21st Century Digital Skills, Technology Integration in Instruction and Challenges Encountered by Senior High School Teachers in Muntinlupa National High School

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ABSTRACT: This descriptive-correlational study determined the 21st-century digital skills, technology integration in instruction, and challenges encountered in integrating technology. The participants in this study were composed of ninety-five Senior High School teachers in Muntinlupa National High School. The study sought to find a significant association between 21st-century digital skills and level of technology integration in instruction; challenges encountered and the level of technology integration of teachers in instruction. The study revealed that the majority of the respondents were female, aged 40 to 49 years old, acquired MA units, 7 – 12 years of teaching experience, and attended less than 3 related training on technology integration in instructions for the last past 6 months. Findings showed that the level of 21st-century digital skills and level of technology integration in instructions of the SHS teachers was very high. Teachers highly used video conferencing software such as Zoom, Microsoft Teams, GoogleMeet, Cisco, WebEx, and others as the technology they integrate for their instructions. The challenges experienced by teachers in integrating technology in instructions were the following; poor internet connection, students' lack of support system, limited electronic materials and equipment, and lack of technological support from the school experts. Senior high school teachers aged 40 to 49 have higher skills in the information of 21st-century digital skills than teachers aged 50 and above. And, female senior high school teachers have higher skills in communication, collaboration, and problem-solving in 21st-century digital skills than male senior high school teachers. Meanwhile, the teachers' level of technology integration in instruction and the challenges encountered in integrating technology were the same regardless of teachers' profiles. The result further revealed that the higher the 21st-century digital skills of the teachers, the higher the teachers' level of technology integration in instructions. And, the more challenges teachers encountered in integrating technology into instructions, the higher their level of technology integration into instructions.

KEYWORDS: 21st century digital skills, technology integration in instructions, challenges encountered, teachers, technology.

I. INTRODUCTION

Change is already inevitable. With that, the academic institution as one of the responsible bodies for preparing a new breed of workforce and leaders must adapt and be flexible with these transformations. Likewise, World Economic Forum [1] emphasizes that education models must adapt to globalization and rapid technological advancements to equip learners with the skills to create a more inclusive, cohesive, productive and innovative world. In response, the Philippines is embarking on a journey to deliver an excellent education to achieve excellence in learning and effective teaching, and produce competent lifelong learners who can respond to challenges and opportunities.

Technology is constantly developing and emerging. Back then, students had to go to the library and open books to obtain information and materials they needed. In the twentieth century, information has been transformed into readily available because of computers, devices, and the internet. Integrating technology into the teaching-learning process becomes a teaching strategy and it additionally provides an opportunity for accessible communication among learners and teachers. With this pandemic, the importance and role of technology in education have become clearer and expanded. Technology is helping new educational modalities for learning to be possible. In October 2020, nonconventional learning modalities were launched which include digital classes, printouts, lessons broadcast on television, radio and social media channels. As a result, the alternative learning modality rely on students and teachers having access to the internet, as well as the necessary devices and abilities to

21st Century Digital Skills, Technology Integration in Instruction and Challenges Encountered by Senior High School Teachers in Muntinlupa National High School

use them. Classroom interactions are transformed into a digital setup wherein teaching and learning happen with the aid of technology such as gadgets, digital tools, applications, and the internet.

There are numerous studies establishing the importance of technology in education even before the strike of the pandemic. Studies describe that technology integration would improve the teaching instructions and learning experiences [2]. It can cover the design, development, application, and evaluation of education at all levels of education either formal, non-formal, informal, special, inclusive, or lifelong education [3].And with the practice of technology integration, educators find convenience, ease, and confidence that students could have rich learning experiences in class [4]. However, there are still limited empirical studies that recognize whether teachers have high integration of technology in the classroom.

Teachers must have the essential skills and knowledge to fully utilize and take full advantage of the potential of technology while using it in the classroom [5]. Learning certain skills requires teaching. Thus, teachers should be knowledgeable in the implementation and application of various teaching and learning tools and have mastered the necessary skills for teaching 21st-century learners. UNESCO [6] stresses the significance of Information and Communication Technology (ICT) on student learning, especially its importance for the teachers to be digitally literate and understand how to incorporate it into the curriculum. Van Laar et al. [7] suggested investigating the 21st-century digital skills of educators as the use of technologies emerges in their work description. Organization, such as education, that deals and concern with fast moving technology need highly proficient teachers in 21st century digital skills. Apparently, 21st-century digital skills are still not completely understood and scientifically investigated in the field of education, especially in the local setting. And most of the available articles aim to investigate 21st-century skills and digital skills, separately. Thus, there's a funding gap in incorporating digital skills into the actual 21st-century skills and another gap in determining whether teachers have a high level of 21st-century digital skills.

