Assessing Pre-Service Teachers' Perception on 21st century Skills in Indonesia

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ABSTRACT

This study was to asses pre-service teachers' perception of thinking, acting and living (TAL) from 21st century skills. The participants who have filled out this questionnaire were 321 pre-service teachers, consisting of 38 men and 283 women from a population of 403 pre-service teachers of mathematics, biology, physics and chemistry. The goodness level the research participants was in the range of 3.70 - 5.40%. The questionnaire consisted of aspects of thinking, acting and living (TAL) of the 21st century skill, and it included 16 indicators and 78 statements. The quality of the instrument was achieved use confirmatory factor analysis (CFA) and alpha Cronbach tests. This study used the multiple comparisons with Tukey HSD and LSD test for factor of the 21st century skills. The result shows that the quality of instrument was valid and reliable. The TAL profile of the pre-service teachers was at the level of able tier, there is a different score of TAL for pre-service teachers, and there is a effect of gender and department for TAL. The other findings indicate that the level of TAL for pre-service teacher in mathematic is related to physics, and biology is related to chemistry. Finally, this study confirms the use of appropriate learning methods to bring 21st century skills to pre-service teachers in mathematic, biology, physic and chemistry.

Keywords: Pre-service teacher, 21st century skill, thinking acting and living, mathematic, biology, physic, chemistry

INTRODUCTION

In the last decade, the assessment of 21st century skills has been one of the "hottest" topics in the education (Geisinger, 2016). The term 21st century skills has been developed as a key

concept and slogan in the field of education (Greiff & Kyllonen, 2016). Because these skills are needed by students to prepare themselves for life in the future (Larson & Miller, 2011), or after graduation (Kaufman, 2013). Including of aims for learning 21st century competencies in curricula has been also an important issue worldwide (Wang, Lavonen, & Tirri, 2018). Among the types of 21st century skills needed by students, are collaborative problem solving, complex problem solving, creativity, and digital information literacy (Geisinger, 2016). Some other 21st century skills include reasoning, collaboration and self-regulation (Ahonen & Kinnunen, 2015), creativity (Lucas, 2016), computer and information literacy (Ainley, Fraillon, Schulz, & Gebhardt, 2016).

There are relationships between several fields that become competencies for students with the process of learning (Greenstein, 2012). The 21st century learning process must involve students in learning-to-learn and collaborating-to-learn to promote thinking process such as critical thinking, creative thinking, and authentic problem-solving (Chai, Deng, Tsai, & Koh, 2015). Other 21st century skills are raised in learning are life and career skills, learning and innovation skills, and information media and technology skills (Trilling & Fadel, 2009). In addition, the 21st century skills is also include in curriculum development (Tunnicliffe, 2007; Burden & Hall, 2005; Rowland, 2007). The 21st century skills was also use in learning process at higher education (Williams, 2005; Tritschler, 2008), such as preparation ICT for pre-service teachers (Lambert & Gong, 2010; Fry & Seely, 2011), and learning evaluation of 21st century learning (DiCerbo, 2014).

There are articles was to investigated the type and factor of 21st century skills in learning process, such as the articles was conducted to develop the instrument of 21st century skill. Chai, Deng, Tsai, & Koh (2015) conducted multidimensional students' perceptions of twenty-first century learning practices and found that the validation of the survey yielded satisfactory reliability and validity through both exploratory and confirmatory factor analyses. The results also showed that the subscales that survey students' perceptions of critical thinking, creative thinking, and authentic problem-solving were more dominant predictors of their knowledge creation efficacy as compared to their perceptions about the learning processes. Muhammad & Osman (2010) used a survey method to compare students' scientific thinking skills in Malaysia and Bruney, and found that the dimension of inventive thinking skills is comprised of adaptability and managing complexity, self direction, curiosity, creativity, risk taking and higher order thinking and sound reasoning. Jia, Oh, Sibuma, LaBanca, & Lorentson (2016) developed the instrument to asses the 21st century skill for pre-service students and found that the analysis identified a three-construct scale including innovation and problem solving, collaboration, and utility of technology for pre-service teachers and a one-dimension scale, cross-functional skills, for in-service teachers. Ercikan & Oliveri (2016) discussed about research on assessing 21st century skills, and found that a case for three considerations that need to be addressed explicitly in assessments of complex constructs such as those captured under the 21st century skills/constructs label. Sang, Liang, Chai, Dong, & Tsai (2018) was conducted the teachers' actual and preferred perceptions of twenty-first century learning competencies and the results indicated that there was a clear gap between actual and preferred perceptions of twenty-fist century learning.

