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ORIGINAL CONTRIBUTION

Administration and Evaluation of Technology Integration and Adaptation: A Basis for Training Policies and Redirection of Technology-Enabled Learning

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***Abstract*— This paper presents the exploratory investigation of faculty trainees' technology preparedness and capability matrix, technology adaptation and integration strategies, challenges, and motivations in facilitating blended courses. The study employed the Sequential Explanatory Research Design. A Technology Preparedness and Capability Matrix developed by the researcher was administered to the training attendees. A semi-structured interview, Focus Group Discussion, and content analysis were used to gather and analyze qualitative data. Based on the results of the Technology Capability Matrix, the faculty trainees are capable of AV technology, the web and internet-based technologies, computing and smartphone devices, social networks, educational technologies, virtual classroom, e-learning authoring tools, office productivity suites, and other components of the office suite. Thematic patterns such as knowledge creation, improved student learning, 21st-century skills, and teachers' web and social presence. Participants elicited their challenges in developing learning materials into an Outcomes-based resource and in moderating the online community in order to create a technology-enhanced learning environment. The researcher recommends considering redesigning the TEL priorities for training and development using other LMS. It is also recommended to conduct studies on the relevance and effectiveness of TEL training to the learning facilitators.**

***Index Terms*— Training, Technology Capability, Technology-Based Learning, Sequential Exploratory, Educational Technology**

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I. INTRODUCTION

The corollaries of educational industry economies and the instrumentalities of inclusive education is the cornerstone of the United Nations Educational, Scientific and Cultural Organizations imperatives. UNESCO said that e-learning is a foundation for building inclusive knowledge societies. According to UNESCO, the organization partnered with industry leaders and global subject experts to develop an international benchmark which sets out the competencies required to teach effectively with ICT designed to improve teachers' practice by providing guidelines for teacher [1]. In implementing e-learning to be embedded into the learning space and ecosystem, the UNESCO ICT Framework for teachers can be used to support developing pedagogy and integrating ICTs in their teaching despite the differences in access to ICT and the Internet [2-4]. The UNESCO is;

Responsible for coordinating international cooperation in education, science, culture, and communication. It strengthens the ties between nations and societies and mobilizes the wider public so that each child and citizen has access to quality education; a basic human right and an indispensable prerequisite for sustainable development; may grow and live in a cultural environment rich in diversity and dialogue, where heritage serves as a bridge between generations and peoples; can fully benefit from scientific advances; and can enjoy full freedom of expression; the basis of democracy, development, and human dignity. The UNESCO ICT framework for teachers anchored with the developmental progression of a teacher in integrating ICT into teaching. The framework sets out the three different approaches from Technology Literacy, Knowledge Deepening, and Knowledge Creation. In the Technology Literacy, it enables students to use ICT in the learning space. Knowledge Deepening enables students to grasp in-depth knowledge and apply the knowledge in crafting out the solution to complex and real-world problems. At the last stage, students, as they progress, are able to produce or generate new knowledge for the society. The table presents the UNESCO ICT Competency Framework for Teachers which is central to redesigning national and institutional ICT direction and imperatives. This UNESCO ICT Competency Framework for Teachers summarized the six aspects of teacher works which are the Understanding ICT in Education [5], Curriculum and Assessment, Pedagogy, ICT, Organization and Administration, and Teacher Professional Learning. In any of these undertakings, a teacher must be able to apply and use ICT and achieve developmental progression. Using this framework, educational industry such as higher education institution can redesign its ICT programs and projects for faculty development, student services improvement, learning infrastructure, and educational resource mobilization by venturing in technology integration to a classroom and human capital development.

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TABLE I
UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS

	Technology Literacy	Knowledge Deepening	Knowledge Creation
Understanding ICT in Education	Policy awareness	Policy understanding	Policy innovation
Curriculum and Assessment	Basic knowledge	Knowledge application	Knowledge society skills
Pedagogy	Integrate technology	Complex problem solving	Self management
ICT	Basic tools	Complex tools	Pervasive tools
Organization and Administration	Standard classroom	Collaborative groups	Learning organizations
Teacher Professional Learning	Digital literacy	Manage and guide	Teacher as model learner

A. Human Capital Development in Technology Integration

Globalization reshaped the sectors of developed economies for its imperatives in human capital. Human capital was asserted being the most significant and requires cultivating environment as the important element in the economy's ecosystem. Human capital popularized by an economist Gary Becker and Jacob Mincer from the University of Chicago postulated that human beings with an invigorating environment can learn and apply new skills, competencies, and behavior as a response to the learning ecosystem to produce activities of economic value. In the university context, the professors and teachers commonly known as learning facilitators in this 21st century require training to perform academic roles and responsibilities to enhance skills through a workshop, write shop, technical application, and knowledge transfer sessions, which are known as the human capital formation. Human capital formations require skilled trainers, technology and processes, training funds [6], and other associated expenditures, which are required in the human capital investment.

In the emergence of transformative global economy, [7] with a process model for faculty development: Individualizing technology learning, a contribution of [8] asserted that developing and implementing effective technology training are quite difficult and challenging in any educational industry since human capital formation in this modern economy must emphasize the importance of both cognitive and non-cognitive skills [9]. Faculty development: Key to the integration of technology in teacher education emphasized that faculty needs to participate in determining the training content to develop an individualized training based on the needs [10]. Training on technology integration to classrooms bridged the educational industry compelling needs to adapt educational models in this information age by the adoption of blended learning strategies [11]. The importance of distance education in today's generation affords higher education institution to reduce barriers and provides unique opportunities to deliver quality education [12], where the students can construct their own way of learning, appreciate the importance of interaction, [13] create student learning communities [26], and recognize major roles of blended learning since it offers convenience and lets them embrace the pace of learning over control of their time [14]. The training on technology must emphasize full usage as productivity enhancers [15] and in order that the technology impacts change in students' behaviors or achievement, learning facilitators must be empowered [16].

