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Attitude in Learning Physics among Form Four Students

Norezan Ibrahim*, Mohd Aiman A. Zakiang, Siti Maftuhah Damio

Faculty of Education, Universiti Teknologi MARA,
UiTM Puncak Alam Campus, 42300 Puncak Alam, Selangor, Malaysia

*Corresponding author email: *norezan3881@uitm.edu.my*

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ABSTRACT

Physics is considered as the most challenging area of learning within the field of science, and it usually magnetises fewer students compared to other science related subjects from secondary school to university. Generally, students tend to have a negative attitude towards physics presumably because they lack interest in the subject and the syllabus itself. This research is carried out to study the learning attitude in physics and challenges towards learning force and motion among Form Four students in Klang. A total of 200 secondary schools students who are taking physics subject from six schools participated in the study. A descriptive research design was employed using survey method to analyse the students' attitude towards learning physics. The findings on the learning attitudes test showed majority of the students have favourable attitudes in learning physics. However, majority of students hold poor score in physics test, probably due to low science grade obtained by students in 'Penilaian Pentaksiran Tingkatan 3' (PT3). Another finding from the data revealed that the nature of topic was found to be the most predominance challenge in learning force and motion among the participants. The findings are beneficial as they can serve as a stepping stone in overcoming the underlying sources of difficulty that

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Keywords*: force and motion, learning difficulties, attitude, physics, form four*

INTRODUCTION

Education system plays a vital role in the development of modern technological nation in 2020. To realise the 2020 vision and the National Science and Technology Policy, the Malaysian Ministry of Education (MOE) has launched a mission to ensure that the student ratio in Malaysia will be 60:40 which represents 60% science stream and 40% arts stream students in the upper secondary school (Saleh, 2014). Generally, this policy aims to encourage more science students to participate in the field of health work, engineering, science education, ICT and others science related courses. The MOE was optimistic that the ratio of 60:40 between science and arts

stream students can be achieved by 2010 through students' early exposure towards integrated science and technology curriculum (Veloo & Khalid, 2015). This aspect of science is making significant contribution to many of the inventions that are shaping modern day and establishing a scientific and progressive society, a society that is innovative and forward-looking, for instance, those who are masters in engineering field, specialist doctors, and those who are experts with high technology. However, it is found that the number of students pursuing science subjects is still far behind the targeted figure. Most of the schools can only provide less than 40% science students compared to social science students (Utusan Malaysia, 27 Mac 2009). One of the main reasons identified as the contributor to the lack of student enrolment in the science stream is the outlook that science subjects are difficult. The poor achievement of students in science especially physics has continued to be a major concern to all and particularly those in the main stream of science education (Utusan Malaysia, 27 Mac 2009).

Physics subject is introduced to Malaysian students during their upper secondary school. Physics is taught in two years starting from Form Four and ends when the students are in Form Five. Physics is taught to enable students to grasp its concept and principles in depth along with how this knowledge can be applied in their daily lives (Curriculum Development Centre, 2002). However, physics is considered as the most unpopular and known to be a boring subject compared to chemistry and biology among students especially in the rural areas (Veloo & Khalid, 2015; Guido, 2013; Olusola & Rotimi, 2012). In Malaysia, it has been found that the level of educational achievement in the subject of physics is considered somewhat less satisfactory. Students in Malaysia have not been quite able to excel in physics because most of the students are actually not interested in studying physics. Students' interest towards physics has been found to be on the decline across the stages of study (Halim, Rahman, Ramli & Mokhtar, 2018). Most students consider physics as a difficult subject, mainly due to the learning processes involved in understanding physics, which require the learners to deal with different types of representations, such as formulas, calculations, graphics representations, and also a conceptual understanding at an abstract level (Saleh, 2014; Angell *et al.,* 2004; Sidin, 2003). The lack of students understanding of the problem and their poor mathematical skills also constitute the major obstacles in the circle of difficulties that students experience in solving physics problems (Fadaei & Mora, 2015). As a result,

students have a wide gap and difficulty in understanding specific topics in the curriculum that are usually characterised as lacking concrete examples and requiring a lot of mathematical manipulations or visualisation particularly in learning force and motion. Rohana and Shaharom (2008) reported that generally students failed to master the conceptual understanding of force in Newtonian force concept in physics and they were poor in giving correct answers to problems which are related to force and motion. Besides, Newton's laws of motion have a special role in exploring the world. They are important when viewed in conjunction with other fundamental concepts in physics. Siti Nursaila and Faridah (2016) and Tomara *et al.* (2017) showed congruent finding which revealed that generally students failed to master the conceptual understanding of force in Newtonian force concept in physics and they were poor in giving correct answers to problems which are related to force and motion.

