

Digital Age Skills Framework and Teacher Education: Analysis of the Gap Between Theory and Practice

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Abstract

The running era is called digital age because of the large appearance of digital technology which seeks education enables students to be successful in their lives and workplace. Twenty first century skill frameworks are to be considered as a key driver for success, however, its implementation needs reforms and because of economic uncertainty most of the developing countries including Pakistan unable to do so. Therefore, this research project was initiated to reach a resized skill framework that is compatible with the digital age by determining the gap between theory and practice. The gap was explored by examining the difference between the acquired level of skills being imparted in teacher education programs and the required level of skills needed for success in the workplace. Data were collected through a survey of in-service teachers' feedback with the help of a self-developed questionnaire. The average mean score of required skills was found high as compared to acquired, which indicates a gap between the skills being imparted on-campus learning (theory) and the need of the workplace (Practice). The gap may be bridged through the integration of digital-age century skills into the curriculum and instruction of teacher education programs resultantly teacher educators would be able to develop digital-age century skills into prospective teachers.

Keywords: *Teacher education, 21st century skills frameworks, theory and practice*

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Introduction

At the ending of second decay of 21st century, swiftness of information transfer has made it digital century. In fact, this is technological revolution and its challenges have called for new models and maps of arrangements in all walks of life (Rychen and Salganik, 2003). By this time, across the developed world, this revolution in their homes and penetrating progressively in developing countries including Pakistan. The internet and social media have made the world smaller and flatter that use to transforming work, organizations and daily lives. It is rapidly influencing the teaching-learning process and has opened up many avenues of learning that transforming the way of thinking, communicating and learning. Students are matured more than the previous time. Now they are modern learner and have urge to be inspired and challenged in learning. In the digitalized world, the aim of schools is not just preparing students only for the present but for changing the world (Liakopoulou, 2011). Hence, this era demands educational excellence, Ducharme and Shecter (2011) said that excellence could be possible if government take initiatives and take steps in preparing young generation for the current digitalized world. Under circumstances, greater responsibility placed on educational institutions.

The key personnel in the educational institutions who play an important role to bring about any transformation are teachers (Levine, 1998). Ongoing through the literature it is researched fact that conventional teaching “learning by memorization” does not educate a generation to live in and compete with the digital era that has is more complicated, competitive and intertwined. In the context of digital revolution, Grand-Clement (2017) explicates the position of the teacher has shifted from mere preacher to the facilitator of students’ social and emotional behaviors; a mentor for their learning and overall development as a balanced citizen. They have to address the needs of students, provide an opportunity for inquiry, dynamic learning and fostering certain skills that enable them to be successful in their lives (Amin, 2016).

Today, the requirements of skills for teachers are changing; schools need active, more skilled, open to everything new, and optimistic, innovative teachers (Symanyuk and Pecherkina, 2016). The teacher’s role expands to enhance skills including higher-order thinking (HOT) and performance skills (Darling-Hammond, 2006; Symanyuk and Pecherkina, 2016). Moreover, (Feuer, Floden et al., 2013) argued that under the changing world, and the imparting of certain skills including digital literacy skills, information skills, critical thinking, interpersonal, and digital literacy skills, especially life skills and career-based skills, to be considered the responsibility of a teacher.

Principles for learning are higher than they have ever been, thus a teacher in the digital age should be a digital teacher and growing evidence shows that digital teachers should have the capacity to know the students, their spirit, and way to nurture their spirit.

Now teachers need an appropriate level of knowledge and proficiency of skills for constructing and managing classroom-learning activities efficiently. Teachers want to communicate well, having the ability to use technology. Moreover, teachers should equip with problem-solving skills, a creative mindset, and information literacy.

Teacher education is a proven phenomenon that transforms the attitude, skill, and knowledge of in-service and pre-service teachers which make them enables to perform professional responsibilities effectively (Anees, 2005). According to the views of Ullah, Farooq *et al.* (2008) teacher education can prepare neophytes able to address classroom challenges. Hence, programs offered in the teacher education institutions would be planned in such manners that the teachers produced by these programs are “workplace fit” in this digital age.

A Snapshot of Skills Frameworks: International Perspective

Skills, dispositions and abilities are potentially required 21st century skills for society, educators, managers, school leaders and academicians. This is international movement for teacher educators and prospective teachers to equip them with skills which are needed for drastically changing digital age (Wikipedia, 2019). Different characteristics of 21st-century learning skills have emerged. The overview, for instance, in 2002, different members of business community, education leaders, and policymakers introduced skills framework for the teachers and workers. These frameworks of skills are called Partnership for 21st Century Skills (P21), it emphasized seven key skills;

- Critical thinking and problem-solving
- Creativity and innovation
- Cross-cultural understanding
- Communications, information, and media literacy
- Computing and ICT literacy
- Career and learning self-reliance.

