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PRIMARY SCHOOL PUPILS' PERCEPTION ON MATHEMATICS IN CONTEXT OF 21ST CENTURY LEARNING ACTIVITIES AND SKILLS

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***Abstract* - The purpose of this study was to identify primary school pupils' perceptions toward learning Mathematics in 21st century education setting. These perceptions are based on four aspects which consist of: i) mathematics as a subject; ii) 21st century learning activities; iii) 21st century skills in learning Mathematics which have been known as 4Cs (Communication, Collaboration, Creativity and Critical Thinking) and iv) pupils' learning performance in Mathematics. The attempt to obtain information or feedback about pupils' perception in learning Mathematics has become very necessary since teachers have to take great effort to understand the pupils' needs and try to fulfil them. Teachers will get ideas what to improve in order to make sure learning mathematics in 21st century can achieve the best level. 88 samples were involved in this study consist of 30 of 8 years old pupils and 58 of 9 years old pupils and they were selected by applying purposive sampling. A quantitative research design was applied. A questionnaire consist of 20 items was conducted. According to the finding, the high grand mean for each aspect shows that pupils have positive views regarding Mathematics as a subject, highly interested with 21st century learning activities, admit to be able in mastering 21st century learning skills and highly agree they have improve in their learning.**

Keywords: *21st century; learning mathematics; pupils' perception*

I. INTRODUCTION

Rethinking pedagogy for 21st century education is a crucial in order to develop new competencies and fulfil today's learners need. 21st century skills and content knowledge are equally important and should be applied in well-combined and balance for pupils in earlier stage (Khalil, N. M. & Osman, K. 2017: 225-233). In this new era of 21st century, the significant changes and developments in various disciplines require us to make changes and modifications in order to move in tandem along the world change for succeed adaptation in study, career and life. Similarly, teaching and learning system in the 21st century necessarily should convey and equip pupils not only the content knowledge but also various skills such as digital literacy, critical thinking, creativity and innovative, effective communications and as well as spiritual aspects need to be emphasized.

Apparently, Mathematics is one of the most important subjects in the education system in this country and other countries around the world. However, frequently so many complaints came from various parties about the unfavorable achievement level of Mathematics proficiency among majority pupils in this country (Khalil & Osman 2017: 225-233) where pupils were found to face difficulties in obtaining good and excellent result in central examinations. For most pupils, Mathematics is accepted as a quite difficult subject to master. There are pupils who show good achievement while in the other hand there are group of pupils who are left behind in mastering these subjects even when dealing with easy topics, content standard and learning standard.

Nowadays, pupils require and deserve motivating and supportive learning atmosphere, engaging and meaningful content as well as opportunities to learn in 21st century setting that support collaboration with peers, teachers and the larger world community (Teaching in The 21st Century. 2008). Creativity among pupils will be stifled when learning environments provide chances for them to communicate new ideas and solve challenging problem through collaboration and cooperation (Scott. 2015).

21st century learning focuses on four skills (4Cs) that should be mastered by pupils, namely communication, critical thinking, collaboration and creativity as cited in Paradigm Bulletin (Paradigm Bulletin. 2015). The responsibility of fostering the 4Cs skills is very important in vision to achieve Malaysia Education Development Plan 2013 - 2025 and all the teachers have to take the responsibility (Malaysia Ministry of Education. 2013). Knowledge and skills should be well-integrated and infused effectively in pupils learning activities (M N Azmi & Nurzatulshima. 2017). Teachers are suggested and encouraged to apply variety of engaging teaching techniques such as brainstorming, role-play, games and other pupils-centred learning activities which are appropriate with the contents and skills to be mastered during the learning and facilitating session. Pupils will get opportunities to experience meaningful learning and it might improve their capability in developing their content knowledge and skills.

II. PROBLEM STATEMENT

Traditional teaching approaches which emphasize on memorization or focus on applying simple procedures and algorithm seem to be less effective in assisting pupils to expand their critical thinking skills (Scott. 2015). Otherwise, teachers should put on efforts intensively to cultivate curiosity, imagination, creativity and evaluation skills (Partnership for 21st Century Skills. 2010). Students who possess these skills are better to tolerate ambiguity, explore new realms of possibility, express their own thoughts and feelings and understand the perspectives of others.

Adoption and infusion of 21st century skills in efficient and effective ways are still lacking in teaching

practice and learning process. As a result, pupils have been identified to fail in applying their knowledge and using critical skills to solve real-life problem (Khalil & Osman 2017: 225-233).

This study is important to identify perception of primary school pupils toward learning mathematics in 21st century classroom since most of the previous research more focused on secondary and higher level students. The literatures which discussed on primary school pupils are very limited.