The purpose of this study is to determine the students' attitude towards learning physics. One of the utmost significant factors which affect students' academic success is their attitudes towards school, lessons and academic success (Guido, 2013). Students' attitudes and interest could play significant role among students studying science. Attitude implies favourable, disfavour able or neutral evaluative reactions towards something or item. In other words, attitude is a way of looking or viewing at things. In the theory of attitude, Rosenberg and Hovland (1960) claimed that attitude is the intermediary for all types of reactions which can be categorised into three main components namely emotion, cognitive and behaviour. These three components explain students' attitude towards learning. Gardner (1980) elaborates attitude as the sum total of a man's instinct and feelings, prejudice or bias, preconceived notions, fears, threats, and convictions about any specified topic. In this study, attitude generally are regarded as the positive or negative feelings of individual towards physics learning. Positive learning attitudes are an important aspect in the process of learning science or science related subject like physics. Veloo and Khalid (2015) in a study revealed that positive attitude stimulates students to put more effort and leads to high achievement in that subject while negative attitude towards a certain subject makes learning more difficult. Godwin and Okoronka (2015) agreed with the assertion that a significant relationship exists between students' attitude and their corresponding academic performance in physics.

Most students tend to have a negative attitude towards physics presumably because they dislike the subject, do not obtain high marks in

examination even though they have tried their best, the cramped syllabus content, also do not like physics teachers or lecturers (Halim *et al.,* 2014; Olusola & Rotimi, 2012). A study conducted by Guido (2013) found the similar findings that the students who have negative attitudes towards science; they also do not like physics courses and physics teachers. On the study conducted by Veloo and Khalid (2015), teachers in schools have always commented that student's lower achievement in physics is due to their negative attitude and lack of interest towards the subject. Attitude affects internal motivation which in turn affects the academic achievement and students' participation in school (Visser, 2007). Students with negative attitudes towards physics and limited interest in science can generally be translated into low student enrolments in science stream and consequently in university physics courses leading toward degrees in physical sciences. This has resulted in fewer students pursuing and persevering in physics-related careers during their undergraduate degree. Because of a visible decline in the enrolment in physics and a fall in the interest in physics around the world, many researchers have been made to estimate the attitude of students towards physics at secondary schools and at universities (Milner-Bolotin *et al.,* 2011; Halim *et al.,* 2018). It is deemed necessary to look into this phenomenon.

Previously, the gender difference in university physics achievement has been documented. The terms of gender differences have been used as synonyms in science education studies. The used of gender differences in this study generally to denote achievement differences in learning physics and the challenges in learning force and motion specifically between males and females. Male students, in general, are found to be more interested in the aspects of physical sciences, while female students' interests in science are focused more on the biological and environmental aspects. Eryilmaz (2004) observed that gender contributes to poor achievement of students in physics. According to Mwangi (2003), female enrolment in physics and science subjects in general is very poor. This is in line with the study by Gonzuk and Chargok (2001) which revealed that the number of females who study physics in secondary and tertiary institutions is small compared to the number of males. This difference in the number of females and males in the study of physics has created gender gap in the academic achievement of students in physics and science subjects as a whole. A study by Fatoba and Aladejana (2014) examined the gender on students' attitude in physics

in senior secondary schools in Oyo State, Nigeria. It was found that there was a slight difference in attitude among the students in favour of females in physics. Other study by Coletta, Phillips and Steinert (2012) reported that males outperform females in understanding the force and motion concepts. There is evidence that learning gains in understanding force and motion concept are associated with students' scientific reasoning ability.