In this manner, the present study aimed to measure the 21st-century digital skills and level of technology integration in instructions in the field of education. Teachers may find it useful for enhancing their 21st-century digital skills and use of technology in instruction since they can incorporate it into lessons, teaching strategies, and student activity. Furthermore, the teachers' improvement on these levels may promote meaningful lifelong learning experiences for students. Since there's a transformation happening in teaching instructions and learning setup, the study's further aim was to identify the challenges encountered by the Senior High School teachers in integrating technology into instructions. Therefore, this study was intended to correlate the teachers' level of 21st-century digital skills and challenges faced by them in integrating technology with instructions to their level of technology integration in instructions.

II. METHODS

This study used the descriptive-correlational research design. Descriptive research aims to accurately and systematically describe a population, situation or phenomenon. It can answer what, when, where, and how questions [8]. The study looked into the significant difference in 21st century digital skills, technology integration and challenges between groups of teachers in accordance with their personal and academic characteristics. It also aimed to present the significant relationship, through correlation, between 21st century digital skills and technology integration; between technology integration and challenges experienced by teachers in instruction. Data used in the investigation came from the 95 Senior High School teachers from Muntinlupa National High School. Sample size was determined by Raosoft.com and the actual selection of the sample respondents was done using random sampling technique where each member of the population had an exact equal probability of being chosen using this sampling procedure [9].

The research used a questionnaire for the purpose of collecting the needed primary data. The research instrument was divided into four (4) parts. Part I dealt with the profile of the respondents. Part II pertained to the 21st century digital skills. Part III covered the level of technology integration in instruction. And Part IV concern on challenges in technology integration in instruction. The Part II of the questionnaire was adopted from van Laar et al. [10]. They used a three-fold approach to test the validity and reliability of the questionnaire. It included cognitive interview to enhance the clarity of the proposed skill items; pilot testing to explore the factor structure; and full survey to measure the consistency of the skill factors. Three items were not included in the final administration of the survey because the technical content is misaligned to the job description of the education profession under dimension of communication. While Part I, Part III and Part IV were researcher-made questionnaires. The items included in these parts were derived from different related literature. The whole questionnaire was subjected to face and content validity by seeking the opinions and insights of the panel of experts such as researcher, ICT teacher and a professional teacher for further improvements. The tools of 21st century digital skills, technology integration and

21st Century Digital Skills, Technology Integration in Instruction and Challenges Encountered by Senior High School Teachers in Muntinlupa National High School

challenges scored its reliability 0.967, 0.802, and 0.824, respectively on Cronbach alpha testing. Part II and III of the questionnaires were measured using the 4-point Likert scale: Always/Very High (3.25 - 4.00), Sometimes/High (2.50 - 3.24), Rarely/Low (1.75 - 2.49) and Never/Very Low (1.00 - 1.74). And Part III was encoded using the following scale: Strongly Agree (3.25 - 4.00), Agree (2.50 - 3.24), Disagree (1.75 - 2.49) and Strongly Agree (1.00 - 1.74).

Data were collected from the respondents through a paper and pen survey and an online survey using Google Form. Permission to conduct the study and administer the questionnaire were secured from the School Division Office of Muntinlupa City and school head. The respondents were given a consent letter together with the survey questionnaires and they participated voluntarily. The study achieved 100% retrieval of survey questionnaires through a paper and pen survey and online survey using Google Form. Data were organized, analyzed and interpreted using the following statistical tools: (1) Frequency count and percentage were used to describe the profile of the respondents. (2) Weighted mean was used to describe the level of 21st-century digital skills, level of technology integration in instruction, and challenges encountered by teachers in technology integration in instruction. (3) Tests of difference such as t-test for independent means, Kruskal Wallis Test, chi-square and ANOVA were used to determine the difference in the teachers' level of 21st-century digital skills when grouped according to profile variables; the difference in the teachers' level of technology integration in instruction when grouped according to profile variables; and the difference in the challenges encountered by teachers in technology integration in instruction when grouped according to profile variables. And, (4) Pearson product-moment correlation coefficient was utilized to determine the relationship between the teachers' level of 21st century digital skills and level of technology integration in instruction; and between the teachers' challenges encountered and level of technology integration in instruction.

