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The Making of a 21st Century English Language Teacher during the Pandemic

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Abstract

English language has become a cosmopolitan language. It is the lingua franca of the 21st century. This fact has turned learning the language to a must since it is the international language of communication. As teachers of English for more than 20 years, we have come to realize that to be successful in class, we need to learn and use English as a tool that helps us access information from other cultures and be able to transfer this knowledge and skill to our learners. We also need to provide our learners with enough exposure to English as used in context. However, this is not enough to turn our learners into 21st century citizens of the world. We need to help them become critical thinkers. This has become even harder with the move to online learning due to COVID 19 pandemic. This paper aims at exploring the perceptions of English language instructors in four local Lebanese universities regarding 21st-century critical thinking skills and the instructors' abilities to promote such skills in their classes. Twenty-seven teachers filled a questionnaire, and five participants were interviewed. Descriptive data were analyzed. The data revealed the perceptions and practices of these instructors. The study concludes with recommendations.

Introduction

In the past two decade several 'big' technology corporations in the West have been complaining about the lack of 21st century skills that their newly graduated employees have (Tsourapa, 2018). Although some of these newly graduate employees had a high GPA, their knowledge is incomplete. There is a discrepancy between their GPA and their competencies due to their lack of 21st century skills (Griffin et al, 2012). Without 21st century skills, new graduates won't be able to fulfill the requirements needed at work. In this manner, all educators need to know if their learners have 21st century skills to determine what to teach these learners (Toch, 2011). In other words, university learners don't just need theories in their classes, they also need to be exposed to real world situations in their classrooms. Consequently, instructors have to present their learners with real world problems to provide these learners with an authentic situation which these learners will face in the workplace (Fatmawati, 2018).

Two questions arise here: the first question is 'what are 21st century skills? These are "core competencies such as collaboration, digital literacy, critical thinking, and problem solving … that students need to thrive in today's

world" (Rich, 2010, par. 1). The second question is 'what is the relationship between 21st century skills and English as Foreign Language (EFL)/ English as Second language (ESL). The answer is simple: EFL/ESL classes are needed in our current century because English has been the lingua franca of the world for more than 30 years. And it is in these classes that instructors need to prepare their learners to become active members who can communicate well, possess critical thinking, practice good problem-solving skills, and work well and efficiently within a team (Voke, 2018).

EFL/ESL instructors can easily find publications discussing 21st century skills. Posting the question 'what are 21st century skills?' on Google will give you 251,000,000 results in 0.77 seconds! However, this broad topic can lead to different interpretations depending on the environment being discussed. In corporation 21st century skills are those required to succeed in the workplace such as collaboration, decision making and communication; in educational institutes they are information and media literacy along with critical thinking and 'smart' social media (Kelly et al, 2019). Therefore, a unified definition is needed. For the convenience of this paper, the 21st century skills that are chosen are: problem-solution, critical thinking, communication, collaboration, and computer literacy. Moreover, EFL/ESL teachers have an obligation to act in response to the needs of their learners to prepare them to become effective 21st century global citizen. EFL/ESL learners don't need traditional teachers; on the contrary, they need teachers who can better prepare them for the new globalized and digitalized world (Baran-Lucarz & Klimas, 2020; Fandino, 2013; Faulker & Latham, 2016). Thus, "the focus in language education in the twenty-first century is no longer on grammar, memorization and learning from rote, but rather using language and cultural knowledge as means to communicate and connect to others around the globe" (Eaton, 2010, p 5 as cited by Baran-Lucarz & Klimas, 2020).

In the years 2019-2021, during the time of COVID 19, learning and teaching were forced to move to a new medium: online platforms. Learners, in general, have experienced this shift easier than most of their teachers because these learners possess new and new literacies (Tsourapa, 2018) since they are 'Digital Natives' (Prensky, 2001). On the other hand, these digital natives' teachers are mostly traditional who have been introduced to the world of technology and online platforms through the World Wide Web (www) when they were older (Tsourapa, 2018). These teachers are 'digital immigrants' (Prensky, 2001). In the Lebanese context, several 'digital immigrant' teachers were forced to move to online learning in 2019 due to COVID-19 without any preparation. Some had it easy while others didn't. some applied their teaching skills online while others found difficulty. The former could have been successful in helping their learners develop 21st century skills, while the latter might not have been able to do so. Therefore, this study becomes worth carrying out to survey the teachers' perceptions and beliefs regarding meeting their learners' needs of acquiring 21st century skills.

Purpose of The Study

In a quest to make EFL teaching efficient and effective, and following other fields of study to keep up with the 21st century skills and competencies, the aim of this study is to investigate and explore the perceptions and practices of EFL/ESL teachers in four local universities in Lebanon concerning 21st century skills.

Research Questions

To investigate the EFL/ESL teachers' perceptions and practices towards the development of 21st century skills, the following questions are explored:

1. What are teachers' perceptions towards the development of 21st century skills in EFL/ESL classes?
2. To what extent are teachers promoting 21st century skills?
3. To what extent are EFL/ESL instructors critical thinkers?

In short, because the researchers believe that EFL/ESL classes are not only designed for teaching the English language; their roles extend to preparing their learners to become 21st century global citizen, this study has been conducted to explore the perceptions and practices of some EFL/ESL university instructors. In the subsequent sections, the literature review, methodology, results, and discussion are presented.

