

Modeling Factors Affecting the 21st Century Skills Viewed by Indonesian Teachers

Maximus Gorky Sembiring

Universitas Terbuka, Indonesia ◆ Indonesia ◆ gorky@ut.ac.id

ABSTRACT

Modeling the determinants of the 21st century skills observed by teachers was explored in this research. It was aimed at classifying and exposing underlying interests related to those skills. It was also of interest elucidating the most influential factor and its attributes relatable to those skills in a more identifiable perspective. The investigation was carried out using quantitative approach with the help of Structural Equation Model. Five variables expansively were involved. The 21st century skills was the dependent variable. Conversely, ways of thinking, ways of working and tools for working were the independent variables; skills for living was a moderating variable. Instruments in the form of questionnaires were made available to pull together replies from respondents selected randomly. One hundred forty two out of 250 questionnaires distributed were finally completed and processed. Ten hypotheses were scrutinized and conclusively six of them validated by the analysis. It was finally obtained that the most noteworthy drive determined the 21st century skills was the ways of thinking. Additionally, the most vital attributes convincingly correspond to this factor were creativity and problem solving skills.

Keywords: The 21st century skills, ways of thinking, ways of working, tools for working, skills for living, Structural Equation Model.

INTRODUCTION

The education of teachers in the future should ponder on the learning, development and education of children, youth and adults. Teacher education programmes are denoted by high-level academic and professional quality. Research affiliation and professional approaches must work together to prop up the education of highly qualified preschool, primary and tertiary teachers (Union of Education Norway, 2008). This is strictly essential as to respond the fact that globalization, economy necessity and low civic engagement compound the urgency for students to develop the skills and knowledge they need for

success (Saavedra & Opfer, 2012). The interconnectedness of global economy, ecosystem and political networks required students learn to communicate, collaborate and problem solve with people worldwide. Moreover, employers demand fewer people with basic skills sets and more people with complex thinking and communication skills.

Correspondingly, Beers (2012) contends that the 21st century dawned as the commencement of the digital age, a time of unprecedented growth in technology and its subsequent information explosion. Never before have the tools for information access and management made such an impact on the way we live, work, and interact. New technologies and tools multiply daily and the new technologies of today are outdated almost as they reach the market. Besides, everyone will think of any single product or service should always be better, faster, cheaper and newer (Gasperzs, 2011). This background then leads us to the questions of “how or what are the 21st century skills” look like?

The 21st century learning should not be controversial. It is simply an effort to define modern learning using modern tools (Chen, 2010). This query is gravely essential to be brought down in relations to preparing both teachers and students entering the weird and wonderful circumstances. It is then relevant to inquire what would be the determinants of the 21st century skills needed as indicated by teachers in Indonesia framework.

Research Model

Numerous studies and reports have emerged over the past decade that seek to identify the life, career and learning skills that define the skills needed for success in the 21st century globe. Despite the fact that there are some differences on how the skills are categorized or interpreted, there are also many commonalities. The current and future health of America’s 21st century economy depends directly on how broadly and deeply Americans reach a new level of literacy, includes strong academic skills, thinking, reasoning, teamwork skills and proficiency in using various technologies (Metiri Group, 2011). It further elaborates the skills into four areas, they are: digital age literacy (today’s basic), inventive thinking (intellectual capital), interactive communication (social and personal skills) and quality (state-of-the-art results). Moreover, the Partnerships for 21st Century Skills (2013) lists three types of them and they are categorized into: learning, literacy and life skills.

In a more identifiable manner, Beers (2012) categorized the 21st century skills into eight perspectives, they are creativity and innovation, critical thinking and problem solving, communication, collaboration, information management, effective use of technology, career and life skills, and cultural awareness. This classification is relevant and is based on the fact that the highest ranked skills for students entering the workforce were not facts and basic skills – they were applied skills that enable workers to use the knowledge and basic skills they have obtained.