In 2003 the Metiri Group and North Central Regional Educational Laboratory (NCREL) presented a two years report of research on the 21st-century skills framework that entitled “ enGauge 21st Century Skills: Literacy in the Digital Age”. The enGauge 21st Century Skills go a step further. Latest cognitive science revealed that real life learning boost students understanding and learning.

The enGauge 21st Century Skills are based on wide research along with high levels workplace readiness which is demanded from government, industry and business. Hence which clearly defines what students need to thrive in today’s Digital Age. To develop common understanding about needs of students, teachers, citizens and workers in digital century the report explicated three types of skills under the umbrella of four

skills. First is named as digital-age literacy which includes basic, technological, scientific, economic, information and visuals, global awareness and multicultural literacies. Second is inventive thinking which comprised of complexity, adaptability, curiosity and self-direction, risk taking, creativity, higher order thinking skills and reasoning. Third is effective communication (collaboration, teaming, complexity, interpersonal skills, interactive communication and civic responsibility). Fourth is high productivity which involves to prioritize things, overall planning, management, effective use of real-world tools, ability to produce appropriate and high-quality products.

The American Association of Colleges and Universities (AACU) recommended some sort of skills essential for a student, named as “The Essential Learning Outcomes”. Students should prepare for twenty-first-century challenges by gaining skills such as writing, critical thinking, quantitative reasoning, communication, intercultural skills, information literacy & ethical reasoning.

According to Friedman (2005) due to the new global trends such as “globalization of economics”, “explosion of scientific and technological knowledge”, global warming and pandemic diseases”, and “changing demographics” each Iowa student will need essential 21st-century skills to lead satisfying lives in this current scenario. Therefore, in the 2007 the Iowa 21st century framework was established i.e. civic, fiscal, health, and technology literacy along with employability skills. In more comprehensive manners the basic framework of skill is comprised of social skill, communication skills, conflict resolution, collaboration, creativity, decision-making, management skill, problem-solving skill, goal setting skill, accountability skills, risk-taking, interpersonal skills, ownership skills, and analyzing skills. This set of Skills Bridge includes knowledge, acquired skills, and dispositions which develop compatibility between education and real life situation. It build capacity in students so they are prepared to lead productive and satisfying lives.

Wanger (2008) stated that today and afterward students must have learned to locate, analyze, interpret and communicate a variety of information, and solve problems creatively and logically, the preface is that in the 21st century, the potential needs of students required scholarly teaching strategies. Therefore, the Connecticut State Department of Education Common Core of Teaching (CCT) (Foundational Skills) has articulated the knowledge, skills, and qualities that Connecticut teachers required to prepare generation able to meet the challenges of the new digital century as communication skills, collaboration skills, literacy skills, analytical skill, social skills, management skills, planning skill, critical thinking, creative thinking, inquiry-based teaching-learning skill, technology literacy skill, interventions skills, monitoring skill, assessment skills.

o help in transforming the teaching, learning, and measurement of 21st-century skills, in 2008 Microsoft Corp; Intel Corporation, and Cisco System Inc., exposed a

project “The Assessment and Teaching of 21st Century Skills (ATC21S). In this project, an effort was made to redefine skills and explored the ways to measure. From around the world, 250 researchers were assembled and in 2009 ATC21S formulated a set of skills essential for teachers, the new generation, and the labor market. The set of skills are creativity and innovation, critical thinking, problem-solving, decision-making, metacognition, communication, collaboration (teamwork), information and communication technology (ICT), literacy skill, social skills, and citizenship skills.

Wagner (2014), in his book *The Global Achievement Gap*, after conducting nearly 100 interviews from top business leaders and observations of American classrooms advocated a list of survival skills. He revealed a vast difference between skills that American businesses seek and expect and skills students are getting. He recommended that we can turn our schools into learning environments that prepare students for the world of work that anticipates them with the help of these Seven Survival Skills i.e. critical thinking & problem solving, collaboration across networks & leading by influence, agility & adaptability, initiative & entrepreneurialism, effective oral & written communication, accessing and analyzing information, and curiosity & imagination.

National Institute of Education, Singapore developed a new Model of Teacher Education for the 21st Century (TE21) for developing teachers who can undertake greater responsibilities as they are at the forefront of educating the youth. This model suggested a framework of skills necessary for raising the standards of youth and at the same teachers are also required to have skills and knowledge which make them effective in bringing the desired change. This model also suggested skills like reflective skills, critical thinking & people management, self-management, administrative skills & management skills, communication skills, facilitative skills, technological skills, innovation & entrepreneurship skills, and social & emotional intelligence skills.

In 2014 Michael Fullan and Maria Langworthy (2014) observed the issue of the digital revolution which is transforming work, organizations, and even daily lives. They addressed the issue and introduced new pedagogy, which is central to the future agenda. They suggested a set of skills called deep learning as a new pedagogy skill such as global citizenship, collaboration, character, communication, creativity and imagination, real-world problem solving, critical thinking, and the use of ICT for learning.