Studies conducted by Nworgu, Ugwuanyi and Nworgu (2013) found that school location also play an important role in learning and understanding physics. The result indicated that the rural students appeared to have demonstrated a higher conceptual understanding in physics than the urban students. The result of the study is in tandem with the studies of Erubami (2003) which found that school location is not a significant factor in students' achievement in physics. It however differs from the findings of Isiugo and Labo (2004) which reported significant location effect in favour of urban students. Abdul Rahman (1980) claimed that students from urban areas are generally found to have higher motivation and better understanding than those coming from rural areas. Rural students have been found to exhibit lower performance, due to the lack of exposure to a stimulating environment (Markstrom *et al.*, 2000). Thus, this study aims to investigate the attitudes of Form Four students in learning physics. Specifically, this study is to determine students' challenges in learning force and motion in physics. For further investigation, the study also explores the influence of gender and school location on students' attitude in learning physics.

METHOD

This research is carried out to study the students' attitude in learning physics and to find out the challenges in learning force and motion among Form Four students in district of central state. The study was conducted in six schools (four urban schools, two rural schools), randomly selected in Klang. The research sample consisted of 200 Form Four Science students who took physics at these schools. Convenient sampling techniques were used to ensure the success of the study. The respondents are ready to cooperate with the researcher and agreed to join the study. A descriptive research design is employed using survey method to analyse the students' attitude in learning physics and the challenges in learning force and motion. Questionnaires

regarding 'students' attitude towards learning physics' were designed and disseminated to the schools to be given to the respondents. Students were required to answer the questionnaires honestly within 60 minutes during school hours, arranged by the school administrators. The questionnaires were then collected after the students have completed their answers.

The questionnaire was divided into three parts namely as Part A, Part B and Part C. Part A attempted to gather the respondents' demographic information. Part B contained 15 items which related to the attitudes of students in learning physics. Part C comprised 42 items on the challenges in learning force and motion among students ranging from nature of topic, assessment and curriculum, students, teachers and language and communication. A Likert scale with a five point system was used to measure responses on the questionnaire ranging from '1' (strongly disagree) to '5' (strongly agree). The items had been adapted and adopted from Ornek *et al.* (2008) and Erinosho (2013). The instruments in Part B and Part C demonstrated strong reliability index with Cronbach's alpha value 0.927 and 0.915 respectively.

The Statistical Package for the Social Sciences (SPSS) programme version 21 was utilised in the data analysis. Descriptive statistics (mean and standard deviation) was used to describe demographic data, determining the attitude of students in learning physics and find out the most predominance challenge in learning force and motion. Meanwhile, inferential statistic such as independent sample *t*-test, Pearson correlation, and Chi-Square analysis were conducted to determine the difference and relationship between variables involved in this study.

RESULT AND DISCUSSION

Research Question 1: What are the Attitudes of Learning Physics among Form Four Students in Klang?

Table 1 shows the attitudes of Form Four students in learning physics. Item 14, 'I do pay attention when my teacher explained the lesson concept in physics' attained the highest mean score with (M=4.05, SD=0.83). This

was followed by Item 9, 'I can apply physics concepts in a real life situation' with a mean score of (M=3.93, SD=0.94), Item 12, 'I feel enthusiastic to learn physics' (M=3.77, SD=0.97) and Item 3, 'I able to use and apply the mathematical skills in physics' (M=3.76, SD=1.00). Meanwhile, the remaining of the items showed in the range of 2.34 to 3.65. Assuming that an attitude mean score of 2.5 (50%) or greater to be considered as favourable attitude in learning. The findings indicated that the overall attitudes of students towards learning physics are positive and favourable as reflected by the overall attitude mean score 3.460 (69.2%). It is similar to a study conducted by Ali and Awan (2013) and Narmadha and Chamundeswari (2013) which also found a positive attitude among students in learning science and physics.