III. RESULTS AND DISCUSSIONS

Discussion of the 21st-century digital skills, technology integration in instruction, and challenges encountered in integrating technology is presented in the succeeding tables and textual presentations:

Table 1. The Personal and Academic Characteristics of the Respondents

	Demographic Variables	Frequency (n = 95)	Percentage
Personal Characteristics	**Age**		
	Below 30	17	17.90
	30-39	27	28.40
	40-49	31	32.60
	50 and above	20	21.60
	Gender		
	Male	34	35.80
	Female	61	64.20
Academic Characteristics	**Highest Educational Attainment**		
	Bachelor's Degree	9	9.50
	With MA units	55	57.90
	Master's degree	19	20.00
	With PhD/EdD units	8	8.40
	Doctorate degree	4	4.20
	Number of Years in Teaching		
	1-6	33	34.70
	7-12	35	36.80
	13 and above	27	28.40
	Number of Trainings Attended		
	0-2	37	38.90
	3-5	36	37.90
	6 and above	22	23.20

21st Century Digital Skills, Technology Integration in Instruction and Challenges Encountered by Senior High School Teachers in Muntinlupa National High School

Table 1 shows the personal and academic characteristics of the respondents. The majority of the respondents were 40-49 years (32.60%) of age, female (64.20%), with MA units (57.90%), had 7-12 years of teaching experience (36.80%), and had 0-2 training attended (38.90%) in technology integration.

Table 2. Composite Table of the Teachers' Level of 21st Century Digital Skills

Skills	Weighted Mean	Verbal Interpretation	Rank
Information Digital Skills	3.43	Very High	2
Communication Digital Skills	3.24	High	6
Collaboration Digital Skills	3.53	Very High	1
Critical Thinking Digital Skills	3.39	Very High	4
Creativity Digital Skills	3.40	Very High	3
Problem Solving Digital Skills	3.29	Very High	5
Overall Weighted Mean	**3.38**	**Very High**	

It is shown in Table 2 that the Senior High School teachers had very high level of 21st century digital skills as evidenced by obtained overall weighted mean of 3.38. This suggests that senior high school teachers believe that they are proficient on the technical aspect of digital skills to listed competencies on 21st century skills. Results are related to the study of van Laar et al. [7] that working professionals are performers of 21st-century digital skills and in a greater range.

The table 2 also reveals that the respondents' highest level is on *Collaboration Digital Skills* as rank 1 with weighted mean of 3.52 signify *very high* level. This means that respondents have very high-level skills for searching, evaluating, and organizing information in digital environment. It also defined as the ability to reach a goal as a team, to complement and support each other [11]. As Kaur and Debel [12] study gives emphasis on teachers' collaboration as part of teachers' daily routines and they need to be involved in planning, implementing, and evaluation. This is congruent with the study made by Gonzales [13], teachers have a very high level of collaboration in 21st century skills, which is defined as the capacity to operate as a team, work effectively and respectfully in teams to achieve a common objective, and take shared responsibility for accomplishing a task.

The composite skills of *Information Digital Skills* (*MW*= 3.43), *Creativity Digital Skills* (*MW*=3.40), *Critical Thinking Digital Skills* (*MW* =3.39) and *Problem-Solving Digital Skills* (*MW* =3.29) where the respondents classified as having *very high* level. Van Laar et al. [7] corroborate the finding that information digital abilities include the capacity to clearly describe information demands, assess digital information, and pick digital information in an effective and efficient manner. Serezhkina [14] supported the findings that school teachers had a high level of digital competence, particularly in the areas of information management and technical internet use. Promoting critical thinking within media literacy education will lead to real integration of media and digital skills in the classroom [15]. Same findings on Gonzales [13] that faculty members on State University had a high degree of critical thinking, creativity and invention which includes the ability to examine a wide range of issues, explore and assess many points of view, and develop suitable conclusions and ability to produce and refine solutions to complicated issues or tasks based on synthesis, analysis, and then merging or presenting what they learnt in new and creative ways. While, Rensburg [16] emphasize developing creative digital abilities, which entails using digital tools and technology to test creative ideas. Castek et al. [17] describe digital problem solving involves the use of the skills, strategies and approaches needed to navigate online. And Gepila [18] claimed that Highly Proficient Teachers have superior educational situation cognition, are better at problem solving, and maximize possibilities obtained through experience.