Similarly, Saavedra & Opfer (2012) introduced seven categories of the 21st century skills, they were: critical thinking and problem solving, collaboration and leadership, agility and adaptability, initiative and entrepreneurialism, effective oral and written communication, accessing and analysing information, and curiosity and imagination. In relation to the development of the model for this research, the 21st century skills as launched by AT21CS (The Assessment and Teaching of 21st Century Skills) is chosen whereby the aspects explained previously are categorised into four main outlooks. AT21CS identified creativity,

critical thinking, problem solving, decision making and learning as the ways of thinking. Communication and collaboration were labeled as the ways of working. Information and communication technology and information literacy were classified as the tools for working. Citizenship, life and career, and personal and social responsibility were grouped as the skills for living in this universe (AT21CS, 2009).

The model for this research consists of five variables in association with searching for the determinants of the 21st century skills. In line with what was introduced by ACT21S, the 21st century skills became the dependent variables. Conversely, the ways of thinking, the ways of working and the tools for working were the independent variables; the skills for living was an intervening variable.

Conceptually, the 21st century skills, as the dependent variable, consisted of four dimensions, they were visionary, flexibility, leadership and risk taking. Operationally, this implied that defined skills for success in the 21st century should be those students that experienced learning processes and enabling them to have a clear vision, high flexibility, strong leadership and rational and calculated risk taking.

Likewise, the ways of thinking, as the first independent variable, conceptually consisted of four dimensions, they were creativity, critical thinking, problem solving and decision making. Operationally, this implied that defined skills for success in the 21st century with respect to the ways of thinking were those students who experienced learning processes that facilitated them to have a prominent creativity, smart critical thinking, excellent problem solving ability and coherent decision making.

Similarly, the ways of working, as the second independent variable, conceptually consisted of three dimensions, they were communication, collaboration and learning. Operationally, this implied that defined skills for success in the 21st century in regards to the ways of working were those students who experienced learning processes that assisted them to have assured communication, mutual beneficial collaboration and lifelong learning habit.

Correspondingly, the tools for working, as the third independent variable, conceptually consisted of three dimensions, they were literacy in media, information and technology. Operationally, this implied that defined skills for success in the 21st century relating to the tools for working were those students who experienced learning processes that assisted them to be familiar with and so friendly to any kind of advancement in media, information and technology issues.

Lastly, the skills for living in this universe as the intervening variable, conceptually consisted of three dimensions: life and career, citizenship, and personal and social responsibility. Operationally, this implied that defined skills for success in the 21st century with regard to the skills for living were those students who experienced learning processes that supported them to be aware of and acquainted with features on life and career, citizenship, and personal and social responsibility trends.

Diagrammatically, the elaboration of those related literatures with respect to the construction of the model clarified previously is illustrated in Figure 1.