Literature Review

Citizens of the world need to be equipped with knowledge, skills, and the right attitudes to be fully capable of participating and contributing to their societies. This need is greatly attributed to the changes in society, and more specifically, to the rapid development of technology and its impact on people's way of life, their work, and their education. In this rapid change, education needs to contribute to the development of factual and procedural knowledge, in the information or knowledge society the development of conceptual and metacognitive knowledge is increasingly considered important. The 21st century skills are the skills that address the individuals' non-traditional capacities and raise their positivism and contribution to their surrounding environment. According to Ledward and Hirata (2011), 21st century skills are a blend of content knowledge, specific skills, expertise, and literacies necessary to succeed in work and life. Ledward and Hirata point out that these skills are more than technological literacy and include proficiency in critical thinking, problem solving, communication, and teamwork. Ultimately, these skills allow people to thrive in the new economy since they help people a) access, synthesize, and communicate information; b) work collaboratively across differences to solve complex problems; and c) create new knowledge through the innovative use of multiple technologies

According to Trilling and Fadel (2009), each of the core skills of the 21st century addresses areas people need to acquire and develop. Life and career, for instance, describe the ability to be flexible, adaptable, self-directed, socially aware, accountable, and responsible. For their part, learning and innovation include the ability to be creative and innovative, critical, problem-solving, communicative, and collaborative. Finally, information, media and technology consist in the ability to access and use information, to create and analyze media products, and to apply technology effectively. Once studied and incorporated into curriculum, instruction, and assessment, these skills can help schools and teachers set up learning environments capable of developing the essential abilities needed in the 21st century (Lai & Viering, 2012)

For these skills to be learned, teachers need to be trained and become well-equipped to teach and guide students to become competent in these essential skills for this century. Researchers have explored various teacher training programs. Urbani, Roshandel, Michael and Truesdell (2017) investigated 21st century skill training,

teaching ability and teacher education program. The study focused on 21st century skills elements (Creativity, Critical thinking, Communication, Collaboration, Information Media, and Technology skills) presented by Partnership for 21st skills. A mixed-methods approach was used to indicate professional, applied, and personal development, ability of preservice and in-service teachers. Data was collected from four courses in which all preservice teachers attend in California. The results demonstrated the simultaneous integration developing, assessing, and modeling of the 21st century skills had the most effect on preservice teachers' teaching.

Another study was conducted by Shahin and Han (2020) which aimed to investigate EFL teachers' level of awareness and attitude towards 21st century skills in a city of Turkey. The findings of the qualitative and quantitative study revealed that 178 EFL teachers have strong attitude towards 21st century skills. Teaching experiences, working school environment factors had no relationship to the attitudes of ELT towards 21st century skills. Furthermore, the results revealed that EFL teachers think positively about using technology in their courses and find these technological tools, materials effective in teaching and in their daily lives.

Moreover, Al Bahal (2019) recommended that English Language classrooms need to be filled with meaningful and intellectually stimulating activities, practices, and processes that allow students to not just articulate thoughts and ideas effectively using oral, written, and nonverbal communication, but to also understand complex ideas, use multiple media and technologies, make judgments and decisions, and work creatively with others. As a result, teachers should be aware of the importance of the 21st century skills and the curriculum should be tailored to meet the needs of this century.

To structure the analysis of 21st century skills, several conceptual models have been created. One of those models is the one proposed by the North Central Regional Educational Laboratory and the Metiri Group (Lemke, 2002). Lemke (2003) explains that this model provides a framework to define what students need to thrive in today's digital age. The framework identifies four general skills through four dimensions: digital-age literacy, inventive thinking, effective communication, and high productivity. The first dimension involves being able to use digital technology and communication tools to create, manage, and evaluate information to function in a knowledge society. Inventive thinking has to do with people's cognitive abilities to apply information technologies in complex and sustained situations and to understand the consequence of doing so. The third dimension includes the ability to clearly communicate with others either orally or in writing using a wide range of media and technology. Finally, high productivity covers abilities to prioritize, plan and manage for relevant and high-quality products and results.

Method

This study followed the qualitative method since the purpose is to explore and investigate the perceptions of ESL/EFL teachers regarding 21st century skills. The qualitative method for this kind of study is the most appropriate because it is investigating a phenomenon to come up with recommendations to addressed matter (When to Use Qualitative Research, 2020).

Instruments

Based on the research questions and the relevant literature, two questionnaires were used. One questionnaire was developed and the other adopted from a previous study. One questionnaire was designed for teachers in order to collect data about their teaching methods- to what extent they incorporate critical thinking in their lesson, Questionnaire A (QA); and the other questionnaire B (QB) also for teachers to gather data regarding their critical thinking skills.

The QA consists of 20 questions which test to what extent do the teachers assist their learners in developing critical thinking. It is based on Likert scale where respondents were asked to choose among the scale of 1-3 where 1 is the least and 3 is the maximum. It was piloted for testing where five EFL/ESL teachers evaluated it and based on their evaluation, the questionnaire was adjusted and reached its final form. Piloting is essential in research studies since it increases the validity of the survey (Cohen et al, 2007). QB is a 50-item questionnaire developed by Kelly et al (2019). The questions are classified into four sections: critical thinking, creativity, communication, and collaboration. The respondents were asked to choose between agree to disagree.

Interviews with five ESL/EFL instructors were conducted to inquire about their perceptions towards the development of 21st century skills in EFL/ESL classes. Interviews are vital for research since they provide a wealth of information gathered from a small size of participants. These interviews provide the researchers with information about the participants' attitudes, opinions, and knowledge of a certain topic. Moreover, interviews are essential for qualitative research because they assist the researchers in explaining the participants' behavior and opinions alongside explaining certain phenomenon (Research Methods Guide: Interview Research, 2018).

Participants

Both surveys QA and QB were emailed to 50 participants who are colleagues of the researchers. Only 27 teachers returned the questionnaires. Five EFL/ESL instructors from three universities were interviewed: two program coordinators and three regular teachers.

Data Collection

The surveys were sent via email to the 50 participants during the month of August and were collected via email by September. The data collected from the surveys were analyzed using SPSS. Descriptive data was computed by finding the means and averages. The interviews were conducted at the end of September using online platforms: Google Meet and Teams by Microsoft office. The interviews lasted between 20 to 30 minutes where the participants answered three questions.

1. Do you believe that 21st century skills are important? Why?
2. Is it the responsibility of ESL/EFL instructors to introduce their learners to 21st century skills?
3. To what extent do you incorporate 21st century skills in your lessons?