Formal Education begins in primary school. The implementation of teaching and learning mathematics in primary school classroom should be done in meaningful and effective ways. The best teaching Mathematics practice in 21st century can be carried out by determining the pupils' views and perception in order to identify their needs in learning.

Since the researches that involve primary school pupils at age 8 and 9 years old are very limited, most of the teachers are unsure about their pupils needs. The needs of the young pupils in learning Mathematics in 21st century classroom are not well determined. Without adequate information about the pupils needs, teacher unable to prepare and implement the most appropriate learning activities which may assist the pupils to master learning outcomes at excellent level.

III. RESEARCH QUESTIONS

There are four questions of this study. The questions are

i. What are primary school pupils' perceptions towards Mathematics?
ii. What are primary school pupils' perceptions towards 21st century learning activity?
iii. What are primary school pupils' perceptions towards 21st century skills in learning Mathematics?
iv. What are primary school pupils' perceptions towards their performance in learning Mathematics?

IV. LITERATURE REVIEW

A study with purpose to explore 21st century skills among 60 pupils in form four at secondary level have been carried out (Salehudin. 2015). The study has emphasized on 5 components of 21st century skills: digital age literacy, inventive thinking, effective communication, high productivity and spiritual value. The researchers have identified pupils' high performance in 21st century skills in learning Mathematics.

An Integrated Model of Infusing 21st Century Skills has been developed and introduced (Arbaa. 2017). Teachers have applied teaching methods that involved every pupil in the classroom in a set of well-planned learning activities. The findings of the study show that pupils' active involvement in learning has provided them more chances to improve their skills. Pupils were promoted to contribute their opinion, developed their confidence and improved their 4Cs skills. In similar, a study implemented on 24 pupils has proven that pupils performed better in mastering 4Cs skills when pupils learn actively and meaningfully in pupils-centred activities (L S Smit. 2016). Problem-based and project-based learning has been applied where pupils worked in small groups and as the result pupils enjoy Mathematics like a craft work .

A study on 2430 secondary pupils' perspective regarding to the needs of classroom practices has found that uninteresting teaching method is one of the major problems that affecting the outcomes of 21st century learning (Teemuangsai & Meesook. 2017).

Teachers are comfortable with traditional teaching method while in the other hand, pupils are request for new teaching strategies which are more fun and relevant to their real life. Inappropriate teaching technique, method, approach and strategy are unable to assist pupils to perform better in their learning and academic achievement. Pupils have not possessed positive attitude toward Mathematics as they admit the Mathematics learning atmosphere didn't meet their interest (X Yang. 2013). It is the consequence of the teaching practice among Mathematics teachers that allocate most of the teaching and learning time for practicing and exercise to fulfil the examination needs. Pupils have no chance to experience meaningful and effective learning.

A study which involved 277 secondary pupils in Kelantan found that pupils' attitude toward learning has increased to high level after 21st century skills are applied (R A Iberahim. 2017). 21st century learning has influenced pupils' attitude, motivation and performance in a subject. 21st century learning has positive influence on pupils' attitudes, motivations and achievement in Malay Language subject (R A Iberahim. 2017). The similar result has been derived in a study conducted on 280 secondary pupils has involved in a study to determine the correlation between pupils' perception and attitude toward Malay Language subject and 21st century skills (M Yunos. 2015). The study has found that pupils' attitude and their learning in Malay Language subject are highly correlated (M Yunos. 2015). Furthermore, correlation between pupils' perception and 21st century skills are strong and high ($r = 0.711, 0.673$). 21st century skills have been applied affectively in teaching and bring positive views and minds among the pupils.

V. METHODOLOGY

This section will discuss on design, sample and instruments used in this study.

A. Sample

This study applied survey study design to determine the perception of Level 1pupils of primary school which consist of Standard 2 and Standard 3 pupils on Mathematics subjects, 21st century learning activities and skills and their performance in mathematics classroom with 21st century setting. This study was conducted at a primary school in Ipoh District, Perak. The selection of

this school was done purposely. A total number of 30 of Standard 2 pupils and 58 of Standard 3 pupils were involved as respondents in this study. Respondents came from different level of performance in Mathematics: excellent, good and intermediate. Pupils at poor level of performance were not involved in this study to make sure the data obtained are acceptable and reasonable.

B. Instruments

In this study, a questionnaire was developed and used. Respondents were given a questionnaire consisting of five sections. Part A contains the questions related to pupils' demographic profile. Part B relates to pupils' perception toward Mathematics. Part C relates to pupils' perception towards 21st century learning activities. Part D relates to pupils' perception toward 21st century skills. Part E relates to pupils' perception towards their performance in Mathematics in 21st century classroom setting.