The success of the faculty training program underscores the importance of considering factors which influence faculty trainings [17, 28]. The contribution entitled faculty computer use and training: Identifying distinct needs for different populations posited the need to emphasize the importance of positive attitude in the learning process [18, 19]. However, Schultz argued that teachers may acquire skills and knowledge but it does not guarantee that these skills and knowledge will become the substantial part of the deliberate investment [20]. On a positive note, training on technology integration will facilitate the development of technology leadership skills among learning facilitators and administrators [21, 22].

II. BACKGROUND OF THE STUDY

Jose Rizal University embarked on Modular Object-Oriented Dynamic Learning Environment (MOODLE) and used in its flipped courses using a Course Redesign Program (CRP) model Austria, [7] said;

The increased usage and implementation of information technology in the Higher Education Institutions (HEIs) in the past years led to several projects integrating blended learning approach, a new method in the instructional delivery. Jose Rizal University (JRU), one of the premier business schools in the Philippines, adopted and implemented the use of blended learning approach through the CRP. Blended learning in the University followed a rotation model where students attend between face-to-face and online sessions [23, 29]. This means a class meets once a week instead of two or three sessions, and learning activities that take place in a classroom can be moved online. The online sessions were delivered using MOODLE. The MOODLE learning environment has provided the students an environment for learning and is also suited for teachers who wish to manage their courses accordingly. The University, in its quest to provide "good education anytime, anywhere" through a technology-enabled instruction, continuously provides opportunities for its students to meet the demands of a digital lifestyle. The strategy was implemented in phases without sacrificing the benefits of conventional teaching approach.

Blended learning has afforded higher education institution which Jose Rizal University has institutionalized for flipped classroom under the auspices of TEL. The TEL houses services for the blended courses, course content development, and management, and provides training and workshop for faculty in the basic education, college, and graduate school divisions. Amongst the trainings provided are; Technology Integration in the K-12 Classrooms, Improving Computer-Assisted Instruction (CAI) Modules, Technology Integration in Higher Education, E-learning Workshop, Moodle 101 (Refresher) [24], Advanced Moodle, and Moving towards online learning. The participants in Technology Integration in the K-12 Classrooms were introduced to the concept and models of technology integration and tasked to design learning activities optimized by technology. The participants in Improving CAI Modules were introduced to principles of instructional design with various e-learning tools that they can use to enhance their existing CAI modules, which will also be explored. Those who have had participated in Technology Integration in Higher Education were introduced to the concept and models of technology integration both in the face-to-face and blended learning environment and they were tasked design learning activities optimized by technology. The participants during the E-learning Workshop have been introduced to principles of instructional design and various e-learning tools have been explored during the technical workshop. A Moodle 101 (Refresher) course was offered to allow the participants explore the basic features of Moodle namely - Creating a course, adding labels, linking to a file or website, constructing discussion forums, assignments, and online tests. During the Advanced Moodle sessions, the participants were introduced to the other features of Moodle such as composing a text and web page, chat, choice and wiki, to name a few and the Moving towards online learning provided the participants a first-hand experience of the nature, design, and development of online course. The trainings dwell on the MOODLE as university's

learning management system and have been re-echoed to new and existing university learning facilitators since the inception of TEL and Course Redesign Program CRP courses. The structure and content of the training sessions ran in different settings but were the same, thus becoming more of refresher training. The training ventures in the repetitive cycle to which it does not cater advanced technology users from the learning facilitators.

A. Statement of the Problem

This study aims to evaluate the level of technology preparedness of faculty trainees in a different department of college division, identify their technology capability, and explore adaptation strategies, challenges, and motivation in integrating technology into their classrooms.

The study also sought to answer the following questions:

- What is the faculty trainees' level of technology preparedness according to:
  - Use of e-learning (use of learning management system)
  - Educational technologies
  - Productivity tools
  - Online collaboration tools
- What technologies the faculty trainees are capable of using, and their level of proficiency in using the technology?
- What are the educational technologies integrated into classrooms by the participants?
- How the faculty trainees adapt to integrating the technology into their classrooms?
- What are the challenges and motivations the participants have in integrating technology into classrooms?
- What course of actions can be done to countervail the challenges?

B. Conceptual Framework

The UNESCO ICT Framework for Teachers will serve as the backbone of opportunities for learning in integrating educational technology in the teaching and learning processes. The rudiments in this study are illustrated in Fig. 1, the conceptual framework. The faculty trainees' training engagement in the institute's training on e-learning and open-source technologies provides opportunities in developing formal and informal learning communities.