Notes were taken during the interviews for the researchers to synthesize and analyze at the end.

Results

Out of the 50 questionnaires sent to the 50 teachers in the four local universities where the researchers teach, only 27 instructors filled out the two questionnaires and turned them in.

Research question 2: To what extent are teachers promoting 21st-century skills?

The research question was answered through the QA questionnaire. As indicated in Table 1, 59.3% of the teachers are familiar with the term 21st century skills and only 7.4% are not, however, 33% are neutral with the term of 21st century. Adding the 33% to the 7%, it sums up to 40%, which is quite a large percentage. It reveals that teacher training programs and teacher trainers should clearly articulate 21st-century strategies in their training programs and include strategies for critical thinking skill development and the proper methods to teach these skills.

Table 1. Are You Familiar with the Term 21st Century Skill?

	Frequency	Percent
agree	16	59.3
neutral	9	33.3
disagree	2	7.4
Total	27	100.0

Table 2 shows that most of the teachers, 63% agree that it is needed to train 21st century skills, and only 37% are undecided. This finding is in accordance with the findings of Table 1. The instructors who are neutral to the knowledge of 21st-centry skills, and most probably do not know what the skills are, could not determine if these skills should be taught and incorporated in the ESL/EFL classes. Yet as Table 2 reveals, although 40% of teaches are neutral with the term 21st-century skills, 63% agree that the skills are needed. The result could be because the idea of critical thinking is always desired in general, and people seek it to adapt to their daily lives. The matter here is that teachers might know the sub-categories of 21st-century skills but believe that critical thinking is needed.

Table 2. Do You Think it is needed to Train 21st Century Skill?

	Frequency	Percent
agree	17	63.0
neutral	10	37.0
Total	27	100.0

What is even more unexpected is that 59.3% of teachers ranked themselves as critical thinkers, as Table A.1 indicates (see Appendix). It is the same percentage that had heard of the 21st-century skills. Table A.1, moreover, shows that most teachers surveyed rank themselves as problem solver (44.4%) and as a decision

maker (44.4%), with critical thinking as a maximum level (59.3%). 48 % of them help their learners develop their 21st century skills in a maximum way. 41 % rank their teaching impact the improvement of their learners' 21st century skills as moderate and 37% as maximum. 44% rank that giving a project assignment to their learner's impact their 21st century skills development as moderate and 41% as maximum. 48% of the teachers rank that their teaching influenced their learners' 21st century skills development as moderate and 37% as maximum. 48% as an overall, rank their classes support their learners in developing 21st century skills as moderate and 41% as maximum. The percentages of teachers that are informed of 21st-century skills is reflected through the survey. The percentages that spread between 48% and 59 % are almost the same as the findings of Table 1. These findings indicate that once teachers possess knowledge of what 21st-century skills are, they usually incorporate these skills in their lessons.

On the other hand, Table A.1 also reveals that 56% of the teachers rank that the project assignment helps their learners in developing their critical thinking as a maximum level. 48% think moderately that project assignments help their learners in developing their problem-solving skills and equal percentage was shown between minimum and maximum ranking (26%). 56% of them rate the impact of the project assignment on developing their learners' decision-making skill as moderate. 44% rank moderately that the project assignments influence their learners' work in team/collaboration skill and 37% as a maximum level. 41% as an overall, rank moderately the project assignment influence their learners' development of their 21st century skills and 37% as maximum. These findings indicate that the participating teachers did not know that these skills help develop 21st-century skills. Perhaps if they had known, they might have emphasized them in their teachings to assist their learners develop their skills. Therefore, these methods should be clearly articulated in the teacher-training programs and workshops.

Table 4 shows that all questions have as a mode 2 or 3; this indicates that most teachers ranking is moderate or maximum level, which is also shown by the mean of all questions that varies between 2.04 and 2.52 which show that all teachers' responses rank was between these 2 levels. An explanation for this finding could be that even if 40% of the teachers who had not heard of the 21st-century skills are themselves to some extent critical readers and that the material they use in their classes to teach ESL/EFL follow the inquiry-based method and promote critical thinking.

Table A.2 (see Appendix) shows that there is evidence of a statistically significant bivariate association between every two ordinal variables where p-value <0.05 except for Variable 15 where we can notice that it is not correlated with variables 1,2,3,4,5,7,8, 9, 10 and 11. Also between variable 3 and 4, 8,9 and 16, where their p-value >0.05. When the correlation coefficients between V1(at what level do you rank yourself as a decisionmaker?) and all other variables are added and p-value < 0.05 which indicates a positive relationship. It is reflected in teachers' reply to maximum on V1 tend to occur with other variables. And this is noticed with all other variables except for V 15 (The project assignments influence your learners' work in team/collaboration skill), the p-value>0.05 with variables 1,2,3,4,5,7,8,9,10,11, that is the results of the teachers occurred due to chance, no association between the variables. The same result was noticed between variables 3 with 4,8,9 and 16.

Table 4. Descriptive Statistics

	Mean	Median	Mode
How do you rank yourself as a critical thinker?	2.48	3	3
How do you rank yourself as a problem solver?	2.19	2	3
At what level do you rank yourself as a decision maker?	2.22	2	3
How well do your learners work with others?	2.04	2	2
How much do you help your learners develop their 21st century skills?	2.30	2	3
How far does your teaching impact the improvement of your learners' 21st cent skills?	2.15	2	2
Does giving a project assignment to your learners impact their 21st century skil development?	2.26	2	2
How far has your teaching influenced your learners' 21st century skills development?	2.22	2	2
Overall, do your classes support your learners in developing 21st century skills	2.30	2	2
How well do you teach your learners what they need to know before starting a project assignment?	2.48	3	3
How do you rank your attitude in providing the project assignment consultatior	2.52	3	3
How far does the project assignment help your learners in developing their criti thinking?	2.41	3	3
Do you think that project assignments help your learners in developing their problem-solving skills?	2.00	2	2
Rate the impact of the project assignment on developing your learners' decision-making skill	2.07	2	2
The project assignments influence your learners' work in team/collaboration skil	2.19	2	2
Overall, does the project assignment influence your learners' development of the 21st century skills?	2.15	2	2
Do you require your learners to develop a plan in completing their project assignment?	2.22	2	3
Do you give your learners clear feedback related to the results of their projects?	2.37	3	3

Research Question 3: To what extent are EFL/ESL instructors critical thinkers?