For all of the sections, the questions are included with a Likert scale consisting of numbers 1 to 5 which represents the value of the interpretation: 1 - strongly disagree; 2 - disagree, 3 - neutral; 4 - agree and 5 - strongly agree.

This questionnaire has been validated by two experts consisted of a primary mathematics lecturer and an expert teacher. A pilot survey on 30 pupils has been conducted to test the reliability of 20 items used in the questionnaire. These 30 pupils not involve in the actual study. Cronbach's Alpha showed the questionnaire to reach acceptable reliability, $\alpha = 0.900$. Minimum Cronbach's Alpha value at $\alpha = 0.800$ is acceptable for the overall reliability (K S Taber. 2018). The instrument is at excellent internal consistency. Table 1 shows the Cronbach's Alpha value of the instrument.

TABLE 1. CRONBACH'S ALPHA VALUE OF THE INSTRUMENTS

Number of Items	Cronbach's Alpha
20	0.900

With the high reliability value, the questionnaire can be used for further study. A study on 88 pupils will be conducted by using this questionnaire.

VI. RESULTS

Research findings can be categorized into two categories: demography and pupils' perception. 88 responses have been collected.

A. Demography

This study has involved 88 pupils from a primary school in Ipoh, Perak, Malaysia. The details of respondents demography profile has been analysed in Table 2.

TABLE 2. DEMOGRAPHY PROFILE OF THE RESPONDENTS

Demography Profile		Frequency (n)	Percentage (%)
Gender	Male	43	48.9
	Female	45	51.1
Age	8 years	30	34.1
	9 years	58	65.9
	Total	88	

Base on the Table 2, respondents are consisting of 43 (48.9%) male and 45 (51.1%) female pupils. The respondents come from 2 categories of age where 30 (34.1%) of the respondents are Standard 2 pupils at age 8 years old and 58 (65.9%) are 9 years old pupils at Standard 3.

B. Analysis of Pupils' Perception toward Mathematics

Analysis of pupils' perception toward Mathematics has been done descriptively. The mean and standard deviation value for each item are analysed and interpreted. Table 3 shows the level of pupils' perception toward Mathematics.

TABLE 3. LEVEL OF PUPILS' PERCEPTION TOWARD MATHEMATICS

No.	Items	M	SD	Interp.
1	I like Mathematics class	4.43	1.003	High
2	Mathematics is an easy subject for me	3.39	1.519	Medium
3	I like to do Mathematics homework	4.27	1.172	High
4	I am able to complete my Mathematics task in time provided	3.82	1.451	High
5	I like to generate new ideas in Mathematics class	4.06	1.216	High
	Grand Mean	3.99		

The findings show pupils' perception toward Mathematics. Pupils are agree at high level that they like Mathematics class, M = 4.43, SD = 1003. With medium agreement, M = 3.39, SD = 1.519, pupils assume Mathematics is an easy subject to them. Pupils show high agreement in three other item regarding to their perception toward Mathematic in which they like to do mathematics homework, M = 4.27, SD = 1.172, able to complete mathematics task in time provided, M = 3.83, SD = 1.451 and like to generate new ideas in Mathematics class, M = 4.06, SD = 1.216. According to the grand mean value, pupils' perception toward Mathematics is high.

C. Analysis of Pupils' Perception toward 21st Century Learning Activities

Analysis of pupils' perception toward 21st century learning activities has been done descriptively. The mean and standard deviation value for each item are analysed and interpreted. Table 4 shows the level of pupils' perception toward 21st century learning activities.

TABLE 4. LEVEL OF PUPILS' PERCEPTION TOWARD 21ST CENTURY LEARNING ACTIVITIES

No.	Items	M	SD	Interp.
1	I like hands-on activity in Mathematics class	4.45	1.027	High
2	I like learning Mathematics in fun with games	4.77	0.601	High
3	I like singing activity in learning Mathematics	4.56	0.957	High
4	I like project-based activities in learning Mathematics	4.66	0.756	High
5	I like to use ICT attract in learning Mathematics	4.73	0.638	High
	Grand Mean	4.63		

The interpretation of 5 items regarding to pupils' perception toward 21st Century learning activities are high as shown in Table 3 above. Pupils are highly agree that they like hands-on activity in Mathematics class, M = 4.45, SD = 1.027 and they like learning Mathematics in fun with games, M = 4.77, SD = 0.601. Pupils shows high interest in singing activity, M = 4.56, SD = 0.957 and project-based activity, M = 4.66, SD = 0.756 in learning Mathematics. Most of the pupils are agree that they like to use ICT in learning Mathematics, M = 4.73, SD = 0.638. Grand mean value, GM = 4.63 shows that pupils have high perception toward 21st century learning activities.