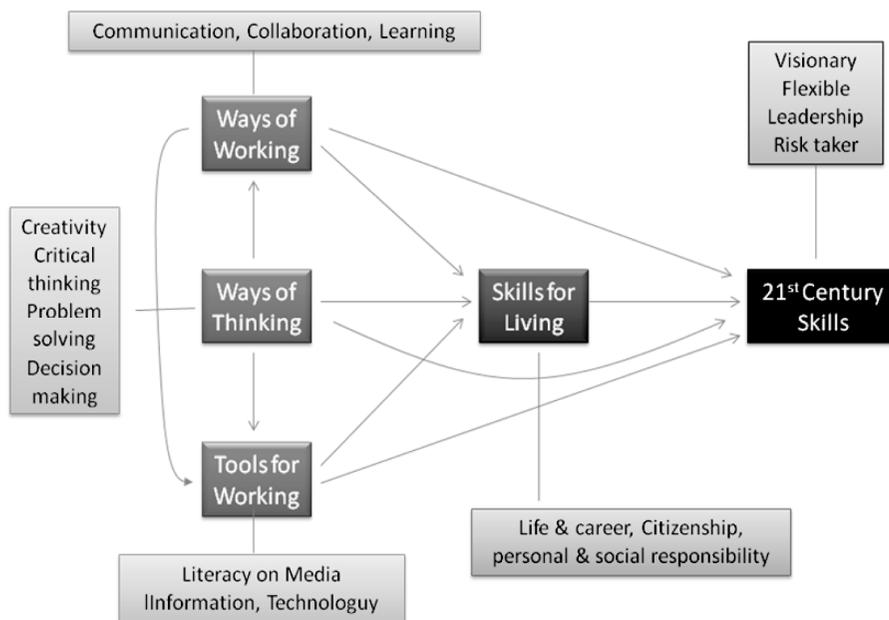


Figure 1: The research Model

All constructs in this framework obviously cannot be separated from learning and its relation to the profession of educator; in a more general term the word teacher is also appropriate. Learning is considered as the acquisition of knowledge, habits, skills, abilities and attitudes through interaction of the whole individual and his/her total environment. Learning is meaningful if it is organized in such a way as to emphasize and call for understanding, insight, initiative and cooperation. Learning is assisted by motives, regulation, readiness, and laws (the laws of exercise, effect and belongingness). Learning is made possible when teacher provides learner with proper stimuli and guides. Besides, learning difficulties is due to many factors within learners itself. Learning is effective when more senses are utilized by the students and made functional and aided by understanding derived from experience (Mondal, 2014).

According to Meador (2010), an effective teacher loves to teach, demonstrates a caring attitude and can relate to students. An effective teacher is willing to think out of the box, an excellent communicator, proactive rather than reactive, and striving to be better. An effective teacher also uses a variety of media in their lessons and challenges their students. More importantly, an effective teacher comprehends the content that they teach and knows how to explain that content in a manner that their students easily embrace it. Thus, the learning outcome through teaching and learning process depends on the course of action conducted by teacher in the classroom. Learning process itself is determined by learning approach utilized by teacher. Learning approach should at least be related to teacher and student characteristics as well as the learning environment in their circumstances.

These additional explanations were intended to emphasize that the 21st century skills clearly cannot be taken apart from learning and educator or teacher settings. Learning, educator and its result are on the same framework for the sake of learning to achieving the 21st century skills with all of their dimensions and attributes.

Methodology and the Hypotheses

This research was conducted at Universitas Terbuka, Indonesia. The population is made of teachers who were also students at Universitas Terbuka (graduated and up to the first semester of 2014). Respondents were teachers from all over Indonesia who attended graduation ceremony in the first period of 2014 academic year.

To congregate data from the respondents, survey approach was conducted by developing instruments in the form of questionnaires. The questionnaires were developed by incorporating the five variables involved and each variable was subdivided into 17 dimensions, 34 attributes and 68 statements.

In the sampling process, Firdaus & Affendi (2008) suggested that the minimum number of respondents under the SEM approach ranged from 5 to 15 for each dimension. This implied that based on this rule of thumb then the number of respondents should be ranged from 85 up to 255. The minimum number of respondents as the samples for this study by design is agreed on 120 teachers. To obtain that minimum target, 250 questionnaires were provided, distributed to and collected from the eligible teachers (graduates) as the respondents of the research.

There were five sets of questionnaires developed. The first one measured the 21st century skills under four dimensions and eight attributes with 16 statements. The other four questionnaires measured the ways of thinking under four dimensions and eight attributes with 16 statements; the ways of working was under three dimensions and six attributes with 12 statements; the tools for working was under three dimensions and six attributes with 12 statements; and the skills for living was under three dimensions and six attributes with 12 statements (Tjiptono & Fandi, 2011). Refer Table 1.

Tabel 1: Variables, Dimensions, Attributes and Statements Involved

Variables	Dimensions	Number of ...		Notes
1. The 21 st century skills (Y)	1. Visionary	Attributes	8	Dependent Variable
	2. Flexibility	Statements	19	
	3. Leadership	- Before tryout	16	
	4. Risk taking	- After tryout	16	
2. The ways of thinking (X1)	1. Creativity	Attributes	8	Independent Variable 1
	2. Critical thinking	Statements	20	
	3. Problem solving	- Before tryout	16	
	4. Decision making	- After tryout	16	
3. The ways of working (X2)	1. Communication	Attributes	6	Independent Variable 2
	2. Collaboration	Statements	15	
	3. Learning	- Before tryout - After tryout	12	
4. The tools for working (X3)	1. Media literacy	Attributes	6	Independent Variable 3
	2. Information literacy	Statements	14	
	3. Technology literacy	- Before tryout - After tryout	12	

5. The skills for living (X4)	1. Life and career	Attributes Statements - Before tryout - After tryout	6	Intervening Variable
	2. Citizenship		14	
	3. Personal and social responsibility		12	

Having described those terms both in the conceptual and operational phase, ten hypotheses were then constructed and analyzed by using a quantitative method under SEM. The ten hypotheses were formulated as follows.