This research question is answered through QB that assesses the teachers' 21st-century critical thinking abilities. The table (see Appendix) shows that all statements that display collaboration activity, the agreement percentage was the highest. However, the statements "make sure all team members' ideas are equally valued" and "make detailed plans about the use of technology" had neutral percentage which was greater than agreement level. Moreover, we can notice that there is no one that disagreed with all statements except "make detailed plans about the use of technology" where the value is 3.7%, and "offer assistance to others in their work when needed" is 22%. These findings are in accordance with the data presented in Table A.1. The conclusion that one can draw from interpreting the data of Table A.3 is that these teachers are critical thinkers and possess 21st-century skills even though some of them (around 40%) did not know what 21st-century skills are.

Table 5 shows that the mode of most statements is 1, which means that most teachers were satisfied concerning their collaboration ability. However, the teachers were not quite satisfied when it came to the statements "make sure all team members' ideas are equally valued", and "make detailed plans about the use of technology." The mode of these two statements was 2, indicating that most teachers were neutral towards these statements. The

mean of all statements ranges between 1 and 1.59, which is between agreement and neutral. We can conclude here that these teachers possess and apply most of 21st century skills, yet the most important skill in time of COVID 19, that is the use of technology, they are not 'comfortable' with since they do not outline their plans of using it.

Table 5. Collaboration Ability

	Mean	Median	Mode
create a task list that divides project work reasonably among the team	1.52	1	1
help the team solve problems and manage conflicts	1.41	1	1
provide feedback useful to team members	1.26	1	1
track our team's progress toward goals and deadlines	1.41	1	1
help resolve issues without asking the teacher for help	1.52	1	1
acknowledge and respect other perspectives	1.00	1	1
interact with team members effectively	1.30	1	1
assign roles as needed, based on team members' strengths	1.56	1	1
make sure all team members' ideas are equally valued	1.52	2	2
be polite and kind to teammates	1.00	1	1
involve all team members in tasks	1.22	1	1
follow rules for team decision-making	1.22	1	1
complete research to contribute to the team	1.07	1	1
use time, and run meetings, efficiently	1.37	1	1
consistently use technology as agreed upon by the team to manage project tasks	1.41	1	1
come physically and mentally prepared each day	1.30	1	1
offer assistance to others in their work when needed	1.52	1	1
make detailed plans about how the team will work together	1.59	2	2
complete tasks without having to be reminded	1.15	1	1
improve my own work when given feedback	1.04	1	1
make detailed plans about the use of technology	1.52	1	1
follow rules for team meetings	1.07	1	1

Table A.4 (see Appendix) indicate that the teachers feel that they possess 21st century skills. Table 8 shows that most teachers agree that they "understand how knowledge or insights might transfer to other situations or contexts", "recognize the limitations of our design and know when to consider alternatives", "evaluate reasoning and evidence that support an argument ", "identify in detail what needs to be known to answer a science inquiry question" , "develop follow-up questions that focus or broaden inquiry", "revise drafts and justify revisions with evidence" , "develop follow-up questions to gain understanding of the wants and needs of client or product users" , "understand a Driving Question (a driving question---> questions that lead to critical thinking)", "thoroughly assess the quality of information" ,"gather relevant and sufficient information from different sources " except for "justify choices of evaluation criteria" their responses was equally between neutral and agreement.

Finally, Table A.5 to A.8 (see Appendix) show a high correlation between all the variables of a subskill and between the different skills. We can infer from this that all teachers filled their questionnaire accurately and did

not just choose answers randomly. For instance, in Table A.5 all variables of critical ability are highly correlated except variables 11 " justify choices of evaluation criteria" and V2 "recognize the limitations of our design and know when to consider alternatives" , V4 "identify in detail what needs to be known to answer a science inquiry question" and V5 "develop follow-up questions that focus or broaden inquiry" which shows that teachers were consistent in their answers. Table A.6 shows that all variables of creativity ability skills were highly correlated with p-value < 0.05 which indicates that teachers' perception of the frequency of how many times they practice critical thinking that leads them to the acquisition of creativity is consistent. Moreover, Table A.7 concludes that all eleven variables of communication skills are highly correlated (p-value <0.05), while Table A.8 shows that there is a strong correlation between the variables of the four abilities of the 21st century skills (Collaboration, Critical thinking, creativity and communication) where p-value <1. In conclusion, the participating EFL/ESL teachers purposefully filled out QB and the result can be considered reliable.

The interviews with teachers aimed at exploring their "*perceptions towards the development of 21st century skills in EFL/ESL classes*". The teachers interviewed showed agreement that the 21st century skills are important and essential for EFL/ESL them. They all believed that having these skills does enrich the class environment and supports the critical thinking application by students. Critical thinking, collaboration and cooperation were skills that these teachers emphasized because they believe that in this century and especially with the advent of Covid 19 Pandemic, students were and are in need for such skills to adapt to this rapid change in their social, academic, and personal lives. Three out of five teachers believed that one of the responsibilities teachers have is to help and prepare students to become 21st century citizens. Therefore, we should incorporate these skills in our classes. The other two teachers, on the other hand, disagree and believe that their job is merely teaching English in their classes. They added that they can not incorporate such skills because they believe that their students will be overwhelmed especially that they are weak and lack English language proficiency.