D. Analysis of Pupils' perception toward 21st Century Learning Skills

Analysis of pupils' perception toward 21st century learning skills has been done descriptively. The mean and standard deviation value for each item are analysed and interpreted. Table 5 shows the level of pupils' perception toward 21st century learning skills.

TABLE 5. LEVEL OF PUPILS' PERCEPTION TOWARD 21ST CENTURY LEARNING SKILLS

No.	Items	M	SD	Interp.
1	I like to communicate my ideas with other pupils and teacher	3.82	1.309	High
2	I can state my answer confidently	3.83	1.243	High
3	I like to contribute creative ideas in learning Mathematics	3.76	1.304	High
4	I can give reason why I choose an answer	3.60	1.402	Medium
5	I like to collaborate with pupils from other classes in learning Mathematics	4.57	0.841	High
	Grand Mean	3.916		

Pupils' perception toward 21st century learning skills has been interpreted according to mean and standard deviation value as mentioned in Table 5. Pupils' agree with high agreement in four items instead of five. Pupils are highly agree that they like to communicate their ideas, M = 3.82, SD = 1.309, confident to state their answer, M = 3.83, SD = 1.243, contribute creative ideas, M = 3.76, SD = 1.304 and like to collaborate with pupils from other classes in learning Mathematics, M = 4.57, SD = 0.841. In the other hand, pupils agree at medium level that they can give reason why they choose an answer, M = 3.60, SD = 1.402.

E. Analysis of Pupils' Perception towards Their Learning Performance in 21st Century Classroom

Analysis of pupils' perception toward their learning performance in 21st century classroom has been done descriptively. The mean and standard deviation value for each item are analysed and interpreted. Table 6 shows the level of pupils' perception toward their learning performance in 21st century classroom.

TABLE 6. LEVEL OF PUPILS' PERCEPTION TOWARD THEIR LEARNING PERFORMANCE IN 21ST CENTURY CLASSROOM

No.	Items	M	SD	Interp.
1	I am good in solving Mathematics problem	3.60	1.386	Medium
2	I am good in using variety of strategies in solving Mathematics problem	4.23	1.201	High
3	I have improved my understanding in Mathematics	4.03	1.189	High
4	I have improved my basic operation skills	3.99	1.140	High
5	I am able to complete my Mathematics works correctly	3.75	1.432	High
	Grand Mean	3.92		

Table 6 shows the level of pupils' perception toward their learning performance in 21st century classroom. The interpretation base on mean and standard deviation values are high in four items instead of five, concern with pupils' perception toward their learning performance in learning Mathematics where 21st century classroom setting has been applied. Pupils highly agree they are good in using variety of mathematical problem solving strategies, M = 4.23, SD = 1.201 but state their agreement at medium level regarding to their ability in solving mathematics problem in general, M = 3.60, SD = 1.386. Pupils show high agreement that they have improve their understanding in Mathematics, M = 4.03, SD = 1.189, improve their basic operation skills, M = 3.99, SD = 1.140 and ability to complete their Mathematics work correctly, M = 3.75, SD = 1.432.

VII. DISCUSSION

Pupils have shown high perception toward Mathematics. Although pupils are not really agree that Mathematics is an easy subject to them, they have admit that they like Mathematics class, like doing Mathematics homework and able to complete Mathematics tasks given by teacher in certain duration as allocated by their teacher. This result is quite surprising since commonly most pupils have negative perception when they are

thinking of Mathematics as they claim Mathematics is very difficult and a boring subject. In this study, meaningful 21st century learning activities have influence pupils' positive minds toward this subject. A research conducted by (Rikhotso. 2015) has derived the same finding as the samples of the study have assumed Mathematics as a difficult subject and they were against declaring Mathematics as a compulsory subject. However, majority pupils who were involved in (Rikhotso. 2015) research have negative attitude against Mathematics and the result is contrast to this study findings. Teachers' attitude was one of the factors responsible for the learners' negative attitude against Mathematics (Rikhotso. 2015).

The findings show pupils like to generate new ideas in Mathematics classroom although Mathematics is not really easy for them since this perception doesn't retard their interest in learning Mathematics. This finding is supported by (Arbaa. 2017) as their samples face no anxiety to contribute ideas during the learning session even though their ideas incorrect or inappropriate. They are confident to generate and share their idea since they are promoted by teacher to learn from mistakes.