- H1 : The 21st century skills is influenced by ways of thinking
- H2 : The 21st century skills is influenced by ways of working
- H3 : The 21st century skills is influenced by tools for working
- H4 : The 21st century skills is influenced by skills for living
- H5 : Skills for living is influenced ways of thinking
- H6 : Skills for living is influenced ways of working
- H7 : Skills for living is influenced tools for working
- H8 : Ways of working is influenced by ways of thinking
- H9 : Tools for working is influenced by ways of thinking
- H10 : Tools for working is influenced by ways of working.

The SEM approach was then used to statistically draw the conclusions and illustrate the results descriptively as well as inferentially (Hair et al, 1995 & Wijayanto, 2008). First, tests on data normality, linearity and multicollinearity were performed; and complied.

RESULTS AND DISCUSSIONS

Before discussing the findings, it is useful to illustrate the characteristics of selected teachers as the respondents of this research. This will provide us much better context for the findings as can be seen in Table 2.

Table 2: Respondents' Characteristics

Description	Notes		
1. Students' domicile	37 Regional Offices (All over Indonesia)		
2. Population	1,100 graduates		
Minimum samples	85 graduates		
3. Questionnaires			
- Provided, distributed	250 sets		
- Returned, processed	142 sets		
4. Age (Y: Year)	18 - 25 = 11 %	26 - 30 = 34 %	
	31 - 35 = 29 %	36++ = 26 %	
5. Study at UT for (Y: Year)	4Y = 12 %	5Y = 58 %	6Y = 19 %
	7Y = 8 %	8Y++ = 3 %	
6. Grade Point Average (GPA)	2.00 - 2.49 = 6 %	2.50 - 2.99 = 59 %	
	3.00 - 3.49 = 31 %	3.50 - 4.00 = 4 %	

7. Gender	Female = 72 % Male = 28 %
8. Teacher in	Early childhood = 21 % Primary School = 73 % High School = 6 %

It can be seen from the table that teacher domicile scattered throughout Indonesia. This is to say that from domicile coverage perspective has hypothetically been fulfilled. Surprisingly, more than 70% of the respondents were teaching in primary schools level; and more than 70% of them were females.

The first result relates to the ten hypotheses of the study. Figure 2 demonstrates that six of the ten hypotheses were validated by the analysis. This implies that three main hypotheses, namely ways of working (1.19), tools for working (1.64) and skills for living (-1.29) toward the 21st century skills were not substantiated, since the values of those three hypotheses were less than ± 1.96 . Another variable that was also not validated by the analysis was the ways of working towards tools for working (1.54).

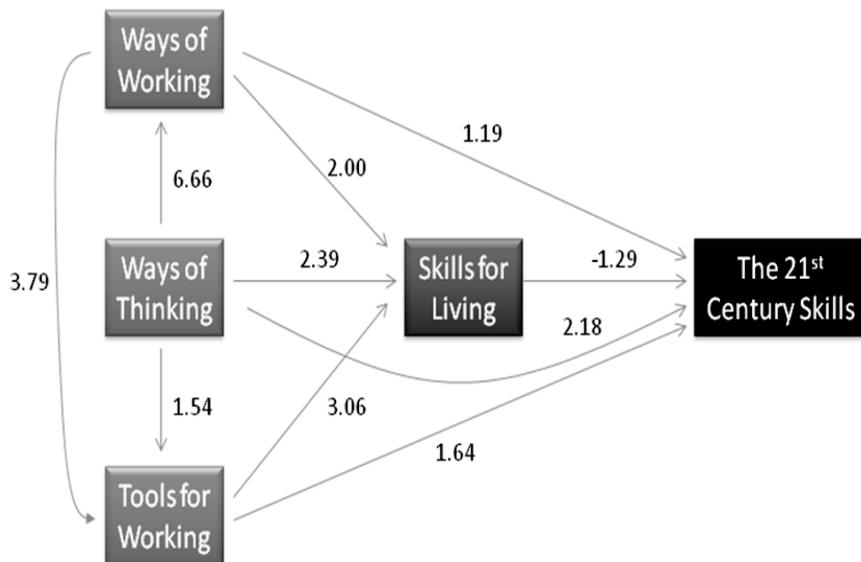


Figure 2: The t-Value of the model

The remaining assumptions, especially one of the main variables, were validated by the analysis, i.e., the 21st century skills was influenced by the ways of thinking (2.18). In addition, the skills for living were also influenced by the ways of thinking (2.39), the ways of working (2.00), the tools for working (3.06); and the ways of working were influenced by the ways of thinking (6.66) and the tools for working were influenced by the ways of working (3.79).