In the last decade, the previous researchers were investigation the use of learning strategies and determine the factors of 21st century skill in mathematics and science. Kan'an (2018) determine the relationship between Jordanian students' 21st century skills and academic achievement in science and found that that urban and female students were better in acquiring the 21st century skills than rural and male students. Tokmak, Incikabi, & Ozgelen (2012) investigate the effect of technological, pedagogical, content knowledge (TPACK)-based course design on mathematics, science, and literacy education pre-service teachers' TPACK and found that there were no significant differences between natural science (mathematics and science

education) and social science (literacy) for pre-service teachers' TPACK. Bell (2010) investigated the use of project based learning for the future skill in 21st century and found that the students drive their own learning through inquiry, as well as work collaboratively to research and create projects that reflect their knowledge. Duran, Yaussy, & Yaussy (2011) has investigated about the integrating 21st century skills into science instruction and found that the meaningful and enjoyable student collaboration, the upbeat class environment, and the enhanced student engagement achieved at the conclusion of this challenging activity set an optimal teaching and learning environment for the entire quarter/semester. Haviz, Karomah, Delfita, Umar, & Maris (2018) has examined the generic science skill as 21st century skill and found that the students' generic science skills were considered to be part of generic science skills and 21st-century skills. There are other influential factors, such as gender, the type of skill that is more comprehensive, and the department where the students study. But this statement further study, for example conducting research on the assessment of student perceptions of the 21st century skills. Although in reality, few reports are found about students' perceptions or views of what 21st century skills they need, especially the reports about the assessment of student perceptions of the 21st century skills in class of mathematics and science.

Thinking, Acting and Living as 21st Century Skill Competencies

The terminology of thinking is the term of variable make individuals to develop problem-solving skills, focusing on the importance of thinking in terms of variables (Unver, 2015). According to Greenstein (2012), thinking skills are differentiated into critical, problem solving, creativity and metacognition. Critical thinking is the mode of thinking about any subject, content, or problem (Elder, 2007). There are several articles investigated about critical thinking, for example the research conducted by Wartono, Hudha, & Batlolona (2018). The study showed that there are 5 element of the critical thinking skills for senior high school students; elementary clarification, basic support, inference, advanced clarification, and strategies and tactics. In other study showed that analysis, evaluation, inference, interpretation, explanation, and self-organization sections was used to determine students' critical thinking skills (Duran & Dökme 2016).

Problem solving is the basics process for identifying problems, considering options and making informed choices, and the step in problem solving are understand the problem, brainstrom all possible solutions, devise a plan, carry out the plan and evaluate the result (Greenstein, 2012). In other study showed that the effectiveness of the thinking strategy and visual representation approach in increasing students' achievement, conceptual knowledge, metacognitive, problem-solving strategies, and attitudes toward mathematical word problem solving among primary school students (Abdullah, Halim, & Zakaria, 2014). The students' quantitative problem solving skills was also improved in problem based learning environment (Argaw, Haile, Ayalew, & Kuma, 2017).

Similiarly, the creativity becomes important for pre-service teachers (Bakır & Öztekin, 2014). Because creativity as the process related to experiences, the restriction of habits, new concepts in some problems and the abilities to solve the problems (Bélanger, Akre, Berchtold, & Michaud, 2011). In the study was conducted by Sener & Tas (2017) showed that there is a significant difference between the scores of the creative and creative thinking test of experimental and control groups when compared before and after teaching process.

Metacognition includes the components and process base of knowledge (Damar, Özdemir, & Unal, 2015). The level of students' metacognitive skills was raised after conducted integrated with think talk write teaching strategy (Listiana, Susilo, Suwono, & Suarsini, 2016), and metacognitive skills contributed to cognitive learning outcome was much greater than the contribution of learning motivation (Bahri & Corebima 2015).

The acting and living skill was different. According to Greenstein (2012), acting was divide in to communication, collaboration, digital literacy, visual literacy and technology literacy. Common Core State Standards Initiative (2011) stated that the communication skills have been identified in practice education, such as identifying and using a variety of types of verbal communication such as conversation, debate, and persuasion, etc. Living in 21st century skill is divide to citizenship, global, leaderships and responsibility, college and career/workplace. Global definitions refer to the attitudes and principles that make it possible to interact with people from around the globe in ways that are intentionally peaceful, respectful and productive. Leaderships and responsibility include the terms visionary, relationships building, knowledgeable, collaborative and tactical. College and career/workplace skills is related to college ready having the academic skills, abilities and attributes to be prepared for any post-secondary education (Greenstein, 2012).