The general result of this study concludes that ESL/EFL teachers who participated in the study possess 21st century skills such as communication, critical thinking and problem solving (Ledward&Hirata,2011). These teachers assist their learners in acquiring and developing the needed skills (Trilling & Fadel, 2009) to become an efficient 21st century global citizen. The skill that is lacking is connected to technology as seen by the responses of the participants which indicate that they do not plan in detail their incorporated technology classes as Urbany et al. (2017) recommended; however, theses teachers have positive attitudes toward 21st century skills particularly critical thinking (Shahi & Han,2020). Finally, the responses show that these teachers have used project-based activities which help in acquiring 21st century skills, especially critical thinking. Moreover, these activities are interesting and do engage the learners in their lessons (Al Bahal,2019).

Conclusions and Recommendations

In this time when everything is constantly changing, the need to stay up to date and always on board has become a must for teachers who are responsible for administering and catering for the newly arising needs of students. The 21st century brought new challenges for EFL/ESL teachers as well as for all educators. This study aimed at exploring and investigating EFL/ESL teachers' perceptions, knowledge of the 21st century skills and whether

they are implementing these skills. Results showed that most ESL/EFL teachers believe that they should implement the 21st century skills in their classes because these skills are real life skills and would help learners become citizens of this century and always adapting to change.

It is highly recommended that teacher-training programs for 21st century skills should be available for all teachers at all levels for the skills to be incorporated in the lessons and in teaching methodologies. The 21sy century skills need to be clearly articulated and highlighted to teachers to ensure proper implementation of these skills. Another recommendation is for teacher-training programs in up to date/ sophisticated technologies which provide a better access to information, knowledge, and collaboration and that will enhance teachers' critical thinking which will in turn benefit the learners. The role of EFL/ESL teachers should be emphasized because they are the ones who are teaching the LINGUA FRANCA/ENGLISH the language that is connecting the whole world. For learners to become citizens of this century, they also need to be citizens of the world and to be citizens of the world, they need English as an essential tool for communication and collaboration.

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Appendix. Additional Tables

Table A.1.

		least	moderate	maximum
How do you rank yourself as a critical thinker?	Count	3	8	16
	%	11.1%	29.6%	59.3%
How do you rank yourself as a problem solver?	Count	7	8	12
	%	25.9%	29.6%	44.4%
At what level do you rank yourself as a decision maker?	Count	6	9	12
	%	22.2%	33.3%	44.4%
How well do your learners work with others?	Count	3	20	4
	%	11.1%	74.1%	14.8%
How much do you help your learners develop their 21st century ski	Count	5	9	13
	%	18.5%	33.3%	48.1%
How far does your teaching impact the improvement of your learner	Count	6	11	10
21st century skills?	%	22.2%	40.7%	37.0%
Does giving a project assignment to your learners impact their 21st	Count	4	12	11
century skills development?	%	14.8%	44.4%	40.7%
How far has your teaching influenced your learners' 21st century ski	Count	4	13	10
development?	%	14.8%	48.1%	37.0%
Overall, do your classes support your learners in developing 21st	Count	3	13	11
century skills?	%	11.1%	48.1%	40.7%
How well do you teach your learners what they need to know befor	Count	7		20
starting a project assignment?	%	25.9%		74.1%
How do you rank your attitude in providing the project assignment	Count	3	7	17
consultation?	%	11.1%	25.9%	63.0%
How far does the project assignment help your learners in developin	Count	4	8	15
their critical thinking?	%	14.8%	29.6%	55.6%
Do you think that project assignments help your learners in develop	Count	7	13	7
their problem-solving skills?	%	25.9%	48.1%	25.9%
Rate the impact of the project assignment on developing your learne	Count	5	15	7
decision-making skill	%	18.5%	55.6%	25.9%
The project assignments influence your learners' work in	Count	5	12	10
team/collaboration skill	%	18.5%	44.4%	37.0%
Overall, does the project assignment influence your learners'	Count	6	11	10
development of their 21st century skills?	%	22.2%	40.7%	37.0%
Do you require your learners to develop a plan in completing their	Count	7	7	13
project assignment?	%	25.9%	25.9%	48.1%
Do you give your learners clear feedback related to the results of the	Count	6	5	16
projects?	%	22.2%	18.5%	59.3%

Table A.2.