Rational of Current Study

Various modes have been adopted to impart teacher education i.e. face to face, distance, and virtual. Teacher education has also been involved in the development of skills and dispositions along with knowledge transmission (Government of Pakistan, Draft National Education Policy-2017). Teachers, coupled with relevant skills and the right professional attitude, can make magic in the classroom. Around the world, teacher education programs are keys to empowering teachers to prepare the next generation who

are lifelong learners and innovators and proper global citizens (Wellings and Levine, 2009).

The low status of teachers and a theory-based approach is one of the problems with teacher education in Pakistan Nawaz, (2013), in similar context Mahmood (2014), UNESCO (2006), and World Bank Report (2014), reports associated the poor quality at the primary and secondary level of education in Pakistan with the lack of professional skills in teachers. To address this delicacy Government of Pakistan, National Professional Standards for Teacher (2008) emphasized professional competence and skills-based activities and reflective content to include in the curriculum to equipping new teachers with coping competence and professional skills that will help them to deal effectively with students' diverse needs, their personality developmental according to ever-changing world demand. However, the Government of Pakistan, National Education Policy (2009), and National Professional Standards for Teacher (2009) prayed the teacher education curriculum to delineate the development of competence, skills, and attributes, nevertheless, the tool for evaluation of syllabus had not addressed the pray. The tool had evaluated the course objectives, goals/outcomes, and overall coherence.

There is a distance between the theoretical foundation being imparted in teacher education and the market needs that requires the need to provide skills according to the workplace and rethinking the relevance and future role of teacher education, learning, and knowledge (Buaraphan, 2012). In the same context, the planning commission of Pakistan (2018) explicated the reorient teacher education program so that need-based supply of teachers may be ensured at various levels of teaching in line with the Pakistan Vision (2025).

Action Plan for Education (2017) has emphasized that skilled based teacher training is needed to equip learners of all ages, so that they may be able to participate and succeed in a changing world Action Plan for Education (2017). However, a great imbalance exists between the supply and demand of teachers in the context of knowledge, specialized skills, and dispositions (Government of Pakistan, National Education Policy, 2018). The economic growth and development indicators of Pakistan specifically after the agreement between Pakistan and China (CPEC-2015) changing the requirements of the labor market. The labor market, now anticipated skilled workers from secondary level education, therefore, the Ministry of education recommended a diversified curriculum at secondary level education. National Education Policy framework 2017 has addressed the issue and explicitly suggested professional development training of teachers typically provided through pre-service and in-service either formal or non-formal mode should be relevant for job-related skills.

Pakistan launched curriculum reforms across the country. The main thrust of the reforms was to maintain uniform standards in teacher education, transform teacher-centered instruction to student-centered instruction and nurture the necessary skills.

Evidence in the previous sections identified different groups of skills that will be in particularly high demand in the digital age. Pakistan also requires all human resources including teachers master the skills required in a knowledge society to be able to thrive and be successful in the digital century. Government of Pakistan, National Education Policy (2009) used ‘appropriate learning’ and ‘skills needs’ of all neophytes of teacher education programs should be met. However, what types of these “skill needs” are and in addition, how they can be assessed have not been clearly defined. It means the term skills used in National Professional Standards for Teacher in Pakistan (2009) have not yet been operationalized and a gap has been found between theory being imparted in teacher education institutions and the demand of the teachers’ workplace. To bridge the gap between theory and practice following objectives were formulated:

To examine the acquired and required level of skills in terms of knowledge and proficiency imparting teacher education programs.

To determine the gap between the acquired (theory) and required (practice) level of skills?

To identify the kind of skills contributes to the success of teacher education in the digital age workplace.

Method

This part of the study comprised the research methodology used to address the issue. A descriptive survey technique was carried out to collect the data from in-service teachers for analyzing the gap between theory (the extent to which teacher education institutions imparting knowledge and proficiency in skills) and practice (the demands of the workplace). This section also threw light on the description of the population, sample, tool development, and ways to analyze the data.

Participants

All teachers working in the public and the private sector secondary/higher secondary schools in the Punjab were the population and had completed their professional degrees in 2016. The population comprised 6402 secondary/higher secondary schools in the public sector and 2213 in the private sector (PSED-2018). It was quite difficult to draw a random sample because the population was scattered all over Punjab so that teachers were taken conveniently. Out of 38 districts of Punjab, 8(20%) districts were taken randomly, as recommended by Gay (2010) that a sample of 20% was more than sufficient for survey studies. These districts were including Bhakkar, Chakwal, Gujranwala, Lahore, Mianwali, Sargodha, Narowal, and Vehari. The researcher selected out-source persons from these areas and sent 100 questionnaires to each of them with a deadline of 30th May 2019. Fortunately, a good

total i.e., 487 questionnaires were received which were completed in all respect and analyzed.