Aim and Research Question

Greenstein (2012) divides the 21st century skill into three groups which include in the learning process namely thinking, acting and living (TAL). Learning in higher education in Indonesia should refer to and apply the Indonesian national qualification framework and this framework requires students to master certain level of competences (Haviz, 2018). For example, based on Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 73 year 2013, the undergraduate level has to master 6th and 7th levels. This regulation also mandates that learning outcomes were capabilities acquired through the internalization of knowledge, attitudes, skills, competencies, and accumulated work experience. Indonesian national qualification framework consist the 21st century skills, that has been written on this regulation. This research conduct developing TAL's instrument, investigated the profile of TAL and the relationships among the factors of 21st century skills. Therefore, the aim of the study to asses pre-service teachers' perception of TAL in 21st century skills. The research question were follows:

- RQ1: What is the quality of TAL's instrument in 21st century skills for pre-service teachers in mathematic, biology, physic, chemistry?
- RQ2: What is the profile of TAL in 21st century skills for pre-service teachers in mathematic, biology, physic, chemistry?
- RQ3: What is relationships among the factors of 21st century skill?

METHODS

   a) Participants

This research involved pre-service teachers in mathematic, biology, physics and chemistry in faculty of science education IAIN Batusangkar, Indonesia. The participants who have filled out this questionnaire were 321 pre-service teachers, consisting of 38 men and 283 women from a population of 403 pre-service teachers. The goodness level of the research participants was in the range of 3.70 - 5.40%. The number of participants in mathematic education was 106 people, and only 92 pre-service teachers (Male=15 and Female=77) have completed the questionnaire. So, that the goodness level score was 3.73%. The number of participants in biology education were 195 pre-service teachers, and only 137 pre-service teachers (Male=14 and Female=123) have completed the questionnaire. So, the goodness level score was 4.57%. The number of participants in physics education were 59 pre-service teachers, and only 53 pre-service teachers (Male=8 and Female=45) have completed the questionnaire. So that the goodness level score was 3.987%. The number of participants in the chemistry education was 44 pre-service teachers and only 39 pre-service teachers (Male=1 and

Female=38) who completed the questionnaire. So, that the goodness level score was 5.35%. The summary of the participants was summarized in Table 1.

Tabel 1. *Summary of research participants of 21st century skill pre-service teacher*

Departments	N	Sample			Goodness level (%)
		Male	**Female**	**Total**	
Mathematic	106	15	77	92	3.73
Biology	195	14	123	137	4.57
Physic	58	8	45	53	3.98
Chemistry	44	1	38	39	5.35
Total	403	38	283	321	

The questionnaire consisted of aspects of thinking, acting and living (TAL) of the 21st century skill, and it included 16 indicators and 78 statements (Greenstein, 2012). Thinking concists of critical thinking (CritT), problem solving (PS), creativity (Creat), metacognition (Metacog). Acting is made from communicating (Comm), debate (Deb), collaborating (Col), digital literacy (DL), technology literacy (TL). Living involved civics and citizenship (CC), global (Glob), leaderships and responsbility (LR), work ethic (WE), college/career/workplace (CCW), flexibility/adaptability (FA), initiative/motivation (IM). This questionnaire has a rating scale of 1-4, with details at level 1: emerging tier = 2.0 to 2.7 (beginning, novice, poor, serious error, incomplete); level 2: able tier = 2.8 to 3.1 (developing, basic, fair, some misconception, partial); level 3: skilled tier = 3.2 to 3.5 (accomplished, proficient, good, meets requirements, mostly complete; level 4: top tier = 3.6 to 4.0 (exemplary, advanced, excellent, goes beyond requirements, fully complete). Researchers have translated from English into Indonesian to be more easily understood by participants (Greenstein, 2012).

b) Data Collection and Analysis

This research was conducted by a survey design. A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population (Gay, Mills, & Airasian, 2009). In this research, thinking, acting and living (TAL) skills was as independent variables, and gender and department was as dependent variables.