Table 1: Students' Attitudes towards Learning Physics

No	Item	M	SD
1	Learning physics changes my ideas about how the world works.	3.47	.95
2	Solving problem of physics is an enjoyable and self-satisfying experience.	3.47	.94
3	I able to use and apply the mathematical skills in physics.	3.76	1.00
4	I understand the definition of physics.	3.45	.91
5	I always spend some time and do revision for the topic in physics.	3.10	.93
6	I develop interest in physics lessons.	3.20	1.00
7	I easily learn physics topics.	3.01	.97
8	I study physics not just to pass examination.	3.55	1.06
9	I can apply physics concepts in a real life situation.	3.93	.94
10	Mastering physics topic is an important goal in my life.	3.13	.94
11	I can summarise the important point of the content in physics.	3.05	.94
12	I feel enthusiastic to learn physics.	3.77	.97
13	I like the challenges in physics assignments.	3.55	.99
14	I do pay attention when my teacher explained the concept in physics.	4.05	.83
15	Topics in physics encourage me to continue learning in physics courses.	3.43	1.00
	Overall mean score	**3.46**	**0.96**

M = mean, SD = standard deviation

Research Question 2: Is There Any Significant Difference in Learning Attitude between Genders?

H_0: There is no significant difference in learning attitude between male and female students.

H_1: Male students have more favourable learning attitudes in learning physics compared to female students.

Table 2 shows the analysis of learning attitude between male and female students. It would be beneficial to know which gender has more positive and more negative attitude towards learning physics in secondary schools in Klang. The findings show that female students (M=3.54, SD=0.76) obtained higher total mean score compared to their male counterpart (M= 3.41, SD= 0.62). The overall *t*-test analysis of physics learning attitudes indicated that there is no a statistically significant difference in learning attitude between male and female students, t (198) = 1.318, p>0.05. That is the female and male students have shown the same favourable learning attitudes in learning physics. Thus, we fail to reject the null hypothesis. The results of the findings are similar to Guido (2013) and Mushinzimana and De La Croix Sinaruguliye (2016) who reported that there is no significant difference in the attitudes of the male and female respondents in the physics subject. However, these results are contradictory to the early researches conducted by Narmadha and Chamundeswari (2013) who found that the girls are better than boys in attitude towards learning of science. Whereas a study by Fatoba and Aladejana (2014) in their study of gender found slight difference in students' attitude in favour of females in physics. Based on the nature itself, female students mostly lack of interest in physics compared to male students. Female students claimed that physics is difficult for them because the subject tends to favour the masculine nature.

Table 2: Learning Attitude in Physics between Genders

	Gender	N	M	SD	*t*	df	*p*-value
Learning attitude	Male	72	3.54	0.76	1.318	198	.189
	Female	128	3.41	0.62	1.246	124.693	.215

Research Question 3: Is There Any Significant Difference in Learning Attitude between Rural and Urban Students?

H_0: There is no significant difference in learning attitude between rural and urban students.

H_1: Urban students have more favourable learning attitudes in learning physics compared to rural students.

Table 3 shows that urban students (M=3.58, SD=0.06) obtained higher mean score compared to their rural counterpart (M= 3.19, SD= 0.06). The overall *t*-test analysis for physics learning attitudes indicated that there is a statistically significant difference in learning attitude between urban and rural students since $t\,(198) = 4.441$, $p<0.05$. That is, the urban students have shown more favourable learning attitudes in learning physics compared to the rural students. Thus, the null hypothesis is rejected. The results of the findings are supported by Saleh (2014) who revealed that urban students do have a higher motivation compared to rural students in learning physics. This finding concurred with a study conducted by Veloo and Khalid (2015) which claimed that physics is unpopular and known to be a boring subject among students in secondary schools especially in the rural areas. Isiugo and Labo (2004) also reported that the location of the school was closely related to the students' achievements. However, attitudes of students could also be affected by the changing environment. Nowadays, young people all over the world are engrossed in computer gadgets and online social networking which may decrease their interest in learning science. Students nowadays like to spend a lot of time on the internet and playing with their gadgets rather than doing revision on academic subjects. Gadgets seem so much more interesting than school work. This is an environmental challenge that the future communities are facing in this era.

Table 3: Learning Attitude in Physics between Rural and Urban Students

	School Location	N	M	SD	*t*	df	*p*-value
Learning attitude	Urban	140	3.58	0.06	3.856	198	.000
	Rural	60	3.19	0.06	4.441	157.601	.000

Research Question 4: Is There Any Significant Relationship between Learning Attitude and Physics Achievement?

H_0: There is no significant relationship in learning attitude and physics achievement.

H_1: There is significant relationship in learning attitude and physics achievement.