Meanwhile, *Communication Digital Skills* is considered as the least performed skills among 21st century digital skills as it gains weighted mean of 3.24 which classify as *high* level. This finding conforms Al-Qahtani [19] study indicating that the current learning modality offered such as online class and virtual courses may enhance communication skills.

The result of the study confirms the discovery of van Laar et al. [20] that sub-skills among 21st century digital skills have interrelationship and it build on each other sequentially. Except for critical thinking, all dimensions affirm to lead directly to problem-solving digital abilities [20]. The findings were also discussed in the study of Benson [21]; Liwa [22]; and Caluza [23] on having high level of 21st century skills and other similar ICT competency of teachers. Meanwhile, Mannila, Norden & Pears [24] study supported these findings that the highest composite self-efficacy in digital competence was information and data literacy followed by collaboration. For the result in communication, it was explained by French [25] that it is included on the soft skills

that are describe in more complex and less tangible skills that needed for communicate confidently and clearly with online contacts.

Table 2. The Teachers' Level of Technology Integration in Instruction

Indicators	*Weighted Mean*	*Verbal Interpretation*	*Rank*
1. I use social networking groups such as Facebook, Twitter, LinkedIn, and others to interact with students.	3.67	Very High	7
2. I utilize online integrated software such as google classroom, MS Teams, Moodle, EdApp, and others to plan, implement, facilitate, assess, and monitor student learning.	3.63	Very High	8
3. I use video-conferencing software such as Zoom, Microsoft Teams, Google Meet, Cisco Webex and others to communicate with students, colleagues, community, and others.	3.80	Very High	1
4. I incorporate video and multimedia into lessons and presentations.	3.69	Very High	4
5. I use online software tools such as Google Forms, MS Forms, SurveyMonkey, Facebook poll to solicit opinions, create forms, surveys, and quizzes.	3.69	Very High	4
6. I use video editing apps such as Filmora, iMovie, OBS and others to create video recorded lesson.	3.24	High	10
7. I let my students to use technology as learning tool that may produce and achieve learning objectives.	3.69	Very High	4
8. I give my students a project-based activities where they need the help of technology such as creating videos, poster and others.	3.59	Very High	9
9. I let my students to use technology to help them solve real-world problems and learn to assess information.	3.72	Very High	2
10. I allow my students to use technology as medium to share their ideas to other students that will promote teamwork, cooperation and collaboration.	3.68	Very High	6
Average	**3.64**	**Very High**	

From the data shown in the table 3, the level of technology integration in instruction of Senior High School teachers was *very high* based on overall weighted mean score of 3.64. This means that respondents have very high level of using technology resources such as computers, smartphones, tablets, digital cameras, social media platforms and networks, software applications, the Internet and others in teaching and learning class practices. TPACK framework of Mishra & Koehler [26] describe how teachers integrate technology into instruction in bringing meaningful learning experiences to the students.

It shows that teachers have a very high level of using technology to enhance and support the educational environment and support classroom instruction by using technology in presenting lessons and creating opportunities for students to complete the assigned task using different technological tools rather than with normal pencil and paper. Implementation of technology in classroom, the teachers need to guide students to ensure that they are meeting their learning objectives [27]. Likewise, Ivus et al. [5] emphasized the need for the teachers to develop skills needed to fully utilize digital technology in the classroom and in an online setting.