The TAL's instrument was given and filled by pre-service teachers in accordance with the results of the sample calculation has written in Table 1. The quality of the instrument was achieved use confirmatory factor analysis (CFA) and alpha Cronbach tests. These tests were taken as both are considered to be the credible ways to conduct instrument validation (Suhr, 2018; Chai, Deng, Tsai, & Koh, 2015; Jia, Oh, Sibuma, LaBanca, & Lorentson, 2016; Sang, Liang, Chai, Dong, & Tsai, 2018). While for achieving instrument reliability, Alpha cronbach test was employed. The result of validation and realibility this activity will be determined the quality of the instrument. Furthermore, this analysis used refer to the survey technique analysis was described by Creswell (2014). The step of analyzing the data were make a report about the number of sample members surveyed and those not surveyed, made a table of the number of respondents and the percentage, discuss the bias of respondents and their influence on research and used the multiple comparisons with Tukey HSD and LSD test for factor of the 21st century skills. The calculation of the data was conduct by using descriptive and inferential statistics with the *SPSS 21 for Windows*.

RESULTS

a) The Quality of TAL's Instrument in 21st Century Skill for Pre-service Teachers

Pattern/structure coefficients for thinking, acting and living instrument with CFA test was summarized on Table 2, 3 and 4. The table shows that score for each item was at range 0.6 –

0.9. The result of validity with CFA indicates that the highest score is found in living ($\chi^2=676.71$), followed by thinking ($\chi^2=479.55$) and acting ($\chi^2=479.55$). The score of *Root Mean Square Error of Approximation* on each factor were thinking (*RMSEA=0.055*), acting (*RMSEA=0.047*) and living (*RMSEA=0.047*). This RMSEA value shows that this instrument model was accepted, because RMSEA value was in the range of values 0-1 (Hu and Bentler, 1999). As noted in Table 5, pre-service teachers in MBPC have a 21st century skill with the highest mean score in living (*M=72.22*), then followed by thinking (*M=66.94*), and acting (*M=65.12*). This result shows that this instrument was valid. The cronbach alpha test results listed in Table 5 also indicates that this instrument was reliable (*Cronbach's Alpha = .940, N items=78*).

Table 2. *Pattern/structure coefficients for thinking*

Item	Factor 1	Factor 2	Factor 3	Factor 4
CritT1	0.97			
CritT2	0.84			
CritT3	0.81			
CritT4	0.87			
CritT5	0.90			
PS1		0.81		
PS2		8.83		
PS3		0.73		
PS4		0.76		
PS5		0.78		
PS6		0.81		
PS7		0.84		
PS8		0.64		
Creat1			0.67	
Creat2			0.84	
Creat3			0.87	
Creat4			0.79	
Creat5			0.82	
Creat6			0.79	
Creat7			0.82	
MetaCog1				0.86
MetaCog2				0.82
MetaCog3				0.78
MetaCog4				0.76

Table 3 *Pattern/structure coefficients for acting*

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Comm1	0.84				
Comm2	0.73				
Comm3	0.73				
Comm4	0.88				
Deb1		0.58			
Deb2		0.87			
Deb3		0.64			
Deb4		0.77			
Deb5		0.67			
Deb6		0.83			
Col1			0.78		
Col2			0.80		
Col3			0.64		
Col4			0.75		
DL1				0.70	
DL2				0.77	
DL3				0.84	

DL4					0.88		
TL1							0.71
TL2							0.64
TL3							0.97
TL4							0.74
TL5							0.72
TL6							0.83

Table 4 *Pattern/structure coefficients for living*

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
CC1	0.94						
CC2	0.80						
CC3	0.74						
Glob1		0.79					
Glob2		0.85					
Glob3		0.52					
Glob4		0.58					
Glob5		0.68					
LR1			0.87				
LR2			0.79				
LR3			0.79				
WE1				0.75			
WE2				0.69			
WE3				0.92			
WE4				0.65			
WE5				0.78			
WE6				0.63			
WE7				0.74			
CCW1					0.71		
CCW2					0.71		
CCW3					0.71		
CCW4					0.66		
CCW5					0.64		
FA1						0.71	
FA2						0.87	
FA3						0.56	
IM1							0.71
IM2							0.87
IM3							0.64
IM4							0.62

Table 5. *Goodness of fit indicators for factor solutions and Cronbach's Alpha for item of instrument*

Factor	N	Mean	SD	χ^2	df	χ^2/df	RMSEA	N item	Cronbach's Alpha
Thinking	321	66.94	10.16	479.55	242	0.00000	0.055		
Acting	321	65.12	9.62	416.30	243	0.00000	0.047	78	.940
Living	321	72.33	10.58	676.71	398	0.00000	0.047		

b) Investigating the Profile of TAL for Pre-service Teachers

The profile of 21st century skill for pre-service teachers in MBFC shows that the living's score for pre-service teachers was highest than the thinking's and acting's scores (see Table 6). This finding indicates that the skills of pre-service teachers in MBFC was at the level 2 (able tier). Then, the result of multiple comparisons with Tukey HSD and LSD test for factor department was showed that there were significant different score 21st century skill for pre-service teacher in MBPC. Then, the multiple comparison with Tukey HSD were conducted to investigated the differencies of 21st century skill in each department was showed that, there

were for significance different between 21st century skill for each department in MBPC. Based on this explanation, it can be concluded that the level of 21st century skill pre-service teacher in mathematic was related to physics, and biology was related to chemistry.