Correlations

			V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
Spearman's rho	V1	Correlation Coefficient	1.00	.415*	.548**	.559**	.556**	.784**	.616**	.687**	.602**	.769**	.687**	.913**	.758**	.574**	.314	.298	.686**	.774**
		Sig. (2-tailed)	.	.031	.003	.002	.003	.000	.001	.000	.001	.000	.000	.000	.000	.002	.111	.131	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V2	Correlation Coefficient	.415*	1.00	.409*	.323	.856**	.718**	.741**	.696**	.715**	.727**	.637**	.437*	.673**	.571**	.275	.584**	.788**	.683**
		Sig. (2-tailed)	.031	.	.034	.101	.000	.000	.000	.000	.000	.000	.000	.023	.000	.002	.165	.001	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V3	Correlation Coefficient	.548**	.409*	1.00	.544**	.533**	.420*	.401*	.355	.352	.770**	.492**	.569**	.618**	.366	.081	-.073	.424*	.509**
		Sig. (2-tailed)	.003	.034	.	.003	.004	.029	.038	.069	.072	.000	.009	.002	.001	.060	.688	.718	.028	.007
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V4	Correlation Coefficient	.559**	.323	.544**	1.000	.549**	.656**	.437*	.445*	.458*	.537**	.340	.608**	.709**	.761**	.677**	.406*	.586**	.565**
		Sig. (2-tailed)	.002	.101	.003	.	.003	.000	.023	.020	.016	.004	.083	.001	.000	.000	.000	.036	.001	.002
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V5	Correlation Coefficient	.556**	.856**	.533**	.549**	1.00	.879**	.854**	.813**	.870**	.743**	.492**	.560**	.804**	.650**	.334	.667**	.812**	.696**
		Sig. (2-tailed)	.003	.000	.004	.003	.	.000	.000	.000	.000	.000	.009	.002	.000	.000	.089	.000	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V6	Correlation Coefficient	.784**	.718**	.420*	.656**	.879**	1.00	.871**	.903**	.901**	.755**	.579**	.777**	.881**	.735**	.431*	.696**	.881**	.826**
		Sig. (2-tailed)	.000	.000	.029	.000	.000	.	.000	.000	.000	.000	.002	.000	.000	.000	.025	.000	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V7	Correlation Coefficient	.616**	.741**	.401*	.437*	.854**	.871**	1.00	.954**	.978**	.668**	.344	.633**	.809**	.645**	.326	.774**	.867**	.746**
		Sig. (2-tailed)	.001	.000	.038	.023	.000	.000	.	.000	.000	.000	.079	.000	.000	.000	.097	.000	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V8	Correlation Coefficient	.687**	.696**	.355	.445*	.813**	.903**	.954**	1.00	.929**	.653**	.419*	.693**	.827**	.662**	.343	.800**	.827**	.715**
		Sig. (2-tailed)	.000	.000	.069	.020	.000	.000	.000	.	.000	.000	.030	.000	.000	.000	.080	.000	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V9	Correlation Coefficient	.602**	.715**	.352	.458*	.870**	.901**	.978**	.929**	1.00	.623**	.312	.592**	.787**	.613**	.284	.754**	.849**	.748**
		Sig. (2-tailed)	.001	.000	.072	.016	.000	.000	.000	.000	.	.001	.113	.001	.000	.001	.151	.000	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V10	Correlation Coefficient	.769**	.727**	.770**	.537**	.743**	.755**	.668**	.653**	.623**	1.00	.811**	.758**	.822**	.568**	.217	.261	.822**	.838**
		Sig. (2-tailed)	.000	.000	.000	.004	.000	.000	.000	.000	.001	.	.000	.000	.000	.002	.277	.188	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V11	Correlation Coefficient	.687**	.637**	.492**	.340	.492**	.579**	.344	.419*	.312	.811**	1.00	.673**	.579**	.398*	.164	.092	.569**	.628**
		Sig. (2-tailed)	.000	.000	.009	.083	.009	.002	.079	.030	.113	.000	.	.000	.002	.040	.413	.649	.002	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V12	Correlation Coefficient	.913**	.437*	.569**	.608**	.560**	.777**	.633**	.693**	.592**	.758**	.673**	1.00	.771**	.655**	.458*	.346	.644**	.718**
		Sig. (2-tailed)	.000	.023	.002	.001	.002	.000	.000	.000	.001	.000	.000	.	.000	.000	.016	.078	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V13	Correlation Coefficient	.758**	.673**	.618**	.709**	.804**	.881**	.809**	.827**	.787**	.822**	.579**	.771**	1.00	.861**	.557**	.580**	.850**	.799**
		Sig. (2-tailed)	.000	.000	.001	.000	.000	.000	.000	.000	.000	.000	.002	.000	.	.000	.003	.002	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V14	Correlation Coefficient	.574**	.571**	.366	.761**	.650**	.735**	.645**	.662**	.613**	.568**	.398*	.655**	.861**	1.000	.885**	.673**	.713**	.647**
		Sig. (2-tailed)	.002	.002	.060	.000	.000	.000	.000	.000	.001	.002	.040	.000	.000	.	.000	.000	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V15	Correlation Coefficient	.314	.275	.081	.677**	.334	.431*	.326	.343	.284	.217	.164	.458*	.557**	.885**	1.000	.578**	.410*	.322
		Sig. (2-tailed)	.111	.165	.688	.000	.089	.025	.097	.080	.151	.277	.413	.016	.003	.000	.	.002	.034	.101
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V16	Correlation Coefficient	.298	.584**	-.07	.406*	.667**	.696**	.774**	.800**	.754**	.261	.092	.346	.580**	.673**	.578**	1.00	.670**	.419*
		Sig. (2-tailed)	.131	.001	.718	.036	.000	.000	.000	.000	.000	.188	.649	.078	.002	.000	.002	.	.000	.029
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V17	Correlation Coefficient	.686**	.788**	.424*	.586**	.812**	.881**	.867**	.827**	.849**	.822**	.569**	.644**	.850**	.713**	.410*	.670**	1.000	.893**
		Sig. (2-tailed)	.000	.000	.028	.001	.000	.000	.000	.000	.000	.000	.002	.000	.000	.000	.034	.000	.	.000
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
	V18	Correlation Coefficient	.774**	.683**	.509**	.565**	.696**	.826**	.746**	.715**	.748**	.838**	.628**	.718**	.799**	.647**	.322	.419*	.893**	1.000
		Sig. (2-tailed)	.000	.000	.007	.002	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.101	.029	.000	.
		N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table A.3.

Collaboration ability

		agree	neutral	disagree
create a task list that divides project work reasonably among the tea	Count	16	8	3
	%	59.3%	29.6%	11.1%
help the team solve problems and manage conflicts	Count	19	5	3
	%	70.4%	18.5%	11.1%
provide feedback useful to team members	Count	20	7	
	%	74.1%	25.9%	
track our team's progress toward goals and deadlines	Count	16	11	
	%	59.3%	40.7%	
help resolve issues without asking the teacher for help	Count	14	12	1
	%	51.9%	44.4%	3.7%
acknowledge and respect other perspectives	Count	27		
	%	100.0%		
interact with team members effectively	Count	19	8	
	%	70.4%	29.6%	
assign roles as needed, based on team members' strengths	Count	18	3	6
	%	66.7%	11.1%	22.2%
make sure all team members' ideas are equally valued	Count	13	14	
	%	48.1%	51.9%	
be polite and kind to teammates	Count	27		
	%	100.0%		
involve all team members in tasks	Count	21	6	
	%	77.8%	22.2%	
follow rules for team decision-making	Count	21	6	
	%	77.8%	22.2%	
complete research to contribute to the team	Count	25	2	
	%	92.6%	7.4%	
use time, and run meetings, efficiently	Count	17	10	
	%	63.0%	37.0%	
consistently use technology as agreed upon by the team to manage project tasks	Count	16	11	
	%	59.3%	40.7%	
come physically and mentally prepared each day	Count	19	8	
	%	70.4%	29.6%	
offer assistance to others in their work when needed	Count	19	2	6
	%	70.4%	7.4%	22.2%
make detailed plans about how the team will work together	Count	11	16	
	%	40.7%	59.3%	
complete tasks without having to be reminded	Count	23	4	
	%	85.2%	14.8%	
improve my own work when given feedback	Count	26	1	
	%	96.3%	3.7%	
make detailed plans about the use of technology	Count	14	12	1
	%	51.9%	44.4%	3.7%
follow rules for team meetings	Count	25	2	
	%	92.6%	7.4%	

Table A.4.