The finding conforms the following study: Gamboa & Gamboa [28] revealed that teachers are highly competent on MS Word, MS Excel and MS PowerPoint; Javier [29] claimed that most teachers are 'good' in ICT skills to utilized ICT tools and applications for teaching with the internet; Nueva [30] showed that teachers have high level of perceived technology integration practices; Albacete & Banhaw [31] revealed that Filipino found convenience and ease on the practice of technology integration; Ruman & Praksha [32] used TIM in measuring the extent of technology integration among teachers to facilitate their lesson; DeCoito & Richardson [33] proposed professional development opportunities for instructors to learn about the interaction of

technology, pedagogy, and subject matter; Hero et al. [34] reported that Filipino teachers highly practiced the ICT integration as part of their instructional practices and strategies in teaching; Samote & De Guzman [35] describe public school teachers are advanced on the ICT competencies and technological operations; Lestiyanawati [36] indicated that online chat, using video conference, and combining both online chat and video conference in online teaching and learning process were the teaching strategies applied by teacher with the aid of technology; and Hero [37] affirmed that technology integration in instruction helps and assists teachers to bridge the gap between traditional teaching approaches and technology-based teaching and learning tools and facilities.

Table 4. The Challenges Encountered by Teachers in Technology Integration in Instruction

Indicators	*Weighted Mean*	*Verbal Interpretation*	*Rank*
1. Internet connection issues in the area.	3.55	Strongly Agree	1
2. Lack of knowledge to facilitate online application such as Google Classroom, LMS, MS Teams, Moodle, EdApp and others.	2.98	Agree	9
3. Lack of a good internet connection of the student for participating to the online activities.	3.40	Strongly Agree	2
4. Students lack of support system.	3.34	Strongly Agree	3
5. Lack of ability to perform necessary skills needed for successful online teaching.	2.98	Agree	9
6. Limited electronic materials and equipment such as gadgets, laptop and others.	3.15	Agree	4
7. Lack of available technological support from the expert in school.	3.12	Agree	5
8. Lack of proper training and mentoring to fully gasps the use of such tools.	3.09	Agree	6
9. Problem in conducting video-conferencing software such as Zoom, Microsoft Teams, Google Meet, Cisco Webex and others to communicate with students, colleagues, community, and others.	3.02	Agree	7
10. Low computer literacy level.	2.89	Agree	10

Table 4 displays that Internet connection ranks one (1) as the challenge encountered by Senior High School teachers in technology integration in instructions based on weighted mean of 3.55. Senior High School teachers also strongly agree that they experience challenges such as lack of a good internet connection of the student for participating to the online activities (*WM* =3.40), and lack of support system for students (*WM*=3.34). Another hindrance for successful integration of technology in instruction are the following: limited electronic materials and equipment such as gadgets, laptop and others (*WM* =3.15); Lack of available technological support from the expert in school (*WM* = 3.12); lack of proper training and mentoring to fully gasps the use of such tools (*WM* = 3.09); Problem in conducting video-conferencing software such as Zoom, Microsoft Teams, Google Meet, Cisco Webex and others to communicate with students colleagues, community, and others (*WM* = 3.02); lack of ability to perform necessary skills needed for successful online teaching (*WM* = 2.98); Lack of knowledge to facilitate online application such as Google Classroom, LMS, MS Teams, Moodle, EdApp and others (*WM* = 2.98), and low computer literacy level (*WM*=2.89).

This means that teachers admitting that they are experiencing problems related to internet connection, gadgets, computers, required skills, and difficulty in using technology as learning and teaching tool. The findings about challenges encountered by teachers in technology integration in instruction strengthened by König et al. [38] which analyzed the teachers' digital competencies were related to how they mastered the challenges during emergency remote education. Furthermore Fabito et al. [39]; Azhar and Iqbal [40]; Lestiyanawati [36]; Almazova et al.[41]; Ivus et al. [5]; Tomaro [42]; Alda et al. [43]; Emre [44]; Klapproth et al.[45]; Hero [46], Samifanni & Gumanit [46]; and Tarman, Kilinc & Aydin [47]; and Javier [29] listed challenges experienced by the teachers on using technology in teaching and learning process. These includes lack of working are for doing online activities, lack of good internet connection, feedback and clarification from instructors, difficulty in using online and

offline tools and application, lack of facilities, lack of parents' support system, computer literacy level, school support, lack of training, and lack of long-term supports.