Instrumentation

The survey provided an opportunity to investigate and mapped out a skill framework that was fit to impart skills in teachers of digitalized age. Surveys typically use quantitative approaches wherein data is collected employing questionnaires (De Vos et al., 2005). To explore the acquired and required level of knowledge and proficiency in skills of in-service teachers, a closed-ended questionnaire was used as the research instrument. In addition, it was identified which skill framework was fit to impart in teachers of digitalized age.

The development of the research instrument was based on an extensive review of the literature. It was relevant to skill frameworks as required for teacher education programs recommended by different advanced countries. These are “The Partnership for 21st Century Skills-2006”, “EnGauge Framework from Metiri/NCREL”, “Iowa Core 21st Century Skills”, “Connecticut State Department of Education-2010, Common Core of Teaching: Foundational Skills”, Assessment & Teaching of 21st Century Skills”, “Survival Skills by Tony Wagner of Harvard Graduate School of Education”, and “Singapore’s TE21 Model of Teacher Education”. The document, National Professional Standards for Teachers in Pakistan (2009) was also reviewed, however, no explicitly, framework of skills was given in National Professional Standards for Teachers in Pakistan. Therefore, the researcher deduced 22 skills from the descriptive paragraph given in the skill part of the document. After validating from five experts, a framework of fifteen skills was finalized (see under the theoretical framework).

It has been seen that many different approaches including National Professional Standards for Teachers in Pakistan (NPST) are representing 21st-century skills, but no single “best” skill framework that applies to all circumstances is available. A considerable congruence among the various skills was figured out through a review of different skill frameworks including National Professional Standards for Teachers in Pakistan and consultation with experts in the field of education. After a degree of consensus among educational experts following common skills were selected to reach a set of digital-age century skill framework:

Table 3

Common Skill Framework (Resized Version)

Skill Framework		
Decision Making	Assessment	Demonstration
Creative Thinking	ICT Literacy	Management
Scientific Literacy	Time Management	Need Analysis

Problem Solving	Communication	Social
Adoptability	Leadership	Interpersonal
Collaboration	Critical Thinking	

The questionnaire was developed by focusing skills framework given in Table. It was divided into two parts; (i) in-service teacher's demographic characteristics and (ii) the survey of the in-service teachers' levels of knowledge and proficiency on 17 different skills. In a questionnaire, the definition of each skill was given so that everyone may have perceived the meaning of each skill. Each of the 17 skills was assessed on a 5-point Likert type scale (ranging from "0" to "4") in terms of the level of knowledge and proficiency. Level of knowledge and proficiency of skills means the in-service teachers have acquired during their graduation at teacher education institutions and as teachers, they are feeling required at the workplace.

The level of knowledge was assessed by scale ranged as follows: no knowledge (0), basic knowledge (1), limited knowledge (2), sufficient knowledge (3), and more than sufficient (4). The level of proficiency was assessed using a scale that ranged as no proficiency (0), low proficiency (1), novice proficiency (2), good proficiency (3), and high proficiency (4).

For facilitating to the respondent, meanings of acquired and required levels related to knowledge and proficiency were also given in the questionnaire.

Data Collection and Analysis

The data were collected by questionnaire from in-service teachers through personal contacts. Descriptive and inferential statistics were used for data analysis. Data were entered and analyzed using Statistical Package for the Social Science (SPSS) version 25 for windows. A significance level of $\alpha = .05$ was set as a priority. Descriptive statistics were used to identify means and standard deviations for the skills and a *t-test* was computed to explore the status of the gap between the acquired and desired level of knowledge and proficiency in skills.

Findings

In this part the major findings exposed through analyses of the data using the statistical package

for the Social Science (SPSS) version 25 for windows. Statistical analyses were used to assess the difference between the acquired level of skills and the required level of skills in terms of

knowledge and proficiency. The table given below indicated the teachers' acquired and required

level of skills in terms of knowledge compared through paired sample *t-test*.

Table 4

Paired sample t-test Analysis of Acquired and Required level of Knowledge in Dimensions of Skills

Skills	Level	Knowledge		<i>t</i>	<i>p</i> -value
		<i>M</i>	<i>SD</i>		
Decision Making	Acquired	0.74	.303	-24.084	0.000
	Required	2.65	1.035		
Creative Thinking	Acquired	0.85	1.404	-23.021	0.000
	Required	2.68	0.974		
Scientific Literacy	Acquired	0.92	1.194	-33.767	0.000
	Required	3.07	0.717		
Problem Solving	Acquired	0.88	1.108	-41.651	0.000
	Required	3.26	0.679		
Adoptability	Acquired	2.60	0.696	7.106	0.001
	Required	2.24	0.843		
Collaboration	Acquired	2.38	0.827	1.799	0.003
	Required	2.28	0.872		
Demonstration	Acquired	2.34	0.858	2.032	0.003
	Required	2.23	0.831		
Management	Acquired	2.35	0.873	4.017	0.007
	Required	2.13	0.787		
Need Analysis	Acquired	2.39	0.966	2.770	0.006
	Required	2.22	0.906		
Assessment	Acquired	1.08	0.918	3.573	0.003
	Required	3.27	0.845		
ICT Literacy	Acquired	2.41	0.938	4.436	0.000
	Required	2.16	0.854		
Time Management	Acquired	1.03	1.127	7.454	0.000
	Required	2.69	1.174		
Communication	Acquired	1.12	1.192	-3.546	0.000
	Required	2.99	0.923		
Leadership	Acquired	2.25	1.133	6.913	0.000
	Required	2.77	0.936		
Critical Thinking	Acquired	0.56	1.241	-15.585	0.000
	Required	2.76	0.991		
Social	Acquired	1.20	1.181	-25.211	0.000
	Required	2.98	0.964		
Interpersonal	Acquired	1.10	0.742	-4.563	0.001
	Required	2.73	0.934		