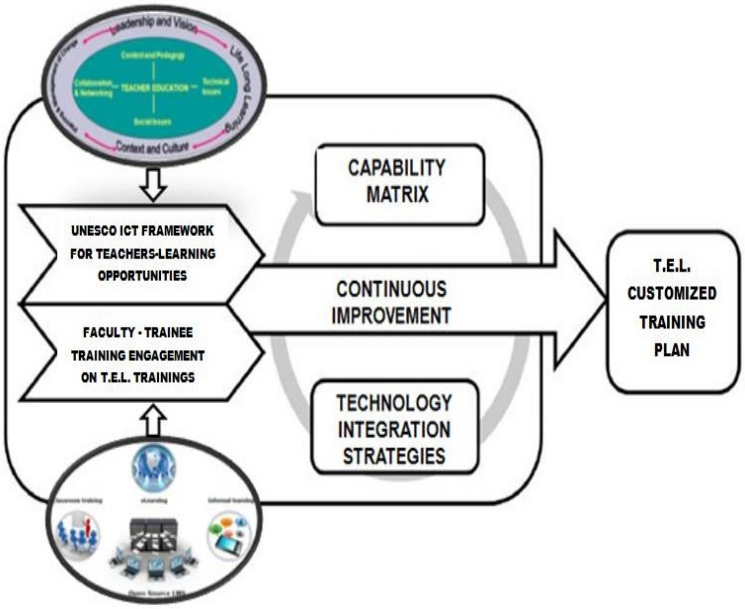

Fig. 1. The conceptual framework of the study

Both the UNESCO ICT Framework and TEL training are contributory to improving the technological, pedagogical, and content knowledge of learning facilitator. The Technology Capability Matrix of a faculty captures the functional technology capabilities required to perform effective development delivery of the course content that forms part of the overarching expectations as higher education faculty and further integrate strategies of using educational technology. The continuum describes the spiral progression of skills and knowledge from transactional to operational capabilities. These capabilities will inform developers of Faculty Development Program to provide tactical and strategic imperatives to align with TEL Customized Training Plan.

III. METHODOLOGY

The study employed the Sequential Explanatory Research Design. A Technology Preparedness and Capability Matrix questionnaire developed by the researcher was administered to the training attendees. Based on the technology preparedness and capability matrix results, there were 15 faculty trainees who were purposively selected for the interview and

Focus Group Discussion. A semi-structured interview was conducted to validate the practices and technology integration into classroom strategies. Participant observation was also used by the researcher to explore observable strategies in using technology-enhanced learning. The Technology Preparedness and Capability Matrix has a set of educational technologies which participants were asked to rate their technology level of competency (Advanced, Intermediate, and Beginner). Seven open-ended questions were used in the semi-structured interview and focus group discussion. A Focus Group Discussion was undertaken to confirm related contentions based on themes and patterns of identified categories. Con-

tent analysis was conducted in order to develop thematic patterns on the qualitative data.

IV. RESULTS AND DISCUSSION

Based on the analysis, the following subsections provide the results and discussion of the participants' educational technology competency based on the Technology Capability Matrix, thematic patterns, challenges, and motivation of technology integration into classrooms.

A. Technology Preparedness and Capability Matrix

A researcher's designed Technology Capability Matrix was used to capture the participants' educational technological capabilities of the selected educational technologies most commonly used. The matrix has a set of technologies with the 3-point Likert scale being Advanced- can write, develop and deploy, and manage content (3), Intermediate- can write and develop content (2), Beginner (1)- can use the technology. These sets of competencies are demonstrable skills to provide structured learning guides in the learning space.

Audio and video-audio technology: The purpose of audio/video technology in the classroom is to provide a reproducible and a wide range of experiences to allow students access the content at their own pace. This kind of technology used in the conventional classroom has long been implemented and successfully embedded into the teaching and learning process and will develop a specific type of listening skill. Some of the audio and video authoring technologies include radio, webcasting, and podcasting. Based on the Technology Capability Matrix as illustrated in Fig. 2 and Table II, 65% of participants have advanced capabilities in creating and authoring learning resource and 35% have an intermediate proficiency level in radio technologies. The faculty trainees have been using video broadcast of their classes transmitted across the internet or commonly called as webcasts.

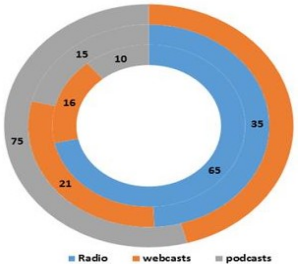

Fig. 2. Distribution of participants' capability in audio/video technologies

There were 16% who have an advanced capability in webcast, 21% are intermediate, and 63% are beginner. Also, with the advent of the technology in aid to teaching and learning, a digital audio file or a recording is made available on the Internet by the learning facilitator which can be played over the internet or can be downloaded to a computer or mobile device also known as podcast. In podcasting, 10% of the participants have an advanced capability, 15% have an intermediate capability, and 75% are beginners in this kind of classroom technology.

TABLE II
DISTRIBUTION OF PARTICIPANTS' CAPABILITY IN AUDIO/VIDEO TECHNOLOGIES

Audio and Video-Audio Technology	Level of Competence		
	Advanced (%)	Intermediete (%)	Beginner (%)
Radio	65	35	0
Webcasts	16	21	63
Podcasts	10	15	75

Other type of audio and video-video technologies: Other technologies used in instructional spaces were the Video Home System (VHS), Digital Video Disc (DVD), and Digital videos. Long before, it has been set as standard for consumer-level analog video recording on tape cassettes and this time usually embedded in the smart classrooms as technology continuously swept innovative mind. A series of recordings, cases, and best practices were played in a physical class or virtually.

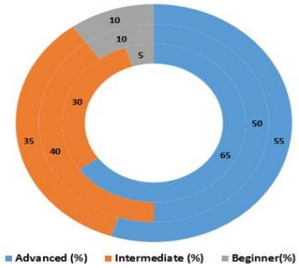

Fig. 3. Distribution of participants' capability in other audio/video technologies

Sixty-five percent of the participants have an advanced competency in using VHS, 30% are intermediate, and 5% are beginners. Another classroom technology used was the DVD tapes and digital video-making, an optical disc storage format which can be used for software and design video programs for the class. This medium was commonly employed in filming performances, classroom-based video presentation or bringing a subject of discussion into the learner's mind space using film-showing. Fifty percent of the participants have an advanced capability, 40% are intermediate, and 10% are beginners. Authoring resource in the form of digital video-making using available technologies can be also made by a learning facilitator. Fifty-five percent of the participants have an advanced knowledge in video-making, 35% have an intermediate capability, and 10% are beginners as depicted in Fig. 3 and Table III.