Table 5. Difference in the Teachers' Level of 21st century Digital Skills when grouped according to Age

21st Century Digital Skills	F-test	p-value	Interpretation
Information $x_{below30}$=3.46 x_{30-39}=3.43 x_{40-49}=3.56 $x_{50\&above}$=3.19	2.894	0.040*	Significant (Between 40-49 & 50&above)
Communication	0.687	0.562	Not Significant
Collaboration	1.511	0.217	Not Significant
Critical thinking	1.445	0.235	Not Significant
Creativity	1.150	0.333	Not Significant
Problem solving	0.645	0.588	Not Significant

*Significant @ 0.05

As disclosed in table 5, there was no significant difference in communication, collaboration, critical thinking, creativity, problem solving on teachers' level of 21st century digital skills when grouped according to age. While 21st century digital skills under information revealed to have significant difference between teachers aged 40 - 49 and 50 & above with *p*-value of 0.040 at 0.05 margin of error. This means that the respondents who were 40-49 years of age had higher level of 21st century digital skills along information that those who were 50 years of age and above. Supported by the study of Gonzales [13] which revealed significant difference between the level of 21st century skills of faculty members when grouped according to age. Findings support the suggestion of Samifanni and Gumanit [46] that elderly teachers should be providing better technical support to provide quality education. And similar to Hinojo-Lucena et al. [48] that age as conditioning factor when developing digital competence of teachers, especially in the information and data literacy.

Table 6. Difference in the Teachers' Level of 21st century Digital Skills when grouped according to Gender

21st Century Digital Skills	t-test	p-value	Interpretation
Information	0.179	0.858	Not Significant
Communication x_{male}=3.43 x_{female}=3.56	2.375	0.020*	Significant
Collaboration x_{male}=3.43 x_{female}=3.56	3.204	0.002*	Significant
Critical thinking	1.029	0.071	Not Significant
Creativity	1.829	0.071	Not Significant
Problem solving x_{male}=3.43 x_{female}=3.56	3.735	0.000*	Significant

*Significant @ 0.05

As observed from the data in table 6, the constraints under 21st century digital skills such as information, critical thinking and creativity have no significant difference between male and female teachers. While the computed p-value of communication (0.020), collaboration (0.002) and problem solving (0.000) revealed to have a significant difference between male and female senior high school teachers at 0.05 margin of error. This means the female teachers (WM=3.56) had higher level of 21st century skills along communication, collaboration and problem-solving digital skills than the male teachers (WM=3.43). The result of the study is parallel with the result of Rubach and Lazarides [49] about gender being correlated with

the six dimension of teachers' basic ICT competence which includes problem solving, communication and collaboration while argue the result of Gonzales [13] that there is no significant difference between male and female teachers' level of skills.

Table 7. Difference in the Teachers' Level of 21st century Digital Skills when grouped according to Academic Characteristics Profile Variables

21st Century Digital Skills	Highest Educational Attainment			Number of Years in Teaching			Number of Related Trainings Attended		
	Kruskal-Wallis test	p-value	Interpretation	F-test	p-value	Interpretation	F-test	p-value	Interpretation
Information	0.932	0.920	Not Significant	0.419	0.659	Not Significant	1.082	0.343	Not Significant
Communication	3.343	0.502	Not Significant	0.402	0.670	Not Significant	1.931	0.151	Not Significant
Collaboration	1.575	0.813	Not Significant	0.723	0.488	Not Significant	0.139	0.870	Not Significant
Critical thinking	2.898	0.575	Not Significant	1.260	0.288	Not Significant	0.167	0.846	Not Significant
Creativity	3.147	0.534	Not Significant	0.573	0.566	Not Significant	1.342	0.267	Not Significant
Problem solving	4.850	0.303	Not Significant	0.174	0.840	Not Significant	1.443	0.242	Not Significant

Significance level @ 0.05

Table 7 unveils that the constraints under 21st century digital skills have no significant difference on grouped according to highest educational attainment, number of years in teaching, and number of related trainings attended. This means that the level of 21st century digital skills of the teachers was the same, regardless of their highest education attainment, number of years in teaching, and number of related trainings attended. This finding supported by Garcia et al. [50] that the teacher's level of education was not related to the level of digital abilities in the twenty-first century. Same with Blažič & Blažič [51] study that instructors' attitudes regarding seminars and training are the primary cause of inadequate outcomes, particularly in bridging the digital divide with digital skills. It reveals that regardless of how many trainings the teachers attended, their level of digital abilities in the twenty-first century was the unaffected. The same result on Gonzales [13] that length of service of teaching personnel had nothing to do with their level of skills. The result contradicts the study of Hinojo-Lucena et al. [48] claiming that Master's Degree and teaching experiences have significant weight and makes greatest impact on digital competence development of teachers. And, prior training on ICT confirmed that it may affect to for teachers to have low digital competence.

