

Science and 21st Century Skill: Students' Perspective

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ABSTRACT--- *Technology evolves almost everyday. Science educators must play important role in order for students to face 21st century challenges. This research is subjected to observe the mastery of 21st century skill among the standard 5 students in the process of learning Science. The method used was surveying using interviewing as the main instrument. 60 students of a school in Batu Pahat, Johor were involved as research sample. This research is focusing on 5 components of 21st century skill including digital age literacy, inventive thinking, effective communication, high productivity and spiritual aspect. Overall analysis shows that there is no significant difference among the students in their 21st century learning skills, regardless their gender. Hopefully, this research will help the educators, schools and Ministry of Education to formulate the strategies for improvement of 21st century science teaching and learning.*

Index Terms— *Perception, Science, 21st Century Skills, Effective Communication.*

I. INTRODUCTION

Over the cause of this 21st century, the transformation and development of various disciplines of knowledge require us to make modification in order to co-exist with the fast changing world. In order to prepare our students to face this fast changing world, the 21st century learning and teaching system also needs to focus on various aspects of skill including digital-age literacy, creative and innovative thinking, effective communication and spiritual as well as moral aspects.

Therefore, to apply the required system, the approach of teaching and learning need to be modified and improved to prepare these 21st century skilled learners to face the challenges ahead with rational thinking. The 21st century agenda that needs to be applied in the education system covers various aspects, such as critical thinking based learning, problem solving, metacognitive skills, digital-age literacy, inventive thinking, effective communication and high productivity.

II. LITERATURE REVIEW

Science is one of the most important subjects in this country's education system. However, we often hear the unpleasant complaints from various quarters about the unsatisfying level of science mastery among the students in our country (Kemal Ariffin, 2002). Science is considered hard to be mastered for some students. The achievements shown are unbalanced, some show excellent performance while some are continuing to drop in Science subjects.

In this regard, the Ministry of Education Malaysia has implemented education transformation through the Pelan Pembangunan Pendidikan Malaysia (PPPM) 2013-2025.

Starting in 2014, the Ministry of Education has been eager to implement Kurikulum Standard Sekolah Rendah (KSSR) in primary schools and Kurikulum Standard Sekolah Menengah (KSSM) in secondary schools. KSSR and KSSM are made as benchmark for 21st century learning effectiveness. This is in line with the transformation of national education in PPPM 2013-2025. The Ministry of Education hopes that this new curriculum is structured in line with the country's education system in accordance with international benchmarks and can bring new generation with the skills needed to compete globally.

Hence, 21st century education needs to provide students with the skills in their curriculum by measuring discrete knowledge for critical thinking skills, gathering information and analyzing problems, creativity and innovation, collaboration and communication needed for future advancement. There are various models closely related to 21st century skills such as enGauge 21st Century Skills (2001) and The Partnership on 21st Century Skills (2002), NCREL and Metiri Group (2003) have introduced the enGauge 21st Century Skills in order to address the challenges of information of information and technology in this era.

Kamisah et al (2007) states that Malaysia practices exam oriented education system which does not provide a conclusive learning environment to the culture and science literacy as expected. Pressure to complete the syllabus of learning by the Ministry of Education is also felt by teachers. This causes teachers to prioritize science knowledge but emphasize less on other aspects such as scientific knowledge, process skills, thinking skills, and moral values. Changes in education paradigm must be done from accepting to creating, individual to grouping, routine to creative and innovative. These changes do not need to be done drastically or totally ignoring the existing orientation but need to be better than before at the new level of thinking.

It is very alarming when Malaysia is among the lowest in TIMSS and PISA results. According to the TIMSS 2017 (International Association for the Evaluation of Education Achievement Report, IEA 2008), the position of Malaysian students in Science and Mathematics showed a decline from 10th position in 2005 to 20th position in 2007 with a score of 474, it is below average score, 500. Therefore, the TIMSS result has provided an overview to the Ministry of Education that the mastery of Malaysian students in Science and Mathematics need to be enhanced as in this 21st century, it is all about science and technology.

