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Teachers' Expectancy and Students' Attitude towards Science

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Abstract

The main purpose of this study was to investigate the influence of teachers' expectancy and students' attitude towards science (ATS). The participants were 130 teachers and 300 students from secondary schools in Indonesia. The results indicated teachers' expectancy significantly affected students' ATS. Different kind of expectancy led teachers to have different classroom behavior. Teachers expect students from the science streams to have significantly higher potential to improve their academic achievements compared to the students from non-science stream. The results also showed that there is a significant correlation between teachers' expectancy and students' perception of teachers' behavior. Furthermore, because students from science stream perceived that their teachers are supportive, they believe that the teachers expected them to score higher in science. In turn, this belief led them to possess higher ATS compared to the non-science stream students, which perceived that their teachers are focusing more on controlling their behavior. It could be concluded that teachers' expectancy affected students' ATS, moderated by the students' perception of teachers' behavior.

Keywords: *Attitude towards Science, Teachers' Expectancy, Perceived Teachers' Expectancy*

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Introduction

Attitude towards science (ATS) is one of the major concerns in science education, due to its significant relationship with academic achievements (Osborne, 2003; Simpson & Oliver 1990; Zhang & Cambell, 2010). In many countries such as the United States (Freedman, 1998), Nigeria (Adesoji, 2008), Iran (Soltani and Nasr, 2010), and India (Khan, 2005), it is confirmed that ATS is highly correlated with academic achievements in science subjects. Students' ATS is positively affecting their academic achievement in science knowledge, because academic success is not only related to cognitive factors, but also non-cognitive factors of the students (Hopkins, 1998). Therefore, positive ATS might elevate students' achievements in science subjects because ATS refers to the students' feeling towards science (Ahmad et al., 2010; Cannon & Simpson, 1985; Kind, 2007; Siegel & Ranney, 2003). Unfortunately, it is indicated that students' ATS and the number of students studying in science are decreasing (George, 2000; Hassan, 2008; Welch, 2010; Wood, 2004). In the context of Indonesia, similar phenomenon occurs (Kamisah, Zanaton, & Lilia, 2007; Zanaton, Lilia, & Kamisah 2006).

In order to re-elevate the academic achievements in science subjects, students are grouped based on their overall academic performance (Gamoran, 2002; Kulik, 2004; Saleh, Lazonder, & DeJong, 2005; Slavin, 1990). This practice is called setting or streaming in Scotland and tracking or ability grouping in the United States is over 100 years old (Gamoran, 2002). Students with higher academic performance are allocated to a group where they are more exposed to the science subjects. In South-East Asian context, major misconception about streaming practices occurrs: non-science stream students are perceived as low achievers, and no bright students would like to be assigned into non-science stream (Adnan & Chew, 1998; Chew, 2006; Othman, 1995). However, the debate on grouping students in such a way is over 100 years old (Gamoran, 2002). Grouping students based on their academic abilities lead teachers to expect that high academic achievers to have positive ATS just because of their overall academic performance. This phenomenon is called correspondence bias (Ross, 1977), and it leads teachers to have different expectancy towards students from different groups. Teachers' expectancy of high academic achievers is higher than low academic achievers. In turn, teachers become academically supportive only to high academic achievers (Al-Fadhli & Singh, 2006; Tong, 2002; Prihadi, Hairul, & Hazri, 2010). It could be concluded that teachers' expectancy play significant roles in determining students' general attitude (Cooper & McIntyre, 1996; Haladyna, Olsen, & Shaughnessy, 1982; Myers & Fouts 1992; Talton & Simpson 1987). The authors believe that students who perceived that teachers are supportive will have higher ATS and vice versa. Therefore, it is important to investigate how teachers' expectancy might affect students' ATS, moderated by students' perception of teachers' classroom behavior.

Research Objective

Overall objective of this research is to investigate the significance of teachers' expectancy to predict students' ATS in a setting where students are grouped into science and non-science streams.