The Pearson correlation analysis in Table 4 shows that there is a negative and significant relationship between students' learning attitude towards physics and their achievement in physics (r = -.547, $p < 0.05$). The null hypothesis is rejected. This finding shows that students who have favourable learning attitude towards physics obtain low grades in physics and those who have negative learning attitude towards physics obtain high grades in physics. Thus, we fail to reject null hypothesis. This finding is similar to the finding by Visser (2007) which showed that attitude towards science has no relationship with achievement in science. The students were found to achieve good grades in science without having any positive attitude towards science. These results are contradictory to the early researches conducted by Ali and Awan (2013) where students who have positive attitude towards science obtained good achievement in science. Attitude is an important factor to determine success in physics and the findings were supported by Narmadha and Chamundeswari (2013), Veloo and Khalid (2015) and Godwin and Okoronka (2015).

Table 4: Pearson Correlation Analysis between Learning Attitude and Physics Score

		Physics Score	Learning Attitude
Physics score	Pearson Correlation	1	-.547**
	Sig. (2-tailed)		.000
	N	200	200

Learning attitude	Pearson Correlation	-.547**	1
	Sig. (2-tailed)	.000	
	N	200	200

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

Research Question 5: Is There Any Significant Association between Physics Score and Science Grade in PT3?

H_0: There is no significant association between physics score and science grade in PT3.

H_1: Physics scores are related to science grade in PT3

Findings in Table 5 shows majority of students (N=98) hold poor score in physics test, probably due to low science grade obtained by students in PT3. Further findings in Table 6 (a) and (b) demonstrated an analysis of Chi-Square Tests carried out in determining the association between physics score and science grade in PT3. The findings indicated that there is a significant relationship between students' physics scores and their science grades in PT3 since $\chi 2\ (2, 200) = 12.257$, $p<0.05$. It can be clearly seen that students who obtained high and low grade in science will affect the students' performance in physics. Thus, the null hypothesis is rejected. The findings are in line with Norasyikin and Normashita (2007) study which revealed a significant difference in physics score between students who obtained low and high grade in science and mathematics in *Penilaian Menengah Rendah* (PMR) examination. According to Kinyota (2013), students who were not planning to join science streams perceived themselves as having poor abilities and performance in science subjects. Students equated choosing science subjects with a risk of a life time because that would lead them to fail the final national examination which is a determinant of their future education and life. Abu Hassan's (2004) showed congruent findings, students who obtained high scores in science-related subjects were also found to score highly in PMR examination. Halim *et al.* (2002) also highlighted the role of students' scientific knowledge in influencing their science scores

in national assessments. Besides, Daud *et al*. (2015) revealed that school performance is related closely to the culture practiced in a school. School culture plays a role in driving the school towards achieving the goal set by the school especially academic performance of students. Thus, school with high performance and have an excellent students practice might contribute to easier learning process in physics.

Table 5: Distribution of Physics Scores between Schools in Klang

		Physics Scores			Total
		Excellent	**Good**	**Poor**	
Schools	A	3	13	44	60
	B	1	2	17	20
	C	14	9	4	27
	D	1	4	22	27
	E	13	7	7	27
	F	28	7	4	39
Total		61	41	98	200

Table 6: Chi-Square Analysis between Physics Score and Science Grade in PT3

(a) PT3 Grade in Science * Physics Score Crosstabulation

			Physics Score			Total
			Excellent	**Good**	**Poor**	
PT3 Grade in Science	High	Count	36	18	31	85
		Expected Count	25.5	17.9	41.7	85.0
	Low	Count	24	24	67	115
		Expected Count	34.5	24.2	56.4	115.0
Total		Count	60	42	98	200
		Expected Count	60.0	42.0	98.0	200.0

(b)	Chi- Square Tests		
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	12.257[a]	2	.002
Likelihood Ratio	12.299	2	.002
Linear-by-Linear Association	12.079	1	.001
N of Valid Cases	200		

a. 0 cells (0.0%) have expected count less than five. The minimum expected count is 17.85.

Research Question 6: What are the Challenges in Learning Force and Motion among Form Four Students in Klang?