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In addition, the 2012 PISA score results show that the country's education system is facing crisis. Malaysian students are categorized as weak in reading section with a score of 398, below average score, 498, Science, 420, below average score, 501 and Mathematics, 421, below average score, 494. High order thinking skills such as reasoning and clarifying are major weaknesses of Malaysian students. One of the declining factor of the result is the attitude of students themselves (Noor Erma and Leong Kwang En, 2014). Most of the participants did not seriously participated and did not answer the questions very well as the assessment was not important for them. In addition, the lack of emphasis on high order thinking skills among students in previous curriculum is also a contributing factor to this problem. This resulted in the inability of students to apply skills in answering the questions.

Challenging efforts need to be taken to prepare students with 21st century skills. According to Nurazidawati, Tuan Mastura & Kamisah (2011), there are students who do not know to express the idea despite having a good idea.

In addition, another 21st century domain of knowledge has been identified and needs to be addressed in the Malaysian context of spiritual norms and values. Based on the study of Osman & Marimuthu (2010) "Integration of 21st Century Skills in Science curriculum". Therefore, it is important for us to know more about the extent to which science education plays an important role in nurturing students with 21st century skills in the provision of human capital and student identities in the present world.

Today our world is surprised by the rapid development and changes that complicate all efforts to shape the future. Therefore, the impact of this changes require people to be prepared to follow the trend of the 21st century in tandem with the world civilization and the globalization era. The key trends that need to be focused on achieving progress are the shift from the manufacturing economy to the service economy such as changes in workplace, individual and family roles and mass media engagement, and the shift from specialization to general knowledge ie rapidly changing science, as well as technology in all life field (Tengku Zawawi, 2002).

Through the findings of the above study, it is clear that today's thinking skills are not only focused on traditional creative and critical skills, but their scope needs to be expanded further. The highlight of the 21st century changes and challenges, this study is focus to the perceptions of 5th year students at national schools on science subjects and to examine the level of 21st century skills among students. Emphasizing was also given to the difference in student skill level in the 21st century in terms of gender of the students as well as to see the relationship between perceptions of students towards science subjects with 21st century skills.

III. OBJECTIVE

- 1) To identify the 21st century skills of the standard 5 students in science subject.
- 2) To identify the comparative analysis of the 21st century skills of standard five students in science subject based on gender.
- 3) To identify the relationship between students' perceptions on science subjects with the 21st century skills.

IV. METHODOLOGY

A. Study Sample

This study uses a survey study design to determine the perception of Standard Five students on Science subjects as well as their relation to the 21st century skills. This study was conducted at a school in BatuPahat District. Selection of schools is done randomly through polls. A total of 60 Year Five students were involved as respondents in the study. Respondents' criteria is based on the results of the mid-year examination of the science subjects of the students. This selected school is a high-performance school.

B. Study Tools

Questionnaire was used in this study. Respondents should answer the questionnaire which contains six parts (sections A to G). Part A is on student demographics, part B on student perceptions on science subjects as well as science teaching and learning. Part C, D, E, F, G are related to the elements of the 21st century, part C is digital era literacy, part D is inventive, part E is effective communication, part F is high productivity and part G is the norm and spiritual values . The Likert scale is used in sections C to G where the use of numbers 1 to 5 which represents the value of the interpretation strongly disagrees, disagrees, agrees, and strongly agrees. The same questionnaire was used and adapted in previous studies by NurulNasrah (2015). The verified questionnaire has a high reliability (α) value of more than 0.60 for each constructed study.

V. RESULTS

A. Respondent Profile

Table 1 shows the respondents profile by gender. It is found that 41.7% of respondents are boys and 58.3% are girls as shown below.

Table 1: Profile of Respondents Based on Gender

Gender	Frequency (n)	Percentage (%)
Boy	25	41.7
Girl	35	58.3
Total	60	100

B. Analysis of the 21st Century Skills of the Standard 5 Students in Science Subject

Number In this study, the 21st century skills level was translated through the interpretation of the mean score of the 21st century skill level built. For each construct, the 21st



century skills level is the feedback or degree of student approval of each item that represents the construct.