A research question to be answered by this study is: *Is there any influence of teachers' expectancy on students' ATS in schools that group students based on their overall academic abilities?*

In order to reach the overall research objective and answer the main research question, several questions are to be answered:

- Is there any difference between teachers' expectancy towards science and non-science stream students?
- Is there any relationship between teachers' expectancy and students' perception on teachers' classroom behavior?
- Is there any difference between science and non-science stream students in term of their perception of teachers' behavior?
- Moderated by students' perception of teachers' behavior, does students' expectancy affect the students' ATS?

Significance of the Study:

Developing and maintaining students' ATS are important (Ahmad, Rohandi, & Azman, 2010; Osborne, 2003; Simpson & Oliver, 1990; Zhang & Cambell, 2010). Therefore, investigating whether teachers' expectancy affects students' ATS is significant. Finding of this research might become a base to support teachers and other educational stakeholders to develop some practical guidelines in order to develop and maintain students' ATS in general.

Literature Review

Teachers' Expectancy towards Streamed Students

Attribution theory (Heider, 1958; Myers, 2008) can explain the teachers' different expectancy towards students with different characteristics. While it was a common conception in Indonesia that students with strong overall academic performance should be allocated to science stream (Kamisah et al, 2007), students' academic reports would be regarded as their common attribute. Under this social circumstance, teachers would likely to use those attributes (higher achievers or lower achievers) in order to differentiate students. The attribution theory explained how teachers might have different expectancy towards students from different streams: because students are carrying different attributes.

As an addition to Heiders' theory, Ross (1977) addressed a term called *correspondence bias* (also called *fundamental attribution error*). It refers to the tendency for observers to underestimate situational influences and overestimate dispositional influences upon others' behavior, or in other words, giving attribute to their observation objects based on the recent situation instead of the internal disposition the objects might have. In the context of this study, teachers who fell into correspondence bias might expect that particular students have positive ATS just because they have strong overall academic performance, and be assigned to the science stream.

Although teachers' behavior in the classrooms might be a result of the teachers' correspondence bias, which refers to teachers' failure to identify students' actual condition due to the influence of labeling situation, students would use it as a reference to evaluate particular matters anyway. In line with the previous statement, study of Myers (2008) noted that the prior information would determine the level of teacher's expectancy; they would likely to expect students with stronger general academic achievements to have positive ATS. The theory of symbolic interaction (Blumer, 1962; Cooley, 1912; Mead, 1934; and Myers, 2008; Stryker, 2002) might explain the phenomenon. While the theory can be simplified as 'we are what we think other people think we are' (Stryker, 2002), some students might have positive ATS just because they think that their teachers expected them to score high in science subject.

Theory of Self-Fulfilling Prophecy (Rosenthal & Jacobson, 1968) might explain the conclusion that there is a significant relationship between teachers' expectancy and students' particular attitude. As explained by Aronson, Wilson, & Akert (2005), self-fulfilling prophecy might starts by teachers who have expectancy about how students would perform, which then influences how they act towards the particular student, which causes the students to behave consistently with teachers' original expectancy, making the expectancy come true. Supporting the existence of self-fulfilling prophecy phenomenon in the classroom, Hung Siu Tong (2002) argued that the perspectives of the teachers gradually take shape and then reflected in their instruction and attitudes towards their students, who perform as they were expected. Other findings by Steven and Vermeersch (2010) and Prihadi, Hairul, and Hazri (2010) supported the self-fulfilling prophecy in the classroom, related to the context of this study. They had pointed out that teachers have lower expectancy towards students in the academically weaker group, and higher expectancy towards students in the academically stronger group. In turns, teachers adapt their behavior in line with such expectancy. Consequently, it influences students' educational outcomes. In the context of this study, self-fulfilling prophecy theory confirmed the significance of teachers' expectancy towards the students' ATS.