Finding in Table 7 reveals that the nature of topic (M=3.91, SD = 0.72) was found to be the most predominance challenge in learning force and motion among the participants. The second highest was attained by the curriculum and assessment with (M=3.23; SD=0.63), followed by challenges among student with a mean score of (M=2.79; SD=0.64). Meanwhile, both teacher and language and communication have the mean score of (M=2.13; SD=0.67) and (M=3.23; SD=0.63) respectively. The findings have been supported by Checkley (2010) who reported that the nature of topic is often considered boring, the fast progression of the topics can be demanding and the large amount of curriculum content can be confusing. Erinosho (2013) also claimed that students are always faced with difficulty in understanding force and motion due to the content that usually provided less concrete examples, textbooks content is hard to understand, past year questions are not easy to answer and examination questions are more difficult than learning in class. Besides, teachers typically explain the content according to the textbooks and give students notes to copy. The content is inflexible. There are very few students who take part in arguing or discussing ideas in the class, consequently, students do not develop good understandings of physics concepts, and students' interest in physics is low and their development of understanding of physics concepts is limited.

Table 7: Challenges in Learning Force and Motion

Factors	M	SD
Nature of topic	3.91	0.72
Student	2.79	0.64
Teacher	2.13	0.67
Curriculum and assessment	3.23	0.63
Language	2.23	0.67

Research Question 7: Is There Any Significant Difference in the Challenges in Learning Force and Motion between Genders

H_0: There is no significant difference in the challenges in learning force and motion between genders.

H_1: There is significant difference in the challenges in learning force and motion between genders.

Table 8 shows an independent sample *t*-test analysis carried out in confirming the influence of gender on the factors of learning difficulties of force and motion. It can be seen that a majority of the respondents are female which made up 128 out of 200 respondents. The findings also found there was no significant difference between genders with respect to all the challenges in learning force and motion given $p > 0.05$. The null hypothesis is accepted. That is, the means score between the male respondents was significantly similar to that of the female respondents. Thus, the null hypothesis is accepted. On contrary, Nworgu, Ugwuanyi and Nworgu (2013) found gender was the main factor in understanding the concept of force and motion. Female students tended to demonstrate superior conceptual understanding of force and motion than their male counterparts.

Table 8: The Challenges in Learning Force and Motion between Genders

Factor	Gender	N	M	SD	*t*	*p*-value
Curriculum and assessment	Male	72	3.28	0.63	.743	.458
	Female	128	3.20	0.64		
Student	Male	72	2.19	0.73	-.001	.999
	Female	128	2.79	0.65		
Teacher	Male	72	2.19	0.73	.897	.371
	Female	128	2.10	0.63		
Nature of topic	Male	72	3.84	0.70	-1.072	.285
	Female	128	3.95	0.73		
Language and communication	Male	72	2.21	0.69	-3.59	.720
	Female	128	2.25	0.67		

CONCLUSION

Learning attitude in physics is an important element to study physics which has been considered as a problematic subject for most students. The findings of this study show that students reflect positive or favourable attitude in learning physics. However, poor performance in physics is detected among the students. It can be seen from the Pearson correlation analysis which indicated that there is a negative and significant relationship between students' learning attitude and their achievement in physics. It clearly indicates that attitude towards physics has no relationship with achievement in physics. The students might achieve a good grades in physics without having any positive or favourable learning attitude towards physics and vice versa. It is believed that the poor performance in physics positively correlated to low science grade obtained by students in *Pentaksiran Tingkatan 3* (PT3). Having a poor abilities and prior knowledge in science subject would lead them to fail the examination. The findings also found that female and male students have shown the same favourable learning attitudes in learning physics. Interestingly, the urban students in this study have shown more favourable learning attitudes in learning physics compared to the rural students. There are many challenges identified by students in learning force and motion. Some are the challenges are nature of topic, curriculum and assessment, students, teachers and language and

communication. Nature of topic was found to be the most predominance challenge in learning force and motion among students. Students claimed that the topic requires good mathematical skills, problems not easy to solve and too many formulae and laws to memorise. The study indicated that there was no statistically significant difference between gender with respect to all the challenges in learning force and motion. Therefore, the findings in this study are beneficial as they can serve as a stepping stone in overcoming the underlying sources of difficulty that impede quality learning of physics as well as in learning force and motion. However, more in depth study is needed to look into this matter with more number of participants including teachers who are specialising in physics.

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