n = 487, *df* = 486 at 0.05 level of confidence

Results in Table 4 showed that there was statistical significant difference between acquired level of skills and required level of skills in decision-making ($t_{(486)} = -24.084$, $p < .05$), creative thinking ($t_{(486)} = -23.021$, $p < .05$), scientific literacy ($t_{(486)} = -$

33.767, $p < .05$), problem solving skills ($t_{(486)} = -41.651$, $p < .05$), assessment ($t_{(486)} = 3.573$, $p < .05$), time management ($t_{(486)} = 7.454$, $p < .05$), communication ($t_{(486)} = -3.546$, $p < .05$), critical thinking ($t_{(486)} = -15.585$, $p < .05$), social skill ($t_{(486)} = -25.211$, $p < .05$), and interpersonal skill ($t_{(486)} = -4.563$, $p < .05$). Furthermore, the mean greater than 1 indicated that teachers had acquired fundamental/basic level of knowledge in decision-making skill ($M = 0.74$), creative thinking skill ($M = 0.85$), scientific literacy skill ($M = 0.92$), problem-solving skill ($M = 0.88$), and critical thinking skill ($M = 0.56$). Additionally, in assessment skill ($M = 1.08$), time management skill ($M = 1.03$), communication skill ($M = 1.12$), social skill ($M = 1.20$), and interpersonal skill ($M = 1.10$), mean values were found greater than 1 indicating that teachers had got limited knowledge, nevertheless, in these skills, the required level of knowledge was greater than 2 (i.e., mean > 2). That means teacher education institutions did not meet the expectation of skills required by the workplace.

The findings also showed that teachers believed in having acquired sufficient knowledge (mean > 2) of adaptability ($M_{(Acq)} = 2.60 > M_{(Req)} = 2.24$), collaboration ($M_{(Acq)} = 2.38 > M_{(Req)} = 2.28$), demonstration ($M_{(Acq)} = 2.34 > M_{(Req)} = 2.23$), management ($M_{(Acq)} = 2.35 > M_{(Req)} = 2.13$), need analysis ($M_{(Acq)} = 2.39 > M_{(Req)} = 2.22$), and ICT literacy ($M_{(Acq)} = 2.41 > M_{(Req)} = 2.16$). It is further revealed that a statistically significant difference ($p < .05$) between the acquired and required level of knowledge was also found in the set of skills as given in Table 4.

Based on the above interpretation and graph, it can be concluded that in-service teachers had acquired a basic introductory level of knowledge of decision-making skills, creative thinking skills, scientific literacy skills, problem-solving skills, assessment skills, time management skills, communication skills, leadership, critical thinking skill, social skill, and interpersonal skill as compared to the required level of skills. The table given below indicated the teachers' acquired and required level of skills in terms of proficiency compared through paired sample *t*-test.

Table 5

Paired sample t-test Analysis of Acquired and Required level of proficiency in Skill Dimensions

Skills	Level	Proficiency			
		SD	<i>t</i>	<i>p</i> -value	
Decision Making	Acquired	0.73	1.084	-31.830	0.000
	Required	3.06	1.159		
Creative Thinking	Acquired	0.80	1.076	-28.187	0.000
	Required	2.91	1.145		
Scientific Literacy	Acquired	0.89	0.910	-35.376	0.000
	Required	3.24	1.091		

Problem Solving	Acquired	0.95	0.968	-36.640	0.000
	Required	3.25	1.052		
Adoptability	Acquired	2.86	0.820	-3.238	0.007
	Required	2.94	0.901		
Collaboration	Acquired	2.75	1.073	1.745	0.002
	Required	2.79	1.134		
Demonstration	Acquired	2.74	1.022	-2.397	0.002
	Required	2.78	1.078		
Management	Acquired	2.80	1.057	2.611	0.020
	Required	2.78	1.105		
Need Analysis	Acquired	1.39	1.079	-22.094	0.000
	Required	2.77	1.005		
Assessment	Acquired	0.83	0.974	-49.092	0.000
	Required	3.67	0.890		
ICT Literacy	Acquired	2.21	1.466	-17.082	0.000
	Required	3.56	0.923		
Time Management	Acquired	1.13	1.049	-36.436	0.000
	Required	3.57	0.993		
Communication	Acquired	0.95	1.077	-23.723	0.000
	Required	3.50	0.907		
Leadership	Acquired	1.84	1.246	-23.024	0.000
	Required	3.46	0.859		
Critical Thinking	Acquired	0.09	1.281	-18.863	0.000
	Required	3.44	0.981		
Social	Acquired	1.01	1.283	-20.446	0.000
	Required	3.50	0.985		
Interpersonal	Acquired	0.21	1.123	-21.031	0.000
	Required	3.01	0.822		