Table 6. *Profile of thinking, acting and living for pre-service teachers of MBPC*

Departement	Skill	M ± SD
	Thinking	63.19 ± 8.19
Mathematic (*N=92*)	Acting	63.19 ± 7.54
	Living	70.42 ± 8.82
	Total	65.60 ± 8.85 [a,b] **
	Thinking	69.73 ±10.46
Biology (*N=137)*	Acting	66.90 ±9.78
	Living	73.71 ±11.23
	Total	70.11 ± 11.25 [a,b] *
	Thinking	64.17 ±10.08
Physic (*N=49)*	Acting	63.68 ±9.84
	Living	70.97 ±11.14
	Total	66.27 ± 10.82 [a,b] **
	Thinking	69.23 ±9.97
Chemistry (*N=43*)	Acting	65.18 ±11.82
	Living	72.79 ±10.81
	Total	69.07 ± 11.25 [a,b] *
	Thinking	66.94 ±10.15
Total (*N=321*)	Acting	65.12 ±9.61
	Living	72.22 ±10.58

[a, b] The mean difference is significant with LSD and HSD test at the .05 level, * The Means for groups in homogeneous with HSD test at the .05 level, ** The Means for groups in homogeneous with HSD test at the .05 level

The result about the gap in profile of thinking, acting and living for male and female for pre-service teachers was showed in Table 7. This finding shows that there was no significant difference (*p>0.05; 0.468< P*-value*0.640*) betwen the profile of 21st century skill between male and female.

Table 7. *Gap in profile of thinking, acting and living for male and female for pre-service teachers*

Gender	N	M ± SD	SE Mean	Levene's Test	t-Test
Male	38	68.76 ± 8.94	1.45005	.044<.834	.468<.640
Female	282	68.04 ± 8.86	.52745		

Levene's Test for Equality of Variances (0.05) and t-Test for Equality of Means (0.05)

The result about the gap in profile between thinking, acting and living for pre-service teachers was presented in Table 8. These results of multiple comparisons with LSD was showed that there were significant differences in mean factor scores at level 0.05. For example, the mean gap between thinking and acting has of *1.8300*. This result was a significance value *.023* at *p>* 0.05. Based on these explanations, its concluded that (a) there were different betwen score of thinking, acting and living for pre-service teachers in MBFC; (b) there was no interaction between gender and TAL and (c) the contribution of gender to TAL was 8%.

Table 8. *Gap in profile betwen thinking, acting and living for pre-service teachers*

Main Skill	Subskill	Mean Difference
Thinking	Acting	1.8300*
	Living	-5.2596*
Acting	Thinking	-1.8300*
	Living	-7.0896*
Living	Thinking	5.2596*
	Acting	7.0896*

Based on observed means. The error term is Mean Square(Error) = 102.695., * The mean difference is significant at the .05 level.

c) Relationships among the Factors of 21st Century skill

The result of the study about gap betwen factor factors of 21st century skill suggests that the dependent test score for thinking, acting and living between gender was the F corrected model score was *17.295 > .000*, and the value of *R* squared=*.083* and adjusted *R* squared=*.078* (see table 9). The data in Table 9 also shows that the dependent test score for thinking, acting and living between department were the F corrected model score (*12.224*) > (*.000*), and the value of *R* squared=*.124* and adjusted *R* squared=*.114.* This result indicates that the contribution of gender and department were 12.4%. These findings indicatesthat there is no relationships between thinking, acting and living with gender, and there is no interactions between thinking, acting and living with department. But, the findings also indicated that there is difference betwen 21st century skill for pre-service teacher in MBPC.