With the results from testing the hypotheses, the next step was to examine values of the loading factor, i.e., the power level of their relations. This result determine the influence of the independent variables on the dependent variable; including on the moderating variable. Figure 3 looks at the loading factor of the model used in the inquiry.

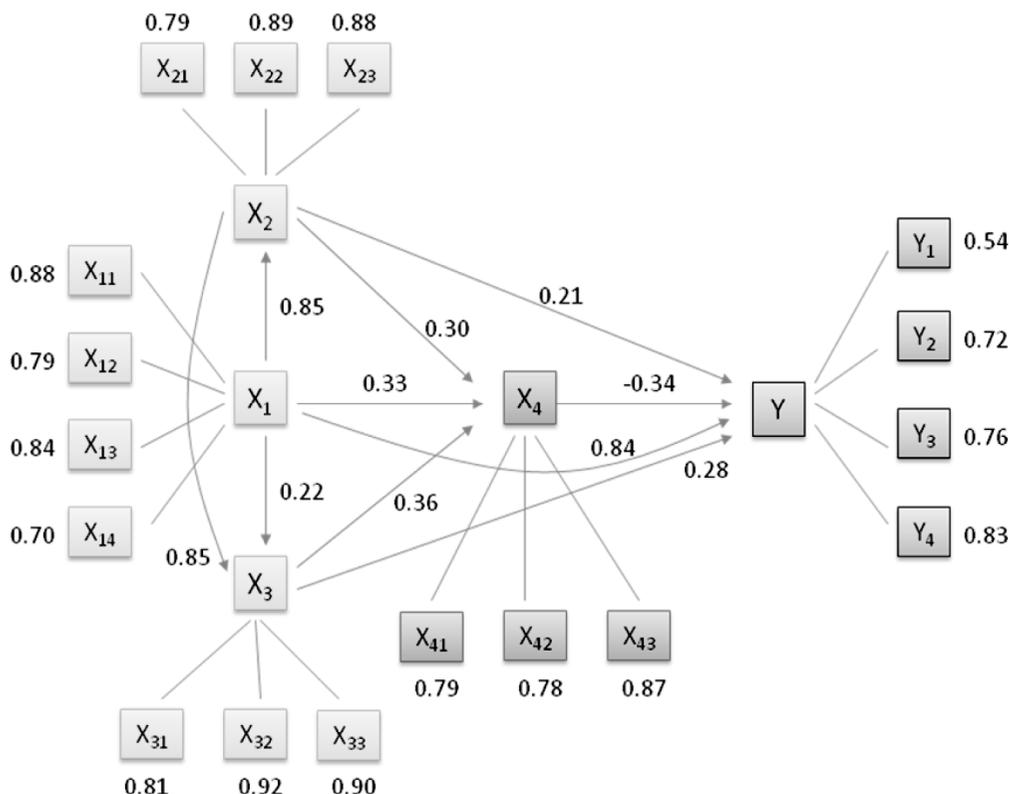


Figure 3: Loading factor of the model

Figure 3 confirms on the five cores of the study. The first piece of evidence is that one of the main variables involved affecting the 21st century skills, namely the ways of thinking ($X_1 = 0.84$). The second point is that the prevalent attributes of the ways of working aspect were creativity ($X_{11} = 0.88$) and followed by problem solving ($X_{13} = 0.84$). The third point that can be drawn from Figure 3 concerns the two prevalent attributes representing the 21st century skills (Y) according to Indonesian teachers were risk taking ($Y_4 = 0.83$) and leadership ($Y_3 = 0.76$).