$n = 487$, $df = 486$ at 0.05 level of confidence

Data in the Table 5 depicted that there was statistical significant difference between acquired and required level of proficiency in decision-making skill ($t_{(486)} = -31.830$, $p < .05$), creative thinking skill ($t_{(486)} = -28.187$, $p < .05$), scientific literacy skill ($t_{(486)} = -35.376$, $p < .05$), problem solving skill ($t_{(486)} = -36.640$, $p < .05$), need analysis ($t_{(486)} = -22.094$, $p < .05$), assessment ($t_{(486)} = -49.092$, $p < .05$), time management ($t_{(486)} = -36.436$, $p < .05$), communication ($t_{(486)} = -23.723$, $p < .05$), critical thinking ($t_{(486)} = -18.863$, $p < .05$), social skill ($t_{(486)} = -20.446$, $p < .05$), and interpersonal skill ($t_{(486)} = -21.031$, $p < .05$). But teachers graduated from professional educational institutions had acquired basic level means (>1) and novice (>2) level of proficiency in decision-making skill ($M = 0.73$), creative thinking skill ($M = 0.80$), scientific literacy skill ($M = 0.89$), problem-solving skill ($M = 0.95$), need analysis skill ($M = 1.39$), assessment skill ($M = 0.83$), time management skill ($M = 1.13$), communication skill ($M = 0.95$), critical thinking skill ($M = 0.09$), social skill ($M = 1.01$), interpersonal skill ($M = 0.21$) as compared to the

required level of proficiency (i.e. mean > 2). Thus, in-service teachers had acquired a comparatively basic level of proficiency (mean > 2). According to the data given in Table 4, the t-values indicated that there was no significant difference ($p < .05$) between acquired and required levels of proficiency of skills i.e., adaptability, collaboration, demonstration, management, ICT literacy, and leadership. Moreover, the mean scores of acquired and required level of proficiency of skills were greater than 2 but lesser than 3.5. It means respondents believed that they had acquired an intermediate level of proficiency as required.

So, it can be inferred from analysis and graph that majority of the in-service teachers had acquired a basic level of proficiency of decision-making skill, creative thinking skill, scientific literacy skill, problem-solving skill, need analysis skill, assessment skill, ICT literacy skill, time management skill, communication skill, leadership, critical thinking skill, social skill, and interpersonal skill.

The Gap between Theory and Practice

This part responds to the third question, which deals with the determination of the gap between theory and practice. The gap was determined based on the difference between overall mean scores of acquired and required level of knowledge and proficiency of skills. This part combines the analysis of the acquired ratings and required ratings to determine specific skills that were in high demand, but acquired rates were low.

The skills gap was measured through the difference between the acquired level and the required level of knowledge and proficiency of skills. Table 8 and their relevant graphs indicated that the mean scores of acquired knowledge of all skills were ranged from 0.43 to 2.19 (mean difference = 1.76), while the required mean scores were ranged from 0.25 to 3.27 (mean difference = 3.02). Similarly, the mean scores of acquired proficiency of all skills were ranged from 0.74 to 2.86 (mean difference = 2.12), while the required scores were from 0.76 to 3.67 (mean difference = 2.91). The average required skills gap was high (i.e., for knowledge 3.02; for proficiency 2.91) as compared to acquired (i.e., for knowledge 1.76; for proficiency 2.12). Furthermore, there was a statistically significant difference at .05% level between acquired and required level of knowledge and proficiency of skills. The difference indicated that there was a skills gap between theory and practice and the mean scores of ten of seventeen skills were found low. These skills were decision-making, creative thinking, scientific literacy, problem-solving, assessment, time management, communication, critical thinking, social, and interpersonal. In these skills, teachers were not having sufficient knowledge and proficiency and gave value to them due to their usefulness at the workplace. It can be concluded that these skills were required (i.e., demand of the workplace) because

initial/pre-service teacher education institutions had not delivered sufficient knowledge and proficiency. Therefore, initial/pre-service teacher education institutions had not met the workplace expectations, which indicated a skills gap between theory and practice.

Discussion and Conclusion

Generally, an increasing emphasis on skills for employability is referred to as workplace skills. Many international thought leaders, business leaders, and researchers are immensely requesting education systems to prepare students with skills and competencies that will enable them to face complex challenges now and shortly. This dream cannot be fulfilled without developing digital era skills in teachers. If teachers would be equipped with knowledge and proficiency in digital-age demanding skills, then they would be able to develop skills in their students.