Table 9. *Gap betwen factor factors of 21st century skill*

Factor	Type III Sum of Squares	R Squared	Adjusted R Squared	F
TAL vs Gender	8880.562	.083	.078	17.295
TAL vs Department	13281.488	.124	.114	12.224

DISCUSSIONS

At the measurement of the quality of instrument, the use of the CFA test has shown that the construction of the factors in the instrument has been identified. Confirmatory factor analysis (CFA) described as orderly simplification of interrelated measures and the number of constructs and the underlying factor structure are identified (Suhr, 2018). Suhr (2018) also stated, the goals of factors are to help the investigator to determine the number of latent constructs, to provide a few newly created variables (factors), and define the content or meaning of factors. This result were also supported by other findings. Mahat, Hashim, Nayan, Saleh & Norkhaidi (2018) conducted a confirmatory factor analysis of malaysian primary school students' energy saving practices , and found that the cronbach's alpha value, which was higher than 0.70, was high and acceptable. Jia, Oh, Sibuma, LaBanca, & Lorentson (2016) was found that the validity and reliability of EFA and CFA was conducted in 16 subjects: information literacy, collaboration, communication, innovation and creativity, problem solving, and responsible citizenship. In line with this study, Taber (2017) has written that the use of Cronbach' s alpha when developing and reporting research instruments in science education, and also stated (a) Cronbach's alpha is a statistic commonly quoted by authors to demonstrate that tests and scales that have been constructed or adopted for research projects are fit for purpose, and (b) a high value of alpha offers limited evidence of the reliability of a research instrument, and that indeed a very high value may actually be undesirable when developing a test of scientific knowledge or understanding.

At the 21st century skill level mastery, this study was found that 21st century of pre-service teachers in MBPC were at level 2. According to Geinsteiner (2012), the conversions of level 2 (able tier=2.8-3.1) likely developing, basic, fair, some misconception and partial. The findings of this study showed that students need an increase in 21st century skills in the process of learning. Because to help students build twenty-fist century learning skills, teachers must have reasonable perceptions about twenty-fist century learning (Sang, Liang, Chai, Dong, & Tsai, 2018).

At the factors of 21st century skill, the result of this study showed that gender and department factors have not contributed to the emergence of 21st century skills for pre-service

teachers in MBPC. These findings indicated that during the learning process, pre-service teachers in MBPC have obtained a 21st century skill from the learning process. This study similiarity with other study showed that the creative thinking levels of preservice science teachers do not different signifiantly with respect to gender, year of study, the type of school they graduated from, or their parents' educational background (Bakır & Öztekin, 2014). The results of this study was also showed that there was interaction in thinking, acting and living indicators in the learning process. Thus, these findings indicated that the use of strategies or learning methods was thought to still be the main factor determining the emergence of 21st century skill for pre-service teachers.

The finding of this study showed that the level of 21st century skill of pre-service teacher in MBPC was limited to IQF competencies. According to the IQF document, the learning outcomes higher education in Indonesia must be at level 6 or/and 7. The characteristics of these levels were the learning outcomes are capabilities acquired through the internalization of knowledge, attitudes, skills, competencies, and accumulated work experience. This finding also was indicated that the teachers must find a solution to overcome this problem, for example strengthen the use of learning methods.

This study suggests that teachers who teach at MBPC are better able to synthesize the 21st century skills of their students. There are several steps that can be taken that tachers have to; play a role in synthesizing 21st century students' skills, facilitate and inspire students, design and develop learning experiences, revise lesson plans, use models for teaching enhanced 21st century skills, and use the evaluating and authentic learning (Haviz, Karomah, Delfita, Umar, & Maris, 2018). Because in principle, evaluation of century-based learning is more about the products produced by students. Greeinstein (2012) explain that alternative and authentic evaluations can demonstrate students' knowledge and skills in real terms. The types of assessment in 21st century based learning are rubric, student contracts, self assessment, peer reviews, observations, total records, concept maps, questioning, conferences and portfolio reviews. The teachers must conduct the assessment based on 21st century learning.

CONCLUSION

This study provides several conclusions that the quality of 21st century skill instruments for pre-service teachers in mathematic, biology, physic and chemistry was valid and reliable. The study was found that the 21st century skill of pre-service teachers was at level 2. TAL and gender factors were not a determining factor for the emergence of 21st century skills for pre-service teacher students at MBPC. The ability of pre-service teachers in mathematics related to physics, and the ability of pre-service teachers on biology also related to chemistry. Specifically, this study suggests the need to study the use of learning curricula and teacher perceptions as other factors in 21st century skills for pre-service teachers. The result this study suggests to strengthen the use of appropriate learning methods to bring 21st century skills to pre-service teachers in mathematic, biology, physisc and chemistry of education.

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