Apart from that, it is nonetheless worth to note that Indonesian teachers had a propensity to put collaboration ($X_{22} = 0.89$), learning ($X_{23} = 0.88$) and communication ($X_{21} = 0.79$) respectively within the variable of the ways of working (X_2). Indonesian teachers also be liable to place information literacy ($X_{32} = 0.92$), technology literacy ($X_{33} = 0.90$) and media literacy ($X_{31} = 0.81$) respectively within the variable of the tools for working (X_3). Moreover, Indonesian teachers be predisposed to grade personal and social responsibility ($X_{43} = 0.87$), life and career ($X_{41} = 0.79$) and citizenship ($X_{31} = 0.79$) respectively within the variable of the skills for living in the world (X_4). The fifth point which is interesting is the fact that the 21st century skills (Y) were not significantly influenced by the other three main variables: the ways of working ($X_2 = 0.21$), the tools for working ($X_3 = 0.28$) and the skills for living ($X_4 = -0.34$).

Despite four of the hypotheses were not validated by the analysis, the goodness-of-fit of the model used was appropriate to evaluate the hypotheses. The output of the analysis

proved the goodness of fit between the model and all its dimensions and requirements used in the study are actually all considered in the categories of Good Fit. This implies that the model is valid in the sense that the model was developed in accordance with and based on the relevant theory. The dimensions, attributes, values and requirements based on the result from SEM can be seen in Table 3.

Table 3: Goodness of Fit of the Model

Goodness of Fit	Cut-off Value	Results	Notes
Significance probability (P-value)	$\geq 0,05$	0.09543	Good Fit
Root Mean Square Residual (RMR)	$\leq 0,05$ or $\leq 0,1$	0.036	Good Fit
Root Mean Square Error of Application (RMSEA)	$\leq 0,08$	0.036	Good Fit
Goodness of Fit (GFI)	$\geq 0,90$	0.91	Good Fit
Adjusted Goodness of Fit (AGFI)	$\geq 0,90$	0.96	Good Fit
Comparative Fit Index (CFI)	$\geq 0,90$	0.98	Good Fit
Norm Fit Index (NFI)	$\geq 0,95$	0.93	Good Fit

DISCUSSION

This study has created a quantitative model of the 21st century skills of a comprehensive analysis from teacher perspectives. No one sees more clearly than teachers on how the technologies we use in our daily lives influence how the students become skilled in learning. Students have changed, teachers have changed, learning itself has changed; and learning tools have evolved accordingly (Stevens, 2012).

This study also ultimately ascertained that the ways of thinking was the foremost determinant to the 21st century skills. This finding was analogous with Edutopia (2014) by saying that it is not adequate to master academics alone, students also need to get hold of a set of skills that will last for a lifetime. To be able to solve problems in our complex and fast-changing world, students must become nimble, creative thinkers who can work well with others. In addition, the findings convincingly indicated that considerable parts on the ways of thinking were creativity and problem solving features respectively in relation to the 21st century skills needed in the sense of risk taking and leadership perspective as the major features to be the star in the era of 21st century.

The question of how to equip students to be creative and skilled in problem solving is a challenge to all teachers. Effective teaching and learning in the classroom must be ensured that the students can survive in the 21st century as they become well-equipped with risk taking ability and effective leadership outlooks. It can be resulted by better curriculum, better teaching and better tests as well (Rotherham & Willingham, 2009). Thus, it is crucial to accommodate these outcomes and to develop relevant support mechanisms to assist teachers to fulfill their mandate from now on. This was relevant both according to Wesling (2010) and Berry (2010) by saying that the 21st century learning embodies an approach to teaching that marries content to skill and that students master content while producing, synthesizing, and evaluating information from a wide variety of subjects and sources with an understanding of and respect for diverse cultures.

IMPLICATIONS

Several factors evidently contribute to student learning and one significant factor that impacting learning is the relationship between teacher and student in the classroom (Gill, 2010). Think back to when we were in school, asked Meador (2010): Who was your favorite teacher and who was the teacher you dreaded having? We have all had great teacher and surprisingly most of us have had teachers that were not effective too. So, what quality does as an effective teacher have that an ineffective teacher do not? It takes a perfect blend of several qualities to create a truly effective teacher who can have a lasting impact on each student. It is then believed that effective teacher would be able to provide students with appropriate for the 21st century skills.