Critical ability

		agree	neutral	disagree
understand how knowledge or insights might transfer to other situations or contexts	Count	18	9	
	%	66.7%	33.3%	
recognize the limitations of our design and know when to consider alternatives	Count	16	11	
	%	59.3%	40.7%	
evaluate reasoning and evidence that support an argument	Count	15	12	
	%	55.6%	44.4%	
identify in detail what needs to be known to answer a science inquiry question	Count	16	9	2
	%	59.3%	33.3%	7.4%
develop follow-up questions that focus or broaden inquiry	Count	15	12	
	%	55.6%	44.4%	
revise drafts and justify revisions with evidence	Count	20	7	
	%	74.1%	25.9%	
develop follow-up questions to gain understanding of the wants ai needs of client or product users	Count	14	13	
	%	51.9%	48.1%	
understand a Driving Question (a driving question---> questions tl lead to critical thinking)	Count	14	13	
	%	51.9%	48.1%	
thoroughly assess the quality of information	Count	16	11	
	%	59.3%	40.7%	
gather relevant and sufficient information from different sources	Count	20	7	
	%	74.1%	25.9%	
justify choices of evaluation criteria	Count	13	13	1
	%	48.1%	48.1%	3.7%

Table A.5.

Correlations

			V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
Spearman's rho	understand how knowledge or insights might transfer to other situations or contexts	Correlation Coefficient	1.000	.853**	.632**	.586**	.791**	.657**	.577**	.577**	.693**	.657**	.469*
		Sig (2-tailed)	.	.000	.000	.001	.000	.000	.002	.002	.000	.000	.014
		N	27	27	27	27	27	27	27	27	27	27	27
	recognize the limitations of our design and know when to consider alternatives	Correlation Coefficient	.853**	1.00	.472*	.779**	.927**	.542**	.408*	.710**	.847**	.542**	.296
		Sig (2-tailed)	.000	.	.013	.000	.000	.004	.035	.000	.000	.004	.133
		N	27	27	27	27	27	27	27	27	27	27	27
	evaluate reasoning and evidence that support an argument	Correlation Coefficient	.632**	.472*	1.00	.237	.400*	.491**	.928**	.481*	.472*	.661**	.781**
		Sig (2-tailed)	.000	.013	.	.235	.039	.009	.000	.011	.013	.000	.000
		N	27	27	27	27	27	27	27	27	27	27	27
	identify in detail what needs to be known to answer a science inquiry question	Correlation Coefficient	.586**	.779**	.237	1.00	.710**	.680**	.372	.706**	.640**	.456*	.365
		Sig (2-tailed)	.001	.000	.235	.	.000	.000	.056	.000	.000	.017	.061
		N	27	27	27	27	27	27	27	27	27	27	27
	develop follow-up questions that focus or broaden inquiry	Correlation Coefficient	.791**	.927**	.400*	.710**	1.00	.491**	.331	.630**	.775**	.491**	.217
		Sig (2-tailed)	.000	.000	.039	.000	.	.009	.091	.000	.000	.009	.277
		N	27	27	27	27	27	27	27	27	27	27	27
	revise drafts and justify revisions with evidence	Correlation Coefficient	.657**	.542**	.491**	.680**	.491**	1.00	.614**	.614**	.542**	.807**	.603**
		Sig (2-tailed)	.000	.004	.009	.000	.009	.	.001	.001	.004	.000	.001
		N	27	27	27	27	27	27	27	27	27	27	27
	develop follow-up questions to gain understanding of the wants and needs of client or product users	Correlation Coefficient	.577**	.408*	.928**	.372	.331	.614**	1.00	.555**	.408*	.614**	.917**
		Sig (2-tailed)	.002	.035	.000	.056	.091	.001	.	.003	.035	.001	.000
		N	27	27	27	27	27	27	27	27	27	27	27
	understand a Driving Question (a driving question---> questions that lead to critical thinking)	Correlation Coefficient	.577**	.710**	.481*	.706**	.630**	.614**	.555**	1.00	.710**	.614**	.496**
		Sig (2-tailed)	.002	.000	.011	.000	.000	.001	.003	.	.000	.001	.008
		N	27	27	27	27	27	27	27	27	27	27	27
	thoroughly assess the quality of information	Correlation Coefficient	.693**	.847**	.472*	.640**	.775**	.542**	.408*	.710**	1.00	.542**	.439*
		Sig (2-tailed)	.000	.000	.013	.000	.000	.004	.035	.000	.	.004	.022
		N	27	27	27	27	27	27	27	27	27	27	27
	gather relevant and sufficient information from different sources	Correlation Coefficient	.657**	.542**	.661**	.456*	.491**	.807**	.614**	.614**	.542**	1.00	.517**
		Sig (2-tailed)	.000	.004	.000	.017	.009	.000	.001	.001	.004	.	.006
		N	27	27	27	27	27	27	27	27	27	27	27
	justify choices of evaluation criteria	Correlation Coefficient	.469*	.296	.781**	.365	.217	.603**	.917**	.496**	.439*	.517**	1.00
		Sig (2-tailed)	.014	.133	.000	.061	.277	.001	.000	.008	.022	.006	.
		N	27	27	27	27	27	27	27	27	27	27	27

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table A.6.