Table 8. Difference in the Teachers' Level of Technology Integration in Instruction and Challenges Encountered by Teachers in Technology Integration in Instruction when grouped according to Profile Variables

Profile	Technology Integration in Instruction			Challenges Encountered		
	Test statistic	p-value	Interpretation	Test statistic	p-value	Interpretation
Age	F=1.419	0.242	Not Significant	F=0.421	0.738	Not Significant
Gender	t=1.265	0.209	Not Significant	t=-1.296	0.198	Not Significant
Highest educational attainment	x^2=4.099	0.393	Not Significant	x^2=2.751	0.600	Not Significant
Number of years in teaching	F=0.111	0.895	Not Significant	F=1.516	0.225	Not Significant
Number of related trainings attended	F=0.495	0.611	Not Significant	F=1.495	0.230	Not Significant

Significance level @ 0.05

21st Century Digital Skills, Technology Integration in Instruction and Challenges Encountered by Senior High School Teachers in Muntinlupa National High School

Table 8 revealed that the teachers' level of technology integration in instructions and challenges encountered have no significant difference when group according to their profile. This means that regardless of the teachers' profile variables, their level of technology integration in instruction and challenges encountered in integrating technology in instructions was the same.

Javier [29] exposed that age and year in teaching are not associated with practices in the use of digital teaching and learning tools, similar to Nueva [30] claimed that age has weaker association with the teachers' belief on using technology. It also underpinned to Sawyer [52] claims that one's ability to integrate ICT into the classroom is not determined by their educational achievement or profile characteristics. As a result, the extent of technology integration in instruction was the same despite of the teachers' profile characteristics. Moreover, findings of the study are comparable with Moralista and Oducado [53] where educational attainment has significantly differed in the favorability toward online education while number of trainings in online teaching was not. The result opposes with Claro et al. [54] assertion that younger teachers with more years of teaching experience performed better on solving information and communication tasks in a digital environment. And contrasting the findings of Germino [55] and Adedokun [56], that there is significant association between the teachers' profile and teachers' capability in technology integration especially on using computers and internet.

While the result in challenges experience by teachers has the same findings with the study of Li et al. [57], where obstacles in utilizing technology into classrooms are observed whatever of the teachers' profile characteristics. Similar to the findings of Tarman, Kilinc & Aydin [47] that there is no statistical difference between male and female teachers' perceived barriers but contradict significant difference between teachers who attended technology-related professional development and those who did not. It also contradicts the study of Hamutogly and Basarmak [58] that lack of training as part of external barriers affects the internal barriers directly and positively in technology integration. Meanwhile, experienced educators suggested way to overcome barriers as posted on the study of Atabek [59], improve quality of in-service and preservice training, allow teachers more time by simplifying number of courses in the instructional program and supplying teachers with technology incentives and technical assistance.

Table 9. Relationship between the Teachers' Level of 21st century Digital Skills and Level of Technology Integration in Instruction

21st Century Digital Skills	Pearson r	p-value	Interpretation
Information	0.516 Moderate Correlation	0.000**	Significant
Communication	0.477 Moderate Correlation	0.000**	Significant
Collaboration	0.564 Moderate Correlation	0.000**	Significant
Critical thinking	0.411 Moderate Correlation	0.000**	Significant
Creativity	0.593 Moderate Correlation	0.000**	Significant
Problem solving	0.484 Moderate Correlation	0.000**	Significant

**Significant @ 0.01

Based on table 9 the computed *r*-value under information is 0.516, communication is 0.477, collaboration is 0.564, critical thinking is 0.411, creativity is 0.593, problem solving is 0.484 are indicating a moderate correlation to level of technology integration. Furthermore, calculated *p*-value from the pair of 21st century digital skills and technology integration in instructions is less than the level of significance at 0.01. Thus, it reveals a significant relationship between the teachers' level of 21st century

digital skills and level of technology integration in instruction. This means that the higher the level of teachers 21st century digital skills, the higher their level of technology integration in instruction. The result is related to the Samonte and De Guzman [35] study which give emphasize on the role of teachers' professional development as a critical factor on the successful integration of computers in teaching. It is also similar to claims of Manco-Chavez et al. [60] and Limjuco [61] about the significant relationship of utilization of technology and level of digital skills.