Attitude towards Science

Attitude is a very complex and unique concept, which integrates multiple properties and has different domains (Zhang & Campbell, 2010). It is defined as the tendency to think, feelings or preferences that a person has about an object, based on their beliefs about the object, which can be positive or negative (Coll et al., 2002; Kind et al., 2007; Oluwatelure & Oloruntegbe, 2010; Salta & Tzougraki, 2004; Sax, 1997). In science education, ATS refers to science as a subject (George, 2003). In the context of this study, ATS refers to *the feelings that students has about science, based on their beliefs and preferences about it that can be positive or negative.*

Klopfer (1971) had made an early notable contribution towards ATS by categorizing a set of affective behaviors in science education, which consisted of six subcategories. Klopfer's classifications are namely, (1) manifestation of favorable ATS and scientist, (2) acceptance of scientific enquiry as a way of thought, (3) adoption of scientific attitudes, (4) enjoyment of science learning experiences, (5) development of interests in science and science-related activities, and (6) development of an interest in pursuing a career in science or science-related work.

Another contribution in defining factors of ATS was stated by Kind et al. (2007). They pointed out that ATS can be measured based on seven constructs: Learning science in school (1), Practical work in science (2), Science outside of school (3), Importance of science (4), Self-concept in science (5), Future participation in science (6) and Combined interest in science (7).

Osborne (2003) advocated that ATS could be influenced by many factors such as: perception of the science teacher; anxiety towards science; value of science; self-esteem at science; motivation towards science; enjoyment of science; attitudes of peers and friends towards science; attitudes of parents towards science; nature of the classroom environment; achievement in science; and fear of failure on course. Some other findings supported the findings that ATS is influenced by several factors for instance, enjoyment of science (Siegel & Ranney, 2003), parental involvement (Oluwatelure & Oluruntegbe, 2010), achievement in science (Tan, 2007), classroom environment (Ong & Ruthven, 2009), language proficiency (De Alwis, 2008), and perception of the science teacher (Steven & Vermeersch, 2010). However, some factors may be more important than other (Zhang & Campbell, 2010). Another study reported that good science students are believed to have some kind of personal quality, which makes them better in their performance regardless of who their teachers are, where their schools are and how they are taught. The same report acknowledged that good science learning outcome does not only rely on the way teaching is carried out but also on other factors such as students' ability and talent, language proficiency, and the right attitude towards science learning (Othman, Wong, Azhar, & Nabilah , 2009).

Regardless of the latter statement, and based on the practical implication of this study, the authors decided to study how teachers affected students ATS. The authors' decision was based on some other findings that stated that teachers have the greatest influence attitude (George, 2000; Papanastasiou, 2002), and that teacher factor is especially important because it serve as influential others in changing attitude for better or worse George (2003).

Based on the presented theories and previous studies, this research was conducted in order to investigate the phenomenon of correspondence bias among teachers. Simultaneously, the correlation of teachers' expectancy and students' perception of teachers' classroom behavior was measured. Eventually, the influence of students' perception of teachers' classroom behavior on their ATS was measured in order to get the overall understanding in the effect of teachers' expectancy on students' ATS.

It is hypothesized that students' ATS is affected by their perception of their teachers' classroom behavior, while the teachers' behavior represented their expectancy towards the students. As illustrated in Figure 1, it is hypothesized that teachers' expectancy towards the students affects students' ATS, moderated by the students' perception of teachers' behavior.

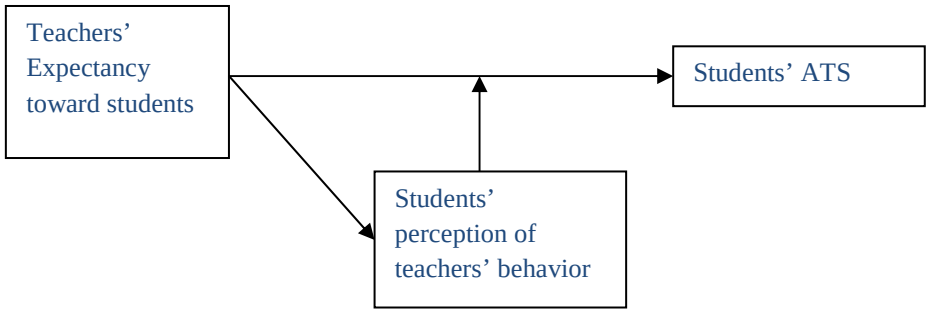

Figure 1. Teachers' Expectancy affects students' Attitude towards Science, moderated by Students' perception of teachers' behavior