21st century learning activities are really interesting to most of the pupils. They highly agree that they like hands-on, fun with games, singing, project-based and ICT-based activities in learning Mathematics. 21st century learning activities significantly play important role in fostering 4Cs skills. A study implemented by (L S Smit. 2016) has proved that pupils perform better in mastering 4Cs skills when pupils-centred lesson were applied through project-based learning and pupils work in group which has make pupils enjoy Mathematics like a craft work. These results are supported by the finding of a research carried out by (Arbaa. 2017) as they found the pupils are interested in pupils-centred learning in which they are promoted to learn actively and effectively. In contrast, pupils do not have positive attitude toward Mathematics and they do not perceive their Mathematics environment very favourably (Yang. 2013). This result was due to teaching practice among Mathematics teachers in China where they tend to spend most of learning session on practices and exercises, they refuse to implement meaningful learning and pupils have no chance to learn effectively.

Pupils' motivation and interest in learning also increase along with the implementation of 21st century learning activities. Pupils admit they have improved their performance of learning Mathematics in 21st century setting classroom. There are high and positive correlation between pupils' attitude toward subject and integration of 21st century skills in learning activities (M Yunos. 2015). This finding also supported by (R A Iberahim. 2017) they have found pupils' attitude toward learning has increased to high level after 21st century skills are applied. Vice versa, Lack of students' interest in Mathematics is due to their attitude of thinking Mathematics as a difficult subject. This negative perception avoids them to accept Mathematics as an easy subject to understand. When they have a negative perception toward the subject, they will be unhappy to attending Mathematics classes, studying Mathematics and possibly being more likely to skip Mathematics classes (Yang. 2013).

Among the 4Cs skills, the finding shows pupils are highly agree regarding to communication skill, collaborative skill and creativity but show agreement only at medium level regarding to critical thinking base on their ability to provide reason why they choose an answer. Infusing critical thinking in teaching and learning neither easy to teachers nor to pupils. Teachers interested in promoting critical thinking in the classroom would first need to commit to allow pupils to engage in productive struggle and push pupils to solve complex problems that are beyond pupils' comfort zones (S Sanders. 2016: 19-27).

Generally, 21st century learning activities are meaningful, joyful, effective and challenging that meet pupils' needs and learning style. Teachers have to apply 21st century learning widely encompass the Mathematics syllabus in their teaching practice to promote active learning among the pupils and offer opportunities to them learning in meaningful and effective way. When the best learning process are adopted, pupils' perception and attitudes toward subject will be positive and their motivation in learning will increase. This positive behaviour and minds will lead to pupils' improvement and success in learning.

Since teachers contribute major influence toward the effectiveness of learning process, support must be provided to them to enhance their knowledge and skills teaching in 21st century education setting. Policy maker consist of Ministry of Education, State Education Department, District Education Office should take serious actions to support teachers change their teaching paradigm from conservative to the more relevant, energetic and appropriate teaching practice. Professional development through courses and workshop may enrich teachers with new techniques, methods, approaches and strategies to apply affective teaching. Sometimes, teachers need ready-to-use resource to assist them in planning and implementing 21st learning activities. One of the best solutions to offer is providing teaching module to the teacher. Practical teaching module enriched by variety of learning bases activities may bring positive impact to the teachers and pupils in 21st century Mathematics classroom.

VIII. CONCLUSION

The result of this study shows pupils' perception toward Mathematics, 21st century learning activities and skill and their performance in 21st century classroom. Their needs and interest are clearly identified in this study. Teacher should take note of this finding and attempt to fulfil the interest and needs. Teaching in traditional paradigm is not relevant anymore and unable to cater the need of high impact learning and education. Teacher-centred teaching approach will not assist pupils achieve their best performance in learning.

Teachers should apply 21st century learning strategies which are joyful, effective, meaningful and yet

challenging pupils to improve their 4Cs skills. Pupils-centred activities comprising project-based, problem-based, ICT-based, rhymes-based and play-based should be applied intensively in Mathematics classroom. These attractive learning activities will cater pupils' interest, build positive perception toward Mathematics or other subjects in general, develop pupils' motivation and increase pupils' performance in learning.

Researches involving Standard 1 and Standard 2 of primary pupils are hard to find. More researches should be carried out regarding to primary pupils learning Mathematics in 21st century setting. This study applied survey method which has just identified pupils' perception on surface. Further studies are recommended with qualitative or experimental methods to obtain deep and precise comprehension about primary pupils' needs and performance in learning Mathematics in 21st century classroom setting.

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