Table 19. Relationship between the Level of Technology Integration in Instruction and Teachers' Challenges Encountered

Indicator	Pearson r	*p*-value	Interpretation
Level of Technology Integration in Instruction and Challenges Encountered by teachers	0.214 Low correlation	0.037*	Significant

*Significant @ 0.05

Table 19 shows the result of relationship between and level of technology integration in instruction and challenges encountered by teachers. The computed Pearson r-value is 0.214 that shows low correlation between teachers' level of technology integration in instruction and their challenges encountered. There is significant relationship between teachers' level of technology integration in instruction and their challenges encountered based on the calculated p-value of 0.037. Since the p-value is less than the level of significance set for the study (p=0.05) thus, the level of technology integration in instruction of senior high school teachers have significant relationship to the challenges they encountered. It means that the higher is the level of technology integration in instruction, the more challenges the teachers encounter in integrating technology in instructions. When teachers have low integration of technology in the classroom, it means that the chance of encountering challenges is also low. Similar to the claimed of König et al. [38] that teacher's digital competencies to integrate technology were related to how they mastered the challenges during emergency remote education. It conveys an idea that teachers who had experienced more challenges the more likely they mastered technology integration. Findings also comparable to the findings of Sillat et al. [62] on the connection between the use of emerging technologies and teacher's barriers in integrating technology.

IV. CONCLUSIONS

The 21st Century Digital Skills of the Senior High School teachers in Muntinlupa National High School is in very high level. Its composite skills of information, communication, collaboration, critical thinking, creativity, and problem-solving is in very high level while their communication is in high level. The level of technology integration in the instruction of the Senior High School teachers in Muntinlupa National High School is very high. Teachers highly use video conferencing software such as Zoom, Microsoft Teams, Google meet, Cisco, Webex, and others as the technology they integrate for their instructions. The challenges experienced by teachers in integrating technology in instructions are the following; poor internet connection, students' lack of support system, limited electronic materials and equipment, and lack of technological support from the school experts. Senior high school teachers aged 40 to 49 have higher skills in the information of 21st-century digital skills than teachers aged 50 and above. On the other hand, female senior high school teachers have higher skills in communication, collaboration, and problem-solving in 21st-century digital skills than male senior high school teachers. Hence, it can be viewed that the higher the 21st-century digital skills of the teachers, the higher the teachers' level of technology integration in instructions. And, the more challenges teachers encountered in integrating technology into instructions, the higher their level of technology integration into instructions.

V. RECOMMENDATIONS

Teachers should attend and be active in collaboration, participate in peer-to-peer teaching, and promote and maintain effective and active learning communities that promote innovation in technology and 21st-century digital skills. To create an expert teacher that could transform their students to be 21st century digitally skilled, leaders, administrators, and school heads should analyze, design, develop, implement and evaluate programs such as professional development programs to sustain and improve teachers' competence and skill for successfully and effectively using technology in the teaching and learning process. Leaders and school heads should establish continuous training and development through seminars and hands-on workshops for teachers to expand and achieve proficiency levels in using different technological teaching and learning tools for teaching instruction and practices. There is a need for strengthening the partnership between the community and school. Reinforcement is needed from local government, NGOs, barangays, and others to address the problems that hinder the effective adaptation of digital

classrooms and distance learning. School heads should adopt the proposed action plan in this study to resolve issues with the integration of technology in the classroom. It will help to strengthen engagement and enhance the learning experience of learners. Teachers should be innovative and adaptive in integrating essential technological tools for teaching. They should have their initiatives to develop skills and learn operational ability to perform the necessary and critical teaching tools for embracing Education 4.0. Furthermore, similar studies must be conducted using the other population and environments not considered in this study such as investigating 21st-century digital skills of other professions and assessing of actual use of technological learning and teaching tools. They may also consider creating and evaluating a program that will enhance teachers' skills and integration of technology in the classroom.

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