Methods

Participants and Research Procedure

As many as 130 teachers, 150 science stream students and 150 non-science stream students participated in this study. All of the students were at their fourth year of Indonesian public secondary schools (late 16 to 17 years old). Supported by principals and teachers of each school, three sets of questionnaire have been distributed to the participants. The data collection on teachers was done in the beginning of academic years, in order to make sure that the teachers' expectancy has not been biased by the present academic achievements of the students. After the academic years went on for 3 months, the data collection on students took place. All of the respondents were given one hour to give their responses, and most of them have done it in approximately 40-50 minutes, while teachers spent approximately 20-25 minutes to give their responses.

Instruments

In order to avoid self-report biasness (Wellington, 2000), the author decided not to ask directly about the teachers' expectancy. Instead, scale of teachers' expectancy was developed in order collect data on teachers' expectancy towards students. The teachers' expectancy scale is a self-report, paper and pencil test, patterned after the constructs identified based on the findings of Good (1981) and Oakes (1985) which stated that teachers tend to control the behavior of the students with weaker academic abilities, and tend to support the academic improvement of students with stronger academic abilities. Content validity of this 4 points scale with 20 items was determined by a panel of scholars who has adequate information and knowledge in the domain of classroom interaction and social psychology from Universiti Teknologi Malaysia and Universiti Sains Malaysia. A pilot study over 30 participants indicated a Cronbach's alpha of .79, while construct validity was determined by using SEM software.

In order to measure student's perception on teachers' behavior, scale of students' perception of teachers were applied. The students' perception of teachers' controlling behavior and students' perception of teachers' supportive behavior questionnaires are 4 points scales with 20 survey items. Cronbach's alpha of both instruments were noted as .77 and .76 respectively when it was used in their previous research, while the pilot study on 80 participants indicated a Cronbach's alpha of .81 and .78 respectively (Prihadi, Hairul, & Hazri, 2010).

Attitude towards Science Test (ATST) was used to measure students' ATS. The five points Likert Scale ATST was adapted from two attitudes measures: Test of Science-Related Attitude, TOSRA (Fraser, 1981) and Attitude towards Science Measure (Kind et al., 2007). ATST consists of eight constructs: self-concept in science; social implications of science; normality of scientist, attitude to scientific inquiry; adoption of scientific attitudes; enjoyment of science lesson; leisure interest in science; and career interest and future participation in science. The construct validity was examined by a panel consisted of several experienced science educators and scholars in science education from Thailand, Malaysia and Indonesia. Each construct consists of five positive items and five negative items, and the construct validity was determined by using SEM software.

In order to meet the needs of this study, back translation process has been done to all of the instruments, which were given to the participants in bilingual version of English and Bahasa Indonesia.

Research Design and Statistical Analysis

This research is framed within a quantitative, empirical-analytical design. This descriptive study compares data obtained from applying the questionnaire to samples of 50 science stream students and 50 students from non-science stream. Statistical analyses were performed using SPSS. Reliability of the instruments were tested after the data collection process, Table 1 shows the reliability of each instrument.

Table 1. Reliability of Scales

Instruments	Cronbach's Alpha
Attitude towards Science Test	.98
Perception on teachers' controlling behavior	.87
Perception on teachers' supporting behavior	.76
Expectancy of Students' Academic Improvement	.97
Expectancy of Students' Potential Disciplinary Problem	.86

Findings

Teachers' Expectancy towards Students.