To explore what are the digital-age century skills is the basic purpose of this study, so it contributed to existing calls for action in digital century skills? Skills are required not to gain employment, but also to progress within an organization to achieve one's potential and contribute successfully according to the organization's direction. Through this research, an effort was put to present a new set of skills to whom to be called "Digital-age Century Skills". It was determined on exploring the gap between theories (i.e., the content of the courses taught in teacher educational institutions) and practices (demand of the workplace) in terms of assessing acquired and required level of knowledge and proficiency of in-service teachers.

In this study, seventeen skills were selected by reviewing the different skills frameworks within the teacher education perspective including National Professional Standards for Teachers (NPST) in Pakistan. These skills were decision making, creative thinking, scientific literacy, problem-solving, adaptability, collaboration, demonstration, management, need analysis, assessment, ICT literacy, time management, communication, leadership, critical thinking, social and interpersonal. In-service teachers were surveyed using a questionnaire that comprised earlier mentioned skills. The cumulative mean difference between the acquired level of knowledge and proficiency was found at 1.76 and 2.12 respectively. Similarly, the cumulative mean difference between the required level of knowledge and proficiency was found to be 3.02 and 2.91 respectively. It is concluded that the mean scores of required skills were higher as compared to acquired, and in all cases, a statistically significant difference was found ($p < .05$).

Therefore, the average difference between acquired and the required level of knowledge and proficiency is indicating a gap between theory and practice. The gap indicated that teachers did have sufficient knowledge and proficiency in ten out of seventeen skills and gave value to them due to their needs at the workplace. Several

studies found that graduates perceived that their course content and classwork had not sufficiently prepared them for real-world practice (Clapton, et al., 2004). Thompson (2000), for example, also showed that there is an intolerable gap between theory and practice, a disjuncture between what is taught or learned and what is required and practiced.

It is therefore pointed out that in-service teachers are demanding preparation in the skills i.e., decision-making, creative thinking, scientific literacy, problem-solving, assessment, time management, communication, critical thinking, social, and interpersonal. It also shows that in-service teachers are satisfied with acquired and required level of skills i.e., adaptability, collaboration, demonstration, management, need analysis, ICT literacy, and leadership skill. The reason for expecting the set of ten skills from pre-service teacher education institutions may be the result of increased innovation, and the universality of information and communication technologies. Riboud, Tan et al. (2009) mentioned that skills acquired in professional institutions become obsolete more speedily in the globalization and digital era, and therefore to learn higher-order thinking skills that are more complex are crucial to respond to the current digital-age revolution. Based on the overall mean scores, as perceived by the in-service teachers ten skills were found most valuable for success at the workplace. There was a range of creative thinking ($M=2.70$) to interpersonal skills ($M=2.23$). Creative thinking has emerged as the most valued skill for success at the workplace followed by critical thinking. Similarly, communication skill is proceeding by scientific literacy and so on.

In the previous section, it has been seen that many different approaches are representing 21st-century skills but there is no single “best” skill framework that applies to all circumstances. Over the past two decades, there has been a growing debate about the selection and implementation of skill frameworks. Through this study, an effort was made to reconcile the different approaches and develop an empirical-based skill framework that can meet the needs of present digital-age teacher educators, school educators, and students. The emergence of these skills is not unexpected at all and it is quite similar to those obtained from other skill frameworks. In current research (as shown in figure 6), there is a set of 10 of the many skills, as like to call it “Digital-age Century Skills” that today teachers should possess. “Digital-age Century Skills” has emerged to be essential not only for the success of teacher education in the digital era but also for participation in other areas of life and build cohesive communities with active citizens playing a role in civic life. Based on the literature “Digital-age Century Skills” can further be divided into two categories such as higher-order thinking skills (decision-making, creative thinking, scientific literacy, problem-solving, and critical thinking) and life and career skills (assessment, time management, communication, social, and interpersonal skill).

The education system of Pakistan is not well ranked among many of the developing countries. One of the reasons is that the system is based on cramming (Fatima, 2018). All stages of education including primary, secondary, higher education even engineering and medical education, the system does not stress creativity, innovation, conceptual learning but provides a way of cramming to pass the examination. Due to this, Pakistan is lagging in the race of developing innovations, inventions, and making discoveries. The problem is not limited to general education but is prevalent in teacher education too.

Barring a few, all teacher education institutions are asked to student's brains is to copy and paste. Teacher educators feed to prospective teachers by providing certain notes, giving un-creative assignments, content-oriented presentations, plagiarized assignments and there is a crisis of research work. The teacher education system is not focusing on developing and improving higher order of thinking skills among prospective teachers i.e., creativity, imagination, innovation, critical thinking. Such type of outgoing teacher having lacked skills if deputed for a teaching job would lead towards cramming approach and unable to develop required skills among the young generation.