TABLE III
DISTRIBUTION OF PARTICIPANTS' CAPABILITY IN OTHER AUDIO/VIDEO TECHNOLOGIES

Audio and Video- Video Technology	Level of Competence		
	Advanced (%)	Intermediete (%)	Beginner (%)
VHS Tapes	65	30	5
DVDs	0	40	10
Digital Video	55	35	10

B. Web and Internet-Based Technologies

Fundamental to open learning and open communities are integrating open-source and freeware platform into the classroom. The Web- and internet-based technologies helped teach facilitators to make their scaffolding in class a success. YouTube, Teacher Tube, Skype, Adobe Connect, Webcams, Telecommuting, and digital video games are amongst the tools a teacher can use to write or create a resource and share it with the students. YouTube is a free video-sharing website which allows teachers develop a learning resource and upload it to a YouTube channel; hence, students can watch at their own pace. Illustrated in Fig. 4 and Table IV, there were 40% of the participants who have the advanced capability in using the YouTube, 50% are intermediate, and 10% are beginners. A Teacher Tube is also available, a free video-sharing website with features similar to YouTube which allows teachers and students to share their educational resources including videos, audios, wikis, documentaries, photos, blogs, and learning communities. There have been 10% of the participants who were open and advanced users of Teacher Tube, 35% and 55% for intermediate and beginners, respectively.

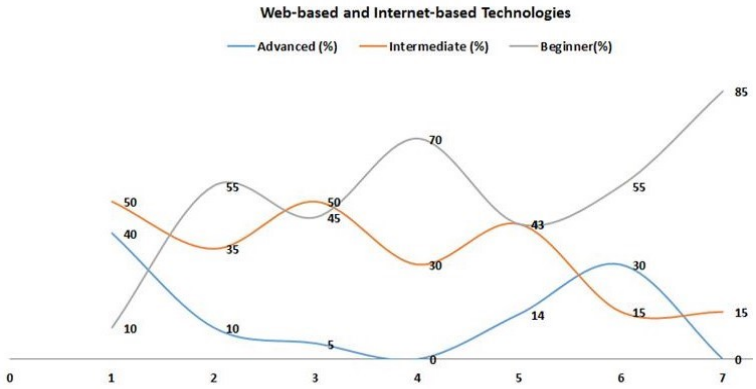

Fig. 4. Distribution of participants' capability on web- and internet-based technologies

Virtual classrooms and classes online are among the educational industries' initiative to provide open and distance education services. These are the educational support to students hampered to attend physical or face-to-face sessions in a class. Using Skype, an application for the virtual class through voice calls and chats, a class can be moderated by the teacher over the internet. This kind of platform significantly works for students and teachers even with different time zones and different locations by exchanging of digital documents in the form of shared desktop, text, video, and also allows video-conferencing. There have been 5% of the participants who have an advanced capability in Skype, 50% are intermediately capable, and 45% are beginners. Another authoring and collaboration tool is the Adobe Connect used to develop materials and presentations, trainings, and web-conferencing. This application software allows a teacher to create learning modules and can host desktop-sharing. As collaboration is advocated in this application, a teacher can also use Blackboard Collaborate to host a webinar. Based on the TCM, 30% of the participants have an advanced capability in Adobe Connect, and 70% are beginners. Webcams are sometimes used in classrooms especially in a project-based learning pedagogy to allow teachers have a real-time streaming with their class or vice versa. There were 14%, 43%, and 43% who were advanced, intermediate, and beginners in using webcams in classrooms, respectively.

TABLE IV
DISTRIBUTION OF PARTICIPANTS' CAPABILITY ON WEB AND INTERNET-BASED TECHNOLOGIES

Web based and Internet based Technologies	Level of Competence		
	Advanced (%)	Intermediete (%)	Beginner (%)
d1. Youtube	40	50	10
d2. Teacher Tube	10	35	55
d3. Skype	5	50	45
d4. Adobe Connect	0	30	70
d5. Webcams	14	43	43
d6. Telecommuting	30	15	55
d7. Digital Video Games	0	15	85

The emergent educational model is the use of telecommuting is which a teacher can be connected to a student's desktop using the remote connection. This has been undertaken by a teacher who dedicated a time to mentor or coach a student over a distance. They are sometimes called tele-teachers who manage a class, a student or a group of students in a teleconference. There were 30% of the participants who have had an advanced capability in telecommuting, 15% and 55% for intermediate and beginners, respectively. Another scaffold in the educational models was the use of digital video games to gamify a lesson or a class. This is effective for a teacher who has identified the class to be game-oriented or would likely grasp the subject by using gamification. In using this pedagogy, a careful design and content must be considered, however. TCM illustrated that there were 15% who have had an intermediate capability and 85% are beginners in this technology.

C. Computers, Tablets, and Mobile Devices

Gone are the days when teachers wrote the lesson on the reusable writing surface commonly known as the blackboard. Educational technology and technology in education have surfaced educational reforms on models, and even the system through digitization. Digital technology has sharpened and helped educational industries to enhance and supplement the teaching and learning processes. In Jose Rizal University context, a 1:1 ratio of student and computers has been advocated in laboratories, laptops and tablets are provisioned in the libraries, WIFIed campus for smartphone users and other tools are instituted, all geared towards a technology-enabled learning environment.