Teachers were found to have different expectancy towards different students group. As illustrated in Table 2, teachers expect students from the science streams to have higher potential to improve their academic achievements (M=26.37) compared to the students from non-science stream (M=24.83), and the p-value indicated that the difference is significant. Furthermore, teachers expected that students from non-science stream to have higher potential to be involved in disciplinary matters (M=26.48) compared to the students from the science stream (M=24.85), again the p-value indicated that the difference is significant.

Teachers' Expectancy and Students' Perception of Teachers' Classroom Behavior

In the light of the previous findings in Table 2, relationship between teachers' expectancy and students' perception of teachers' behavior is investigated. Correlation between teachers' expectancy of academic improvement and students' perception of teachers' supportive behavior was investigated, as

well as the correlation between teachers' expectancy of potential disciplinary problems and students' perception on teachers' controlling behavior. As illustrated in Table 3, significant correlation was found between teachers' expectancy of academic improvement (E.S.Aca) and students' perception of teachers' supportive behavior (P.Sup), while teachers' expectancy of potential disciplinary matters (E.S.Disc) was found to be significantly correlates with students' perception of teachers' controlling behavior (P.Sup).

Table 2. *Teachers' expectancy towards science and non-science stream students*

	Students Group	N	Mean	Std. Deviation	t-test for equality of means
Expectancy on Academic Improvements	Sci	130	26.3704000	.12396491	t=18.75; df=8; p=.00;
	Art	130	24.8292000	.13564365	
Expectancy on Potential Disciplinary Problems	Sci	130	24.8480000	.06514215	t=-20.42; df=8; p=.00
	Art	130	26.4048000	.15753476	

Table 3. *Correlation between Teachers' Expectancy and Students' Perception of Teachers' Behavior*

		P.Con	E.S.Disc	P.Sup	E.S.Acad
P.Con	Pearson Correlation	1.000	.994**	-.808**	-.989**
	Sig. (2-tailed)		.000	.005	.000
E.S.Disc	Pearson Correlation	.994**	1.000	-.765**	-.982**
	Sig. (2-tailed)	.000		.010	.000
P.Sup	Pearson Correlation	-.808**	-.765**	1.000	.842**
	Sig. (2-tailed)	.005	.010		.002
E.S.Acad	Pearson Correlation	-.989**	-.982**	.842**	1.000
	Sig. (2-tailed)	.000	.000	.002	

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

Another phenomenon illustrated in Table 3 was the significant negative correlation between P.Sup and E.S.Disc, as well as between P.Con and E.S.Acad. These findings could be interpreted as the more teachers expect their students to be able to improve their academic achievements; the more the students perceived that teachers were being supportive. On the other hand, the more the teachers expect their students to be potentially involved in disciplinary matters, the more the students perceived that teachers were trying to control students' behavior to avoid disciplinary problems.

Difference of students' perception of teachers' classroom behavior

Taking the findings illustrated in Table 3 further, the difference of students' perception of teachers' classroom behavior is investigated. Independent sample t-test was done to confirm that students from science stream and non-science stream perceive their teachers' classroom behavior differently. Table 4 illustrated the result of the test.

Table 4 indicated that for the students' perception of teachers' supportive behavior, $t = 4.198$ and $t_{0.05,5} = 2.015$ where $t > t_{0.05,5}$, which means that there is significant difference between science stream and non-science stream students in term of their perception of teachers' supportive behavior. For students' perception of teachers' controlling behavior, $t = 3.511$ and $t_{0.05,1} = 6.314$ where $t < t_{0.05,1}$, which means that there is no significant difference between science stream and non-science stream students in term of their perception of teachers' controlling behavior.

In other words, students from science stream perceived that their teachers are significantly more supportive compared to the students from non-science stream. On the other hand, teachers' controlling behavior was not perceived differently by the students from both streams.

Table 4. Difference between science stream and non-science stream students in term of their perception of teachers' behavior

	Class	N	Mean	sd	independent sample t-test
Supportive Behavior	Sci	150	25.511	0.60	t=4.198, df=8, p= .003, F=5.043
	Art	150	23.137	1.11	
Controlling Behavior	Sci	150	23.817	0.084	t=3.511, df=6.147, p= .005, F=0.450
	Art	150	25.296	0.117	

Influence of students' perception of teachers' behavior on students' ATS.