Kindsvater, et al (1988) then addresses seven assumptions and beliefs prime to effective teaching and four of them are relevant to this , they are: (1) teaching is a complex behavior, (2) teaching is a learned behavior, (3) student must be motivated and (4) teaching in the final analysis is personal invention. Correspondingly, Gurney (2007) believes that teacher knowledge and responsibility for learning, classroom activities that encourage learning, assessment activities that encourage learning through experience, effective feedback that establishes the learning process in the classroom and effective interaction between the teacher and the students as well as stimulate learning through experience are five fundamental factors for effective learning. These remarks were considered to be right and proper elements that should be taken in to account seriously to, once again, provide better students to later entering the 21st century era with more confident.

REFERENCES

- AT21CS (The Assessment and Teaching of 21st Century Skills). (2009). What are 21st-century skills? <http://1tc21s.org.index.php/about/what-are-21st-century-skills> (Downloaded 10 March 2014)
- Beers, S.Z. (2012). 21st century skills: Preparing students for their future. (STEM) www.mheonline.com/mhmymath/pdf/21st_century_skills.pdf (Downloaded 12 March 2014).
- Berry, B. (2010). How do you define the 21st century learning? *Education week teacher professional development sourcebook, Volume 4* (01), p. 32.
- Edutopia. (2014). *Skills for tomorrow: A parents' guide to 21st century learning*. (Downloaded 18 April 2014). http://www.edutopia.org/pdfs/guides/edutopia-parents-guide-21st-century-learning.pdf
- Firdaus, M & F.M. Afendi. (2008). *Aplikasi metode kuantitatif terpilih untuk manajemen dan bisnis*. Bogor: IPB PRESS.
- Gaspersz, V. (2011). *Total quality management: Untuk praktisi bisnis dan industri*. Bogor: Penerbit Vinchristo Publication.

- Gill, D. (2010). Factors that contribute to learning. Downloaded 10 March 2014 from <http://www.shotuk.org/wp-content/uploads/2010/03/Effective-Teaching-Deborah-Gill.pdf>.
- Gurney, P. (2007). Five factors for effective teaching. *New Zealand journal of teachers' work*, Volume 4, Issue 2, pp. 89-98.
- Hair, J.F et al. (1995). *Multivariate data analysis with readings*. 4th Edition. New Jersey, USA: Prentice-Hall, Inc.
- Kindsvater, R et al. (1988). *The dynamic of effective teaching*. New York: Longman.
- Meador, D. (2010). Quality of an effective teacher – Ten qualities of an effective teacher. Downloaded from <http://teaching.about.com/od/pd/a/Qualities-Of-An-Effective-Teacher.htm> (12 March 2014).
- Metiri Group. (2011). Twenty-first century skills. www.metiri.com (Downloaded 15 March 2014).
- Mondal, P. (2014). 16 most important principles of learning. Downloaded 1 April 2014 from <http://www.yourarticlelibrary.com/learning/16-most-important-principles-of-learning/6056/>.
- Rotherham, A.J & D. Willingham. (2009). 21st Century Skills: The Challenges Ahead. *Teaching for the 21st century*, September 2009, Volume 67 (1), pp. 16-21.
- Saavedra, A.R & V.D. Opver. (2012). Learning 21st-century skills requires 21st-century teaching. Kappan October 2012. New Style of Instruction, RAND Corp. (Santa Monica Ca).
- Stevens, M. (2012). The 21st-century learner is here—is your classroom ready? The 21st Century Learner - Create! Communicate! Collaborate! <http://www.nea.org/home/46989.htm> (downloaded 17 April 2014).
- Sugiyono. (2012). *Metode penelitian kombinasi (mixed method)*. Bandung: Alfabeta.
- The Partnership for 21st Century Skills (2013). What are 21st century skills? from http://www.thoughtfullearning.com/resources/what-are-the-21st-century-skills. (Downloaded 15 March 2014)
- Tjiptono, F & G. Chandra. (2011). *Service, quality & satisfaction*. Yogyakarta: Penerbit Andi.
- Union of Education Norway. (2008). A policy document: Teacher education for the future. www.utdanningsforbundet.no (Downloaded on 14 March 2014).
- Wesling, S.B. (2010). How do you define the 21st century learning? *Education week teacher professional development sourcebook*, Volume 4 (01), p. 32.
- Wijayanto, S.H. (2008). *Structural equation modelling* – Lisrel 8.80. Yogyakarta: Graha Ilmu.