The 21st century skills level among Standard 5 students in science subjects is shown in table 2. For digital age literacy, inventive thinking, effective communication, high productivity and norms and spiritual values are 3.63, 3.83, 3.75, 3.75, and 4.22. Then the researcher obtained the average score of the 21st century skill level for each construct. Overall, the mean value as shown in table 2 ie 3.83 shows that the overall mean of the 21st century skills is high.

Table 2: Analysis of the 21st Century Skills In Science Subjects

Construct	Mean Score	Standard Deviation	Mastery Level
Digital Age Literacy	3.63	0.44	High
Inventive thinking	3.83	0.43	High
Effective communication	3.75	0.49	High
High productivity	3.75	0.59	High
Norm and spiritual values	4.22	0.49	High
Level	3.83	0.48	High

C. The Comparative Analysis of the 21st Century Skills of Standard Five Students in Science Subject Based on Gender

To compare the 21st century skills level, the t-test is used as a measurement. The t-test results are as in Table 3.

Table 3: Result of T-test of the 21st century skills Level of Standard Five Students in Science Subject Based on Gender

Construct	Gender	N	Mean Score	Sp	T	Sig
Digital age literacy	Boy	25	3.75	0.46	1.97	0.72
	Girl	35	3.51	0.42		
Inventive thinking	Boy	25	3.93	0.49	1.62	0.11
	Girl	35	3.74	0.38		
Effective communication	Boy	25	3.90	0.53	0.03	0.03
	Girl	35	3.60	0.46		
High productivity	Boy	25	3.87	0.70	0.13	0.13
	Girl	35	3.63	0.49		
Norm and spiritual values	Boy	25	4.29	0.45	0.90	0.38
	Girl	35	4.15	0.54		

The t-test results show that male and female students not have as significant differences in the four constructs of the 21st century. The constructs are digital era literacy [t (60) = 1.97, p <0.05], inventive thinking [t (60) = 1.62, p <0.05] as well as norms and spiritual values [t (60) = 0.90, p <0.05]. This difference is clearly visible from the mean score of both sexes. Mean for the five constructs namely digital era literacy (M = 3.75), inventive thinking (M = 3.93), effective communication (M = 3.90), high productivity production (M = 3.87), and spiritual norms and values (M = 4.29) for men is higher than women. All these mean differences are measured at the significance level of 0.05.

D. The Relationship Between Students' Perceptions On Science Subjects With The 21st Century Skills

The Pearson Correlation Test is used to determine the relationship between student perceptions of science subjects and the 21st century skills. The Pearson correlation results are as in Table 4.

Table 4: Results of Pearson Correlation (r) Among Students' Perceptions on Science Subjects with 21st Century Skills

Relation	Frequency (n)	Correlation (r)	Sig.
Students' perception	60	0.393**	0.002
21 st century skills level	60	0.393**	0.002

**significant correlation at p <0.01 (two ends)

The results in table 4 above show the correlation coefficient obtained for the 21st century skills level and the perception of the Standard Five students in science subjects is 0.393. 0.393 with all the probability values below the set level p <0.01. Results of the data analysis in the table found that there was a significant correlation between the perceptions of students towards 21st century science subjects.

VI. DISCUSSION

The results of this study show a mean score of 3.83. This value indicates that perceptions of Standard Five students on Science subjects are at a high level. This proves that students' perceptions of science subjects are good. This perception is very important to increase the motivation for learning science as well as cultivating interest in the subject. It can not be denied that one of the factors that led to the deterioration was the attitude of the students themselves. According to Shaari et. al. (2011) feeling embarrassed to ask questions and weak in reasoning cause the students to fail in understanding a concept. According to Mohd Fuad Sam et. al. (2016) expressing the intrinsic implication of pupil's intrinsic motivation has resulted in ineffective learning. This negative perception causes them to disallow themselves to accept the subject as something that is easy to understand. Noriatiet. al. (2017) states that no intrinsically motivated pupils will be less disciplined, diligent and less persevere in facing of challenges.