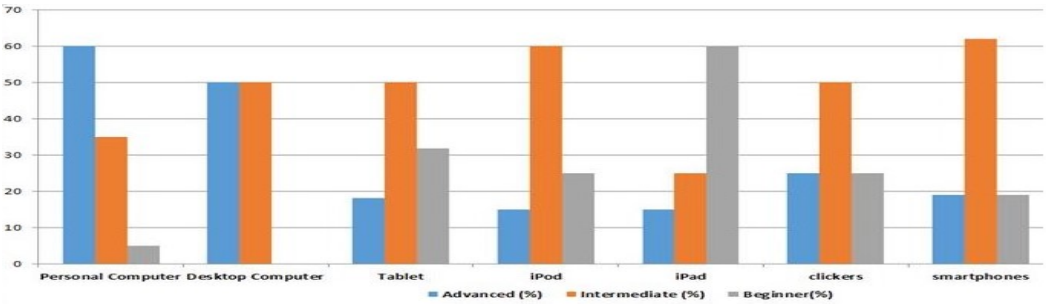

Fig. 5. Distribution of participants' capability on computers, tablets, and mobile devices

Sixty percent of the participants have advanced capabilities in the personal computer, 50% in a desktop computer, 18% in tablets, 15% for both iPod and iPad, 25% for Clicker technologies, and 19% for smartphones as illustrated in Fig. 5 and Table V. There have been 35% intermediately competent in using the personal computer, 50% in the desktop computer, 50% tablets, 60% iPod, 25% for iPad, 50% Clickers, and 62% on smartphones. Teachers of today are much needed to be technology adept as teachers of the millennials, but TCM still depicted that there were 5% teachers who were beginners in using personal computer, 32% tablets, iPod 25%, iPad 60%, Clickers 25%, and 19% on smartphones.

TABLE V
DISTRIBUTION OF PARTICIPANTS CAPABILITY ON COMPUTERS, TABLETS, AND MOBILE DEVICES

Computers, Tablets and Mobile Devices	Level of Competence		
	Advanced (%)	Intermediete (%)	Beginner (%)
Personal Computer	60	35	5
Desktop Computer	50	50	0
Tablet	18	50	32
iPod	15	60	25
iPad	15	25	60
Clickers	25	50	25
Smartphones	19	62	19

D. Other Social Networks

A web page is a dedicated document for a specific lesson, course or program. The page may contain the structure of the course, course details, expected results and outcomes, learning resources and milestones or deliverables including reference links. A collection of these web pages can be hosted on a website for the course or program. Teachers can develop a customized website for their courses to allow students access the same at their own pace from their own devices.

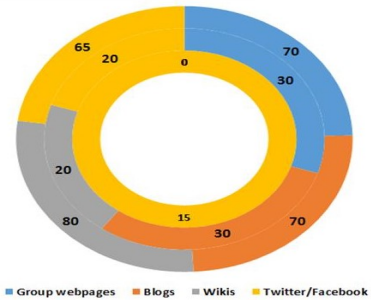

Fig. 6. Distribution of participants' capability on other social networks

As reflected in Fig. 6 and Table VI, there have been 30% who have an intermediate capability in designing and implementing webpages for the group, a class or a program and 70% are beginners. Another informational tool was the use of Blog sites for informal discussion published online. This does not, however, merit that what has been posted on the blogs is reliable, since most blogs are expressions of lessons learned, best practices, and opinionated. Some or 30% of the participants have been using blogs and 70% are beginners. Wiki has been used by the teachers also, which imbibed the collaborative trust of each contributor. The wiki allows teachers or contributors to create and edit wiki content. These collective resources are, however, found to be trivial; therefore, citations must be considered for veracity. Most known is the Wikipedia. The participants' TCM showed that there were 20% who were intermediately capable of using and implementing it, and 80 percent who were beginners. Twitter and Facebook alike were used even before for classrooms, where 15% of the participants have had an advanced capability in Twitter and Facebook, 20% and 65% who have an intermediate and beginner capability, respectively.

TABLE VI
DISTRIBUTION OF PARTICIPANTS' CAPABILITY ON OTHER SOCIAL NETWORKS

Other Social Networks	Level of Competence		
	Advanced (%)	Intermediete (%)	Beginner (%)
Group Webpage	0	30	70
Blogs	0	30	70
Wikis	0	20	80
Twitter/Facebook	15	20	65

E. Other Educational Technologies

Using web cameras can revolutionize classrooms to improve classroom practices and capture observations in the class which can be replayed further. Cameras are sometimes installed in the classrooms to allow a teacher monitor what has transpired in the entirety of the class. Webcams are also during video calls and other online-related activities. There have been 25% of the participants who have an advanced capability and 75% are beginners in webcams integrated into classrooms.

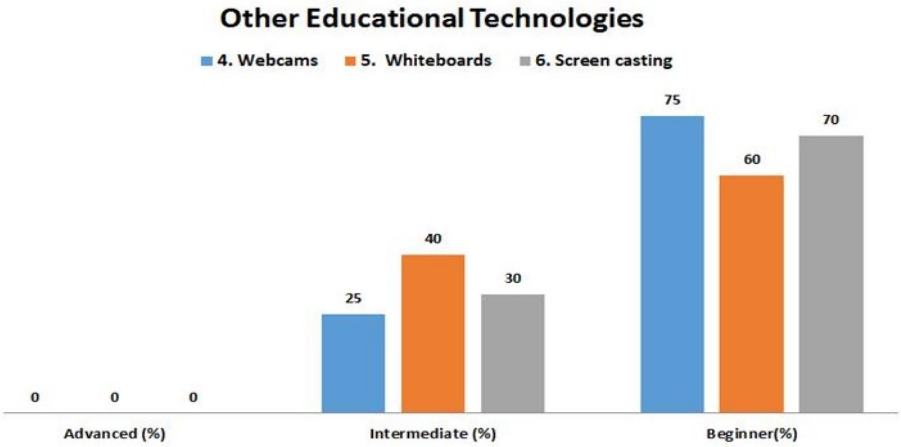

Fig. 7. Distribution of participants' capability on other educational technologies