Research finding illustrated in Table 4 was confirmed by the next analysis. Stepwise method was applied in order to analyze the influence of students' perception of teachers' behavior on students' ATS. The variable of students' perception of teachers' controlling behavior was excluded due to insignificancy. As shown in Table 5, the significance of the mentioned variable was found to be very weak (.929) and the influence is very weak (β=.915).

Table 5. Influence of students' perception of teachers' behavior on students' ATS

	R^2	df	F	p	β
Perception of Supportive Behavior	.817	1	41.276	.000	.915
Perception of Controlling Behavior	-	-	-	.929	-.024

Table 5 also illustrated that in term of students' perception of teachers' supportive behavior, adjusted R^2 = .817; df = (1); and F = 41.276. It means that students' perception of teachers' being more into controlling students' behavior can explain 9.1% of the variance in students' ATS. The beta value indicated that the influence was strong (higher than .20), and the influence is significant because p-value was lower than .05. It could be concluded that students' perception of teachers' supportive behavior affected students' ATS.

Because the students from science stream scored higher in perceiving their teachers to be supportive (See Table 4), they should have higher ATS compared to the students from non-science stream. Table 6 confirmed the statement.

Table 6: ATS difference between science stream and non-science stream students.

	N	Mean	Std. Deviation	paired sample t-test
Science Stream	150	3.094	0.002	t = 3.511, df = 8, p = .0008, F=10.813
Art Stream	150	3.050	0.028	

As seen in Table 6, where t = 3.511 and $t_{0.05,11}$ = 1.796 where $t > t_{0.05,5}$. It can be concluded that that there is significant difference between science stream and non-science stream students in term of their ATS, where students from the science stream possess significantly higher ATS.

Influence of teachers' expectancy on students' ATS, moderated by students' perception of teachers' behavior.

In order to answer the last research questions, forward multiple regression method was employed to determine whether the students' perception of teachers' behavior moderates the influence of teachers' expectancy on students' ATS. Table 7 indicated that that the variable E.S.Disc and P.Con were excluded due to the insignificance (p = .054 and -.149). This indicates two findings; first, neither E.S.Disc nor P.Con significantly predict students' ATS, and second, P.Con does not moderate the overall influence of independent variable on dependent variable.

Table 7. Excluded Variables[c]

Model		β In	t	Sig.	Collinearity Statistics	
					Partial Correlation	Tolerance
1	E.S.Disc	1.645[a]	1.492	.179	.491	.036
	P.Sup	.915[a]	3.241	.014	.775	.291
	P.Con	.677[a]	.414	.691	.155	.021
2	E.S.Disc	.143[b]	.132	.899	.054	.023
	P.Con	-.434[b]	-.368	.725	-.149	.019

a. Predictors in the Model: (Constant), E.S.Acad

b. Predictors in the Model: (Constant), E.S.Acad, P.Sup

c. Dependent Variable: ATS

Table 8 indicates the significance of P.Sup in moderating the influence of E.S.Acad on students' ATS, where the p value = .014. In other words, more than 90% of the variance of ATS could be explained.

Table 8. Model Summary of Students' Perception of Teachers' Behavior as a Moderator.

Model	R^2	Change Statistics				
		R^2 Change	F Change	df1	df2	Sig. F Change
1	.594	.594	11.707	1	8	.009
2	.838	.244	10.503	1	7	.014

a. Predictors: (Constant), E.S.Acad ; b. Predictors: (Constant), E.S.Acad, P.Sup

Discussions and Conclusion

Data analysis produced several findings, which can be summarized as follows:

- Teachers expect students from the science streams to have significantly higher potential to improve their academic achievements compared to the students from non-science stream.
- There is a significant correlation between Teachers' Expectancy and Students' Perception of Teachers' Behavior.
- Students from science stream perceived that their teachers are significantly more supportive compared to the students from non-science stream.
- Teachers' supportive behavior significantly influences students' ATS, moderated by students' perception that teachers are being academically supportive.