The students' motivation and interest should be maintained by teachers using various approaches and methods of teaching and learning in the classroom. Subahan and Syed Ismail (2017) states that the traditional way of teaching is irrelevant as students only act as listeners. In addition, according to Rokiah, I. (2000) the teaching method by less qualified or less competent teachers will result in some disciplinary problems and students' competence problems such as lack of interest, become easily bored and often skipping classes among students. Effective teachers need to use co-operative and collaborative student-centered learning strategies (Mahdi Shuid et al (2017). Thus, the student-centered creative teaching method, emphasizes



thinking skills as well as attractive approach will encourage students to learn independently through information and technology is important in this 21st century education.

The Standard Five Students' 21st century skills in terms of digital age literacy, inventive thinking, effective communication, high productivity and spiritual norms and values are at a high level, the mean score is 3.83. In terms of spiritual norms and values has the highest mean score interpretation (mean = 4.20) compared to other components of the 21st century skills. This finding is in line with the study conducted by Nurul Nashrah (2015) in Mathematics around Putrajaya which also shows a mean score of 3.65. This proves students are at a high level of norms and spiritual values. It also corresponds to the Rukiah (2013) study which earns the highest mean scores for norms and spiritual values of 4.22 versus other components of science subjects. In Malaysian context, spiritual norms and values play an important role as Malaysia is a multiracial and multi-religious nation. This aspect of the norm and spiritual value is very important to produce balanced human capital and to spur the country's economy. Therefore integrating and integration of norms and spiritual values in the teaching and learning process is essential to be applied among the students.

Overall, the 21st century skills analysis based on gender shows that there is no significant difference between male and female students in terms of 21st century skills. The results are consistent with Rukiah's study (2013) which shows that there is no significant difference in the mean score of the 21st century skill level between male and female students [$F(1296) = 3.82, p = 0.537$]. However, from the analysis, there is a skill that demonstrates the difference in the mastery of the 21st century skills. It is effective communication components. The results show that male students obtained higher mean score (mean = 3.90) compared to female students (mean = 3.60). For these components of effective skills, it is contrary to Knox et al. (2004) and Roy et al. (2000) found that female students have the highest communication skills and prefer to have closer relationship to each other than male students.

From the results obtained in this study, it also shows that there is a significant positive correlation between the perceptions of students towards science subjects and the 21st century skills with a coefficient of correlation of 0.39. This shows that there is a significant but modest correlation between the perceptions of students towards Science subjects and the 21st century skill components. Hence, from this finding, it is very reasonable that the strategy or approach of teaching and learning methods used by teachers to attract students to learn Science is through exploration, discovery and using modules. Helping students acquire 21st century skills through exploration and discovery requires a profound knowledge of effective technology and pedagogy.

In this regard, the selection of appropriate teaching and learning strategies is essential to maximize the students learning process, as well as to attract students to learn the subject. According to Ismail Kailani et al. (2010) there are various ways teachers can use in order to attract students during the teaching and learning process in the classroom. The Inquiry-Based Education teaching method is an inquiry-based teaching and focuses on acquiring the

student's own experience (Noriati et al 2017). Therefore, teachers are responsible for selecting and providing science teaching and learning resources to strengthen their science concept in the classroom or laboratory (Ellyza Karim et al., 2015). In addition, pedagogical method of teaching should be material oriented and students oriented. Students should be able to access information and apply technology-based learning (Subahan and Syed Ismail 2017). With this, students' perceptions of learning can be improved and thus improve students' thinking skills.

VII. CONCLUSION

This study proves that if a student has a positive perception towards Science subject, the development of the 21st century skills can easily be applied during the teaching and learning process both inside and outside of the classroom. From the outlook of these skills, teachers, educational organizations and policy makers, especially the Curriculum Development Division, can identify the weaknesses and shortcomings on the needs of the 21st century skills among students. Many of the more creative and innovative strategies and methods of teaching and learning as well as the 21st century-oriented skills need to be emphasized by teachers. Hence, it is hoped that the 21st century skills in the pupils will continue to be generated and enhanced in producing balanced human capital and have a high market value to compete in the era of globalization technology.

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