The heir of the conventional blackboard is the whiteboard which allows the teacher to reuse the board by using a whiteboard marker. In this study, the whiteboard is a computer software application which can setup file size up to 1.5MB and caters to educational demand in the classroom. Whiteboard provides handy drawing tools such as pen, eraser, text, etc. related to paint application. The matrix illustrated in Fig. 7 and Table VII depicted that there were 40% of the participants who were intermediately capable and 60% were beginners. Also, another learning resource development tool is the screen casting software. Screen casting allows digital recording of computer screen navigations with an audio narration. Based on the Technology Capability Matrix, there have been 30% who were intermediately capable and 70% were beginners.

TABLE VII
DISTRIBUTION OF PARTICIPANTS' CAPABILITY ON OTHER EDUCATIONAL TECHNOLOGIES

Other Educational Technologies	Level of Competence		
	Advanced (%)	Intermediete (%)	Beginner (%)
Webcams	0	25	75
Whiteboards	0	40	60
Screen Casting	0	30	70

F. Virtual Classroom

Because of the corollaries of internet, the educational space was revolutionized, virtual education. In virtual education, the learning space is separated by a distance and even time zones. The learning environment is referred to as virtual learning environment where the virtual classroom is set up by the teacher. A web-based platform is used by the teacher to be accessed by the students. The teachers manage the virtual class from the class set-up, course content, multimedia, and another learning resource including video-conferencing.

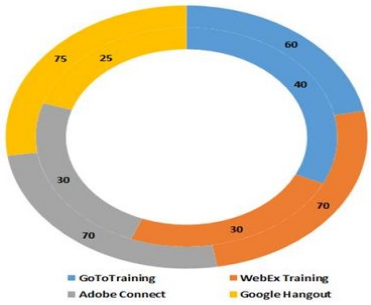

Fig. 8. Distribution of participants' capability on virtual classroom

There are numerous applications that can be used for virtual classrooms such as GoToTraining, WebEx Training, Adobe Connect, and Google Hangout. Based on Fig. 8 and Table VIII, there were 40% intermediately capable in GoTo Training, 40% WebEx Training, 30% Adobe Connect, and 25% for Google Hangout. There were, however, 60% beginners for GoTo-Training, 70% WebEx Training and Adobe Connect, and 75% for Google Hangout.

TABLE VIII
DISTRIBUTION OF PARTICIPANTS' CAPABILITY ON VIRTUAL CLASSROOM

Virtual Classrooms	Level of Competence		
	Advanced (%)	Intermediete (%)	Beginner (%)
Go To Training	0	40	60
Web Ex Training	0	30	70
Adobe Connect	0	30	70
Google Hangout	0	25	75

G. Learning Management System

Learning management system has reshaped educational models. Learning management system has long been used in higher education institutions [27] which is a software application for the course administration, management, and documentation, tracking, reporting management, and delivery of the courses. Most commonly used LMSs are Academy Platform LMS, Blackboard, Canvas, Edmodo, Google Classroom, Moodle, NEO LMS, Schoology, etc.

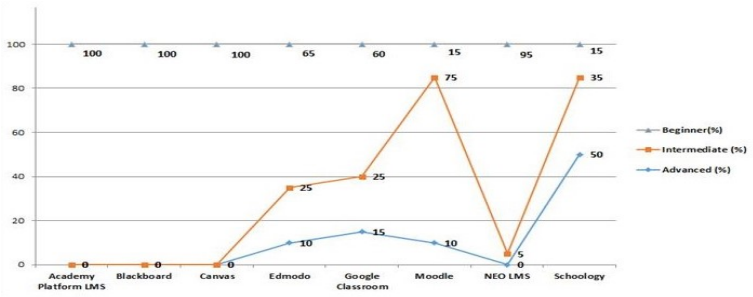

Fig. 9. Distribution of participants' capability on learning management system

Based on the study, TCM shows through Fig. 9 and Table IX that all participants were beginners in Academy Platform LMS, Blackboard, and Canvas. There were 10% with advanced capability, 25% were intermediate, and 65% beginners in Edmodo. There have been 15% with advanced capability in Google Classroom, 25% intermediate, and 60% beginners. In Moodle, which is the platform institutionalized by Jose Rizal University - Institute of Technology-based learning, there were 10% advanced capable, 75% intermediate, and 15% beginners. Likewise, in NEO LMS, only 5%

were intermediately capable and 95% were beginners. In Schoology, an online learning, classroom management, and social networking platform [25] there were 50% who had an advanced experience and capability, 35% intermediate, and 15% of the participants were beginners.

TABLE IX
Distribution of participants' capability on learning management system

E-Learning Authorizing Tools	Level of Competence		
Learning Management System	Advanced (%)	Intermediete (%)	Beginner (%)
Academy Platform LMS	0	0	100
Black Board	0	0	100
Canvas	0	0	100
Edmodo	10	25	65
Google Classroom	15	25	60
Moodle	10	75	15
NEO LMS	0	5	95
Schoology	50	35	15

H. Office Productivity Suites

Office Productivity software are fundamental to teachers in their everyday endeavors in a classroom or off the class. This application software is dedicated to be used for producing information, such as documents, presentations, worksheets, databases, charts, graphs, digital paintings, electronic music, and digital video. Based on Fig. 10 and Table X, there have been 50% from participants who have an advanced competency in Microsoft Word, Microsoft Power Point, and Microsoft Excel. There were 27% and 15% advanced users of MS Publisher and MS Project Manager. Intermediate users were 45% for MS Word, MS Power Point, and MS Excel, and 5% and 13% for MS Publisher and MS Project Manager, respectively. Beginner users were 5% for MS Word, Power Point, and Excel; and 60% for both MS Publisher and MS Project Manager.