The objective of this study was achieved; all of the research questions were answered accordingly, and all of the findings can be theoretically explained. Even though the academic records of the students have not been recorded for the respective year, teachers expect science stream students to have higher academic potential than the non-science stream students. This phenomenon is in line by the theories of attribution and correspondence bias (Heider, 1958; Myers, 2008; Ross, 1977). Students are grouped into different streams based on their previous overall academic records, and the grouping system provides labels to the students. In turn, teachers use these labels to set their expectancy, instead of their thorough evaluation on the students along the academic year.

Furthermore, the significant correlation between their expectancy and students' perception of teachers' behavior confirmed that teachers' expectancy led teachers to behave differently in different classroom. As explained by self-fulfilling prophecy theory (Rosenthal & Jacobson, 1968; Aronson, Wilson, & Akert, 2005), teachers would behave in such a way to direct their students to behave as they want. Eventually, because science stream students perceived that they were expected to improve their academic achievement, they developed self-beliefs that they are able to achieve higher, as well as higher levels of ATS. This phenomenon could be explained by symbolic interaction theory (Blumer, 1962; Cooley, 1912; Myers, 2008; Stryker, 2002), which stated that individuals tend to believe that they represent what they perceive other people think they are.

Practical Implications

Conducted in the context of South-East Asia, which represent Indonesia contextually, findings of this research were found to be identical with previous studies, which reported that teachers play significant role in determining students ATS (Osborne, 2003; George, 2000, 2003; Papanastasiou, 2002). Furthermore, based on the previously presented reports that students' ATS is decreasing (George, 2000; Hassan, 2008; Welch, 2010; Kamisah, Zanaton, & Lilia, 2007; Wood, 2004; Zanaton, Lilia, & Kamisah 2006), findings of this study led to an implication that teachers should have different approaches in order to re-elevate the ATS and achievements in science subjects. The implication is relevant because ATS was reported to be one of the important factors that determine the level of achievement in science subjects (Adesoji, 2008; Ahmad et al, 2010; Cannon & Simpson, 1985; Freedman, 1998; Khan, 2005; Kind, 2007; Osborne, 2003; Siegel & Ranney, 2003; Simpson & Oliver 1990; Soltani and Nasr, 2010; Zhang & Cambell, 2010).

However, based on the findings reported by Tong (2002), Steven and Vermeersch (2010) and Prihadi, et.al, (2010), the adjustment of teachers' approach should involve the adjustment of the grouping or streaming system. The existing grouping system, which is based on the students' previous overall achievements (Gamoran, 2002; Kulik, 2004; Saleh, Lazonder, & DeJong, 2005; Slavin, 1990), suggested teachers to behave differently towards different groups of students. In the context of South-East Asia, the grouping and streaming practice even led teachers further to expect non-science stream students to be problematic and 'not smart at all', while science stream students are expected to be academically perfect (Adnan & Chew, 1998; Chew, 2006; Othman, 1995). Without denying any facts that students with different ability might need different instructional method, it is suggested that the grouping and streaming practice should involve some investigations on students' interests. This suggestion was based on assumption that there could be some possibilities that high-achievers might have interest towards arts subjects instead of science, and some low-achievers who have high ATS might perform better when they are assigned in a stream of their interests.

Future Research

While discussion and conclusion were presented, it is also realized that some variables in the research theme are left uninvestigated. Future studies should involve some other variables such as personality types of students and teachers, previous academic achievements that specifically related to science subjects, and students' interests. In order to obtain a deeper understanding on the researched phenomenon, identical qualitative researches are as well suggested. Another suggestion is to conduct the identical studies in the context of other countries where similar streaming or grouping methods are practiced, in order to provide general guidelines for the teachers and school managements. ATS of the general society should as well be investigated, because it might be influential towards students and teachers ATS.

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