In the era of digital technology and globalization, making an atom bomb or aeroplane is likely to be a reinvention of the wheel. The time of copying is over; this is a digital age. In simple words, the digital age means knowledge and proficiency in learning and higher-order thinking skill, information, media, and technology skills, and life and career skills.

National Education Commission (2006) reported that teacher educators failed to impart 21st-century professional skills due to traditional teaching methods and outdated curriculum of Initial teacher training institutions, henceforth; several key competencies have been incorporated in the National Professional Standards for Teachers in Pakistan (2009). In these standards, the sample anticipating behaviors is identified in the outline of knowledge, disposition, and skills. Higher Education Commission, under the guidelines of National Professional Standards for Teachers, developed courses for B.Ed.(Honor)-Elementary/B.Ed-1.5 programs courses, for instance, Critical Thinking and Reflective Practices, Citizenship Education and Community Engagement, Communication Skills (Technical Writing & Presentation Skills), General Science and Art, Crafts and Calligraphy. In these courses, prospective teachers are given opportunities to attain knowledge and skills commonly linked to 21st-century skills.

There is precursory evidence that most of the in-service teachers irrespective of gender, type of school (public, private) or location (urban, rural) perceived their current level of knowledge and proficiency in "Digital-age Century Skills" are appeared to be basic level than the corresponding required level. In-service teachers have a point of view that teacher education institutions are not sufficiently equipped with "Digital-age Century Skills" that they have yet to acquire knowledge and proficiency of skills

commonly needed at the workplace. This lacking is well figured out through the findings of this study in terms of the “skills gap” between acquired (theory) and required (practice) level of knowledge and proficiency. The “skills gap” indicated that in-service teachers had acquired a common understanding of the basic or introductory type of knowledge and proficiency of skills but were unable to apply it across multiple situations. The finding is much congruent to the research reports of Reigeluth *et al.*, (2009) and Voogt *et al.* (2013), in which they exposed some reasons, for example, inadequate implementation of teaching strategies in line with imparting skills, non-conducive learning environment.

It may also be assumed that teacher educators themselves do have not the ability to perform the actions associated with digital-age century skills without assistance. They are unable to explain the process or skills to foster a greater understanding among prospective teachers, colleagues, and external constituents Law, Lee *et al.* (2002) further support this assumption, by adding that if teachers did not perceive 21st-century skills as important then they would not be able to arrange, prepare and design pedagogical activities to support students’ development of skills. The “skills gap” between the acquired and required level of knowledge and proficiency are likely to suggest a need for sustained change effort in improving the learning environment and pedagogical practices (Fraser, 2012)

No doubt, it is true that Pakistan has no dearth of talent but it needs to sharpen and the tremendous responsibility is placed on teacher education institutions. The “skills gap” between acquired (theory) and required (practice) implied that the current content of teacher education programs has not been effective in developing “Digital-age Century Skills”. While the existence of learning gaps between the actual and required skills shows that course content, does not fit the needs of the workplace. Voogt, Erstad *et al.* (2013) Voogt *et al.* (2013) added that the skills gap between theory & practice is due to the lack of integration of skills into curriculum, and assessment.

Consequently, teacher education for success in the digital age workplace needs to bridge the “skills gap” between theory and practice. The “skills gap” can be bridged through a curriculum integration approach. Imbedding in the existing teacher education curriculum the instruction of “Digital-age Century Skills” content and themes which are based on the finding of this study. Incorporating the “Digital-age Century Skills” framework into the curriculum and instruction for every prospective teacher can help to ensure equitable opportunities to develop the skills in terms of knowledge and proficiency needful to succeed in the workplace.

To bridge the skills gap, it may be pertinent to say that Higher Education Commission (HEC) should review the prevailing curriculum and need to make those subjects in preference that can well equip the neophytes with “Digital-age Century Skills”. The curriculum renewal process makes it possible to focus increased attention on

the development of “Digital-age Century Skills” that will be increasingly needed in our changing society, integration of information & communication technology, globalization, China-Pakistan Economic Corridor, and the classrooms of tomorrow. Another important thing is that higher-order thinking skills are not limited to mere sciences and technology content. It is boundless from poetry, painting, sculpture, and architecture.

To do something new and different has proven a deciding behavior in the rise and fall of nations. Nevertheless, this deciding behavior is nothing but a dream that can be fulfilled by teacher educators with the help of their teaching. This report is a source of information and worthy practice, for The National Curriculum Review Committee (NCRC) for teacher training programs, National Accreditation Council for Teacher Education, Punjab Higher Education Commission, policymakers, and teacher educators, on how to enable prospective teachers to take on a challenging role in the classroom, use groundbreaking methods of teaching, that help young people to develop digital-age century skills. Teacher educators may also need to revisit their teaching and prepare their course files to consider the development of Digital-age Century Skills through thought-provoking activities, creative assignments, and innovative presentations. Moreover, Group Discussions, Role-plays, Just A Minute (JAM) session, and Case Studies, etc. may be organized in classrooms.

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