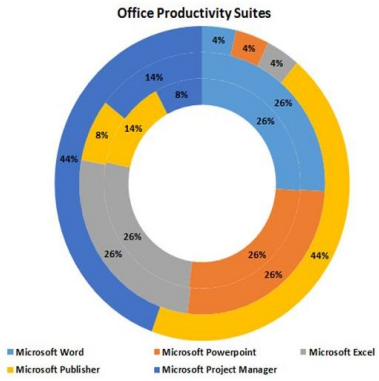

Fig. 10. Distribution of participants' capability on office productivity suites

TABLE X
Distribution of participants' capability on office productivity suites

Office Productivity Suits	Level of Competence		
	Advanced (%)	Intermediete (%)	Beginner (%)
Microsoft Word	50	45	5
Microsoft Powerpoint	50	45	5
Microsoft Excel	50	45	5
Microsoft Publisher	27	13	60
Microsoft Project Manager	15	25	60

I. Other Components of Office Suite

Other Office Productivity Suites or commonly known as Productivity Tools are additional applications embedded to Office suites including software in designing databases, graphing software, desktop publishing systems, and software for video production, etc. This contains, however, those proprietary and open-source software programs. The TCM result described in Fig. 11 and Table XI shows that there have been 5% advanced users of database software, Graphics suite (raster graphics editor, vector graphics editor, image viewer), Desktop publishing software, Diagramming software, Email client, Communication software, Personal, information manager, Notetaking software, Groupware, and Project management software. There were 11% who were advanced users of Formula editor. There were also 5% of intermediate users of Database software Graphics suite (raster graphics editor, vector graphics editor, and image viewer), Desktop publishing software, Communication software, and Personal information manager.

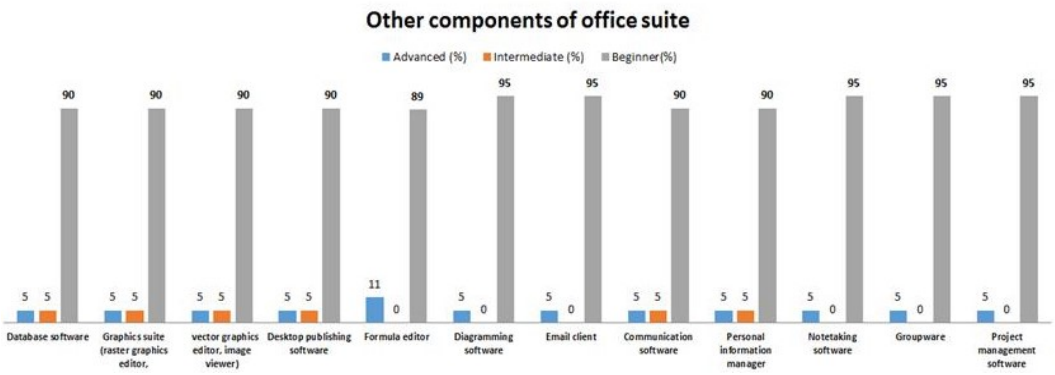

Fig. 11. Distribution of participants' capability on other components of office suite

There were 95% beginners in Notetaking software, Groupware, Project management software, Diagramming software, and Email client. Ninety percent of the participants were beginners in Database software, Graphics suite (raster graphics editor vector graphics editor, image viewer), Desktop publishing software, Communication software, and Personal information manager, and 89% of the participants were beginners in the Formula editor.

TABLE XI
Distribution of participants' capability on other components of office suite

	Level of Competence		
Other Components of Office Suite	Advanced (%)	Intermediete (%)	Beginner (%)
Database Software	5	5	90
Graphic Suite (raster graphic editor,	5	5	90
vector graphic editor, image viewer)	5	5	90
Desktop Publishing Software	5	5	90
Formula Editor	11	0	89
Diagramming Software	5	0	95
Email Client	5	0	95
Communication Software	5	5	90
Personal Information Manager	5	5	90
Notetaking Software	5	0	95
Groupware	5	0	95
Project Management Software	5	0	95

J. Adaptation and Strategies for Integrating Technology into Classroom

Technologies deployed in the classrooms either new, emerging or matured usually channeled through a carefully designed program, curriculum, and content. For a neophyte faculty in the university, technology culture should invest in embracing what are live and running. Faculty trainees credited the work of TEL in providing training on MOODLEd courses which were the flipped classes. Educators agree that an intensive way to revolutionize education is by adopting technologies to improve conventional way of teacher-led lecture discussion, and transform the educational media into a more meaningful and reusable form.

The participants emphasized their strategies for adapting technologies and integrating to the classrooms:

- Recognizing the technology skills needed and soliciting an internal support system, such from colleagues, IT Office or Institute of Technology-based Learning.
- Shifting the educational paradigm to a student-centered learning.
- Advocating a gradual change and building confidence in using the technology-based pedagogy.
- Emphasizing open-ness to knowledge discovery, the social and communication skills; and
- Continuously monitoring the relevance of the content to the needs of the learners.

Integrating technology into classrooms drives constructivism. The ramification of technology has enabled rapid change in the teaching and learning process. Faculty trainees postulated the following themes emerged based on the content analysis; Knowledge creation, improved student learning, 21st-century skills development, and Teacher's web and social presence.

