 \leq M \geq 100$ = Very Good
$62.5 \leq M < 81.25$ = Good
$43.75 \leq M < 62.5$ = Enough
$25 \leq M < 43,75$ = Less

Data from table 2 shows that pedagogical knowledge and tecnological knowledge assessed by observation of Lesson Plan documents include good, sufficient and less grades with an average value of sufficient. This shows that the Technological and Pedagogical knowledge (TPK) of prospective UKI biology teachers in the range is sufficiently seen from the observation of the Lesson Plan document. Pedagogical Knowledge (PK) seen from the Lesson Plan or learning implementation plan is an assessment of students, teaching approaches, classroom management of learning steps, adjustment of learning styles with students according to the learning steps and learning models chosen (Candra, 2020). This Lesson Plan assessment is also based on pedagogical knowledge (PK) components according to (Chai, Koh, & Tsai, 2010) namely 1) adjustment of teaching styles with different learners, 2) adjustment of teaching based on what students understand or do not understand, 3) using various teaching approaches in the classroom (collaborative teaching, direct instruction, inquiry learning, etc.), 4) the teacher knows how to assess the performance of students in the classroom, 5) class management. As for the technological (TK) it can be seen from the students' ability to choose teaching materials, make concept maps, make goals according to basic competencies (KD), and make learning steps in accordance with KD.

The above also shows that *pedagogical content knowledge* (PCK) from the Lesson Plan observations in table 2 shows panelists A and B giving indicators of the formulation of learning objectives with good grades. Then for the selection of teaching materials and the selection of learning media, panelist A and panelist B gave sufficient grades. As for the learning method, learning steps, and learning assessment design, it provides less value. These results reflect that there must be an increase in training in making Lesson Plan so that prospective teachers make Lesson Plan with good or even very good pedagogical knowledge and content knowledge.

Pedagogical Knowledge (PK)

The pedagogical knowledge and pedagogical abilities possessed by prospective Biology teachers at the Christian University of Indonesia are in the sufficient category. This proves that this prospective Biology teacher student is already in the stage of sufficiently mastering the known pedagogical knowledge to be implemented in learning through a lesson plan or learning implementation plan. According to (Mishra & Kochler, 2006) *Pedagogical Knowledge* (PK) that will be seen in student-made Lesson Plan is the problem of step steps of student learning activities, class management can be seen from what model design is used, development and implementation of learning plans, and evaluation of learning contained in the appendix to the Lesson Plan. Teachers must be able to develop and implement learning implementation plans to be able to compile effective teaching and learning activities, this is in accordance with the opinion that with the use of learning tools such as Lesson Plan (learning implementation plans) teachers will be more helped in the implementation of learning.

Students of prospective Biology teacher at UKI still has sufficient pedagogical skills judging from the results of answering the pedagogical knowledge test and observation of Lesson Plan documents. This can be seen from the majority of students who are not good enough in understanding models / methods / approaches that are in accordance with the characteristics of the material, the learning objectives to be delivered and the characteristics of students, so that the learning process has not been able to run effectively. Based on these results, students need to increase their pedagogical knowledge with the aim of being able to know and be able to implement pedagogical knowledge both in writing through tests and in practice (microteaching) so that the material can be conveyed properly with appropriate learning methods.

According to Kanuka (Sahin, 2011: 98) according to Government Regulation Number 74 of 2008 pedagogical knowledge is the ability to manage student learning which includes understanding of the educational foundation, understanding of students, developing syllabus, learning planning, implementing learning, utilizing technologists i learning, evaluation of learning outcomes, and development of students to actualize the various potential talents possessed. Pedagogical knowledge is knowledge of teaching strategies and methods to answer the needs of learners in the learning process. Teaching and learning which includes practices, procedures, or methods needed in the learning and teaching process (Oktamersetyayani, 2018).

Pedagogical knowledge also includes knowledge of techniques or methods used in the classroom, recognizing the characteristics of learners and strategies for the evaluation of learners' understanding. This will have its own uniqueness in each teacher. It is this uniqueness that illustrates the degree of depth of pedagogic knowledge. A teacher with deep pedagogical knowledge will understand how to build learner knowledge to acquire skills and how learners develop a positive dispositional way of thinking towards learning (Wahyuningtyas, 2022).

Technological Knowledge (TK)

Technological Knowledge (TK) according to Nasution (2018) has many benefits that can be obtained when implemented optimally in learning including 1) for learners to increase attention, concentration, motivation, and independence, 2) for teachers to reduce time in delivering material, make student learning experiences more enjoyable, design material to be more interesting, and trigger teachers to developed his knowledge and abilities about computers. Alavi (2003) outlined several objectives of using technology in learning, namely improving the quality of learning, student satisfaction, income, and service quality.

Technological Knowledge (TK) contains how students who are prospective biology teachers know various kinds of social media platforms (such as; Blog, Facebook, and Youtube), LMS (Learning Management System) platforms (such as; Google Classroom, Edmodo, Moodle and Dokeos), conference software such as; Skype, Google Meet, and Zoom, basic software such as office applications (such as; Word, Excel, and Powerpoint), learning quiz makers (such as; Kahoot and Quizizz), image processors (such as; Adobe Photoshop, CorelDraw and Adobe Illustrator), video processors (Movie Maker, Power Director, and Adobe Premiere), learning media makers (such as; Adobe Flash, Autoplay, and Lectora), 2D and 3D animation makers (such as; 3dsMax and Blender) and technologies such as Augmented Reality (AR) and Virtual Reality (VR). This must be known by students when they are still in college. To get to the era of society 5.0, this will be something that must be implemented in the study of students when in school.

Ability to use hardware such as; Computers, Laptops, Smartphones, Printers, Scanners and LCD projectors must also be mastered if the prospective teacher masters Technological Knowledge (TK)

(Fitriyana et al., 2021). Prospective teachers are important in mastering this knowledge of Biology technology. All basic competencies in all classes in Senior High School must be mastered by teachers with the material and the development of the latest information. This is because without this knowledge it will allow for misconceptions about the technology of the material to be taught. Technological knowledge is the teacher's knowledge of the subject matter to be studied or taught. Knowledge of technology is very important for teachers as well as prospective teachers. Technological knowledge contains knowledge of concepts, theories, ideas, frameworks, knowledge of proof, as well as practices and approaches to developing such knowledge (Sahin, 2011: 99).

The limitations of this study are that the sample is not representative because students are mixed in different semesters, the documents that are observed are only lesson plans, other documents such as student worksheets and evaluation sheets, the instrument used does not have many questions so that it does not represent all Technological Pedagogical Knowledge abilities. Suggestions for further research is the development of instruments regarding TPK or Technological Pedagogical Knowledge. Further research is also expected to contain data not only on RPP observations but also direct observations of teaching methods. In addition, it is also expected that the sample is all students who are taking PPL courses or practicing teaching experiences in schools.

CONCLUSION

Based on the discussion above, the conclusions in this article are as follows.

1. The level of Technological *Pedagogical* Knowledge (TPK) ability of biology education students is sufficient in terms of test results regarding Technological *Pedagogical* Knowledge (TPK) knowledge.
2. The level of Technological *Pedagogical* Knowledge (TPK) ability of biology education students entered the criteria sufficiently reviewed from the results of the observation of the Lesson Plan document.

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