Correlations

			V1	V2	V3	V4	V5	V6	V7	V8
Spearman's rho	elaborate and improve on ideas	Correlation Coefficient	1.000	.783**	.771**	.714**	.454*	.771**	.570**	.661**
		Sig (2-tailed)	.	.000	.000	.000	.017	.000	.002	.000
		N	27	27	27	27	27	27	27	27
	use brainstorming to generate original ideas	Correlation Coefficient	.783**	1.000	.839**	.767**	.583**	.687**	.439*	.702**
		Sig (2-tailed)	.000	.	.000	.000	.001	.000	.022	.000
		N	27	27	27	27	27	27	27	27
	find sources of information and inspiration when others do not	Correlation Coefficient	.771**	.839**	1.000	.613**	.429*	.841**	.432*	.703**
		Sig (2-tailed)	.000	.000	.	.001	.025	.000	.024	.000
		N	27	27	27	27	27	27	27	27
	use creativity and imagination	Correlation Coefficient	.714**	.767**	.613**	1.000	.636**	.769**	.648**	.775**
		Sig (2-tailed)	.000	.000	.001	.	.000	.000	.000	.000
		N	27	27	27	27	27	27	27	27
	create new, unique, surprising products	Correlation Coefficient	.454*	.583**	.429*	.636**	1.000	.429*	.796**	.686**
		Sig (2-tailed)	.017	.001	.025	.000	.	.025	.000	.000
		N	27	27	27	27	27	27	27	27
	combine different elements into a complete product	Correlation Coefficient	.771**	.687**	.841**	.769**	.429*	1.000	.586**	.703**
		Sig (2-tailed)	.000	.000	.000	.000	.025	.	.001	.000
		N	27	27	27	27	27	27	27	27
	promote a variety of creative perspectives	Correlation Coefficient	.570**	.439*	.432*	.648**	.796**	.586**	1.000	.713**
		Sig (2-tailed)	.002	.022	.024	.000	.000	.001	.	.000
		N	27	27	27	27	27	27	27	27
	create ideas geared to the intended client or user	Correlation Coefficient	.661**	.702**	.703**	.775**	.686**	.703**	.713**	1.000
		Sig (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.
		N	27	27	27	27	27	27	27	27

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table A.7.

Correlations

			V1	V2	V3	V4	V5	V6	V7	V8	V9
Spearman's rho	use appropriate media to enhance understanding	Correlation Coefficient	1.000	.657**	.807**	.657**	.727**	.315	.904**	.596**	.807**
		Sig (2-tailed)	.	.000	.000	.000	.000	.110	.000	.001	.000
		N	27	27	27	27	27	27	27	27	27
	adapt a communication style appropriate for the purpose, task, or audience	Correlation Coefficient	.657**	1.00	.657**	.833**	.746**	.505**	.756**	.434*	.837**
		Sig (2-tailed)	.000	.	.000	.000	.000	.007	.000	.024	.000
		N	27	27	27	27	27	27	27	27	27
	speak clearly and professionally	Correlation Coefficient	.807**	.657**	1.00	.657**	.727**	.475*	.904**	.771**	.807**
		Sig (2-tailed)	.000	.000	.	.000	.000	.012	.000	.000	.000
		N	27	27	27	27	27	27	27	27	27
	create a clear and interesting introduction and conclusion	Correlation Coefficient	.657**	.833**	.657**	1.00	.918**	.654**	.756**	.434*	.837**
		Sig (2-tailed)	.000	.000	.000	.	.000	.000	.000	.024	.000
		N	27	27	27	27	27	27	27	27	27
	present all information clearly, concisely, and logically	Correlation Coefficient	.727**	.746**	.727**	.918**	1.00	.521**	.824**	.510**	.912**
		Sig (2-tailed)	.000	.000	.000	.000	.	.005	.000	.007	.000
		N	27	27	27	27	27	27	27	27	27
	clearly communicate alternative or opposing perspectives	Correlation Coefficient	.315	.505**	.475*	.654**	.521**	1.00	.429*	.616**	.475*
		Sig (2-tailed)	.110	.007	.012	.000	.005	.	.026	.001	.012
		N	27	27	27	27	27	27	27	27	27
	organize information well	Correlation Coefficient	.904**	.756**	.904**	.756**	.824**	.429*	1.000	.697**	.904**
		Sig (2-tailed)	.000	.000	.000	.000	.000	.026	.	.000	.000
		N	27	27	27	27	27	27	27	27	27
	use appropriate body language when presenting	Correlation Coefficient	.596**	.434*	.771**	.434*	.510**	.616**	.697**	1.000	.596**
		Sig (2-tailed)	.001	.024	.000	.024	.007	.001	.000	.	.001
		N	27	27	27	27	27	27	27	27	27
	answer questions clearly and concisely	Correlation Coefficient	.807**	.837**	.807**	.837**	.912**	.475*	.904**	.596**	1.000
		Sig (2-tailed)	.000	.000	.000	.000	.000	.012	.000	.001	.
		N	27	27	27	27	27	27	27	27	27

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table A.8.

Correlations

			collaboration ability	critical thinking ability	creativity ability	communication ability
Spearman's rho	collaboration ability	Correlation Coefficient	1.000	.929**	.851**	.881**
		Sig (2-tailed)	.	.000	.000	.000
		N	27	27	27	27
	critical thinking ability	Correlation Coefficient	.929**	1.000	.948**	.895**
		Sig (2-tailed)	.000	.	.000	.000
		N	27	27	27	27
	creativity ability	Correlation Coefficient	.851**	.948**	1.000	.871**
		Sig (2-tailed)	.000	.000	.	.000
		N	27	27	27	27
	communication ability	Correlation Coefficient	.881**	.895**	.871**	1.000
		Sig (2-tailed)	.000	.000	.000	.
		N	27	27	27	27

**. Correlation is significant at the 0.01 level (2-tailed).