Knowledge creation: Teachers advanced the learning resources which directed to address the course objective and intended outcome. These resources are shared in media and instrumentalities for general and informational collection. It was being utilized in the processing and analysis, and generates a new knowledge, emphasized by one of the interviewees. These resources are also stored and collected in databases, websites, and LMSs for future references. Teachers who have integrated technologies and developed resources have contributed literature to the existing knowledge, said one of the participants.

Improved student learning: Integrating technology into classroom drives motivation to learning and enables collaboration. Students can resolve a real-world problem using the technology as their main tool, expressed by an interviewee. Since students can view the course materials, expected deliverables, and milestones per week, they can do the attempts on the assessments proactively. The students are becoming active-

learners, critical thinkers, and exchange ideas over the course of online classes or even in their own blogs" a languages department participant said. From the conception of the solution to a question or problem, students become informed decision-makers (says a participant), and achieve the authentic learning, which centers on how they capture the learning environment.

21st-century skills development: Teachers of today have more powerful tools and technologies at their own disposal to take advantage of to enable students grasped the 21st century learning skills. Most activities in school and flipped classrooms are geared toward collaboration, digital literacy, critical thinking, and problem-solving which are advocated by a thriving university, college and a 21st century teacher. These core competencies or skills are essential for these millennials survival after school life. The 21st century skills are the associated "higher-order skills and learning disposition" as emphasized by one of the interviewees, work habits and character traits that need to be develop in order to succeed in this information age, he furthered.

Teacher's web and social presence: In this milieu of millennials, teachers are immigrant of technology compared to the students, who are digital natives. In most literatures, students are more tech-savvy or techy and the teachers too should be technically adept as described and recommended by one of the participants. In managing flipped classrooms, technology-enabled learning space, teachers must be available to intervene and filter-out arguments based on facts and reliable sources and references, said one of the participants handling courses in CRP. Teachers should provide a dedicated time for online consultation and moderate the forums in order to guide the learners. It is also important to address confusions and queries posted online, in MOODLE and in other platforms being used by the teacher, says a faculty trainee.

K. Challenges and Motivations in Integrating Technology into Classrooms

Migrating from non-OBEd to outcomes-based resources: The shift of university educational system to Outcomes-based Education has remarkably challenged educational industries in its curriculum design, faculty and development, facilities, and even in technology infrastructure. In the library and online resources, for example, the course content, assessment tools must be revisited to provide an intuitive appeal which hooks to the teachers and students, and eventually meet the learning outcomes and targets. In flipped class, it has been a challenge for CRP users and teachers when assessments online were not OBEd but target learning outcomes require OBEd assessment. Also, online materials were found to be purely textual, and static informational resources, learning resources, and laboratory software applications have no upgrades to accommodate industry's changing demands, participants remarked.

Moderating the online community: Integrating technology into the classrooms requires more time for learning facilitators. Aside from reluctance in using the technologies, there has been an increased workload. Teachers or learning facilitators find it challenging to moderate their classes online because it consumes much of our time, and ends up giving more online activities than tuning in the forums and discussion boards which sometimes makes the class less interactive. However, a teacher can provide relevant topics or argument as the point of discussion to culminate a debate; to draw attention to opposing perspectives which solicit conflicting opinions and different dilemmas, participants emphasized. If the teacher cannot moderate online, group or collaborative works are sometimes preferred to make the learning experience better, they agreed.

Attendances and participation in TEL and off campus technology-based trainings: The Institute of Technology-based Learning housed and managed the university's educational technology-related services especially on its Learning Management System MOODLE. The institute provides prime opportunities to the learning facilitator on course management, content development concerns, and other technology-related training to handle the flipped courses better and for professional development. The training programs were designed specifically for the institute and learning facilitators need to improve the knowledge and skills, and technological behavior to attain the university's vision of becoming the leader in the use of technology and developed leader of this information age. To deliver and manage a successful flipped and technology-enabled learning space, new hires and existing must attend technical training, write shop, and workshops conducted by TEL or even off campus. These allow learning facilitators to develop skill set and competencies necessary for 21st-century teachers.

V. CONCLUSION AND IMPLICATIONS

Based on the results of the Technology Capability Matrix, the faculty trainees are capable of AV technology, the web- and internet-based technologies, computing and smartphone devices, social networks, educational technologies, virtual classroom, e-learning authoring tools, office productivity suites, and other components of the office suite along with thematic patterns such as knowledge creation, improved student learning, 21st-century skills, and teacher web and social presence. Participants elicited their challenges in developing learning materials into an Outcomes-based resource and in moderating the online community in order to create a technology-enhanced learning environment. The researcher recommends considering redesigning the TEL priorities for training and development using other LMS. The researcher recommends the following:

- Conduct a study on MOODLE vs Schoology (since the results showed that there were 50% advanced users of Schoology than 10% advanced users of MOODLE
- Invest in video integration in flipped courses deployed through MOODLE.
- Run parallel courses in Schoology and MOODLE and conduct an empirical study based on the components of LMS ecosystem
- Consider advocating m-learning by providing the educational content through learners' personal devices rather than housing it in the university LMS or online
- Develop a training plan for Podcasting and Screen casting to assist learning facilitators in content development
- Intensify relevant educational technologies trainings by institutionalizing or departmentalized initiative in partnership with TEL
- Develop and forge partnership with other universities and LMS providers to benchmark best practices
- Develop a TEL development plan aligned with the university academic and IT infrastructure imperatives

It is also recommended to conduct studies on the relevance and effectiveness of TEL training to the learning facilitators.

Declaration of Competing Interest

We, the undersigned, declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. We wish to confirm that there are no known conflicts of interest associated with this publication

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