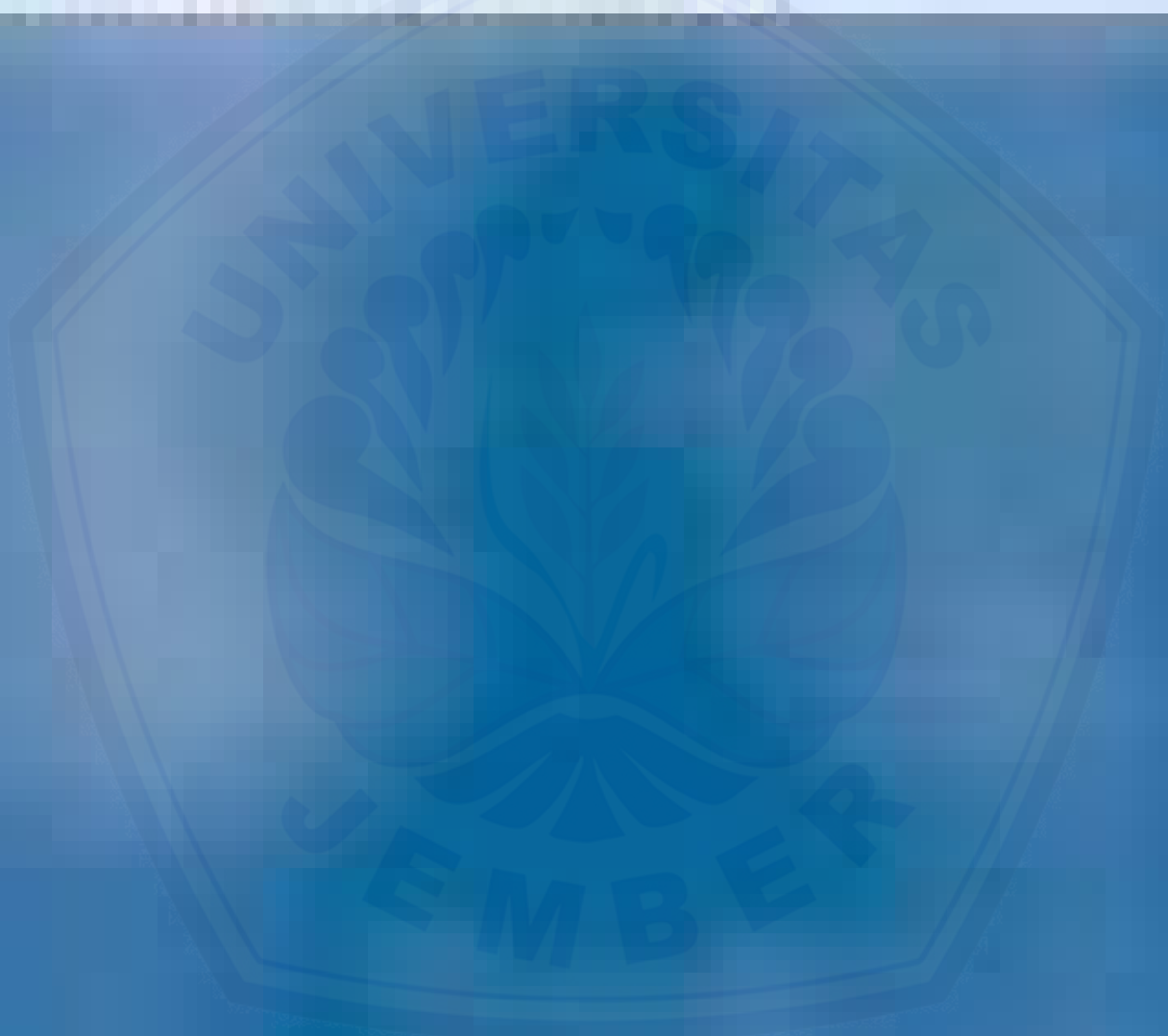


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Comparing learning motivation and learning style between natural science and social science students in higher education

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Abstract: This study aim to assess and analyse the extent of motivation and learning styles between students of natural science and social science. This study was carried out by survey research method using online questionnaire. The sample consists of 320 students from Faculty of Education in University of Jember and Sebelas Maret University. The questionnaire used to measure students learning motivation, was the motivated strategies for learning questionnaire (MSLQ) and inventory of learning styles (ILS), was used to measure student learning styles. Data gathered were analysed descriptively and inferentially using the SPSS package. Result from the descriptive analysis found that there is a significant difference between science and social science students in learning motivation and learning styles. There was also a positive relation between learning motivation and learning styles. The results of this study give useful information for improving the teaching and learning process of teachers and students, because the effective teaching and learning requires flexibility, creativity and responsibility in order to provide an instructional environment to respond to the learner's individual needs.

Keywords: learning motivation; learning styles; natural science; social science.

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1 Introduction

The issue of motivation for learning is one of the present interests for the contemporary society; it is studied and presented in the relevant literature in many different ways (Duta, 2015). Motivation is a concept which has been used by both psychologists and educationists to explain differences among learners in the amount of efforts they put into their learning (Entwistle, 1987). Motivation has been regarded by many educators as a crucial factor that promotes students engagement and consequently their performances in learning. Motivation is considered a key discriminating factor between high ability students who maximise learning potential and those who underachieve (McCoach and Siegle, 2003). Motivation is dynamic and contextually bound and that learning strategies can be learned and brought under the control of the student, where motivated students are attentive in class (Duncan and McKeachie, 2005; Wong et al., 2013). According to Ryan and Deci (2000), students are more motivated and stay motivated, driven by intrinsic rewards such as constructive criticism, than extrinsic such as good grades because the intrinsic rewards give more satisfaction than the extrinsic rewards. Motivation to learn is referred to the meaningfulness, value, and benefits of academic tasks to the learner regardless of whether or not the tasks were intrinsically interesting. Therefore, student's motivation to learn might come from intrinsic or from extrinsic sources (Marshall, 1987).

During ten years, educational researchers have identified a number of factors that account for some of the differences in how students learn (Reid, 1987). Academic achievement is associated with motivation and learning styles. A learning-style model classifies students according to where they fit on a number of scales pertaining to the ways they receive and process information. Some research suggests that the motivation and learning styles vary based on the needs and knowledge. Learning style refers to the method used by an individual to force and retain new and difficult information (Sengodan and Iksan, 2012). Pashler et al. (2008) have an opinion that the term 'learning styles' refers to the concept that individuals differ in regard to what mode of instruction or study is most effective for them. Proponents of learning-style assessment contend that optimal instruction requires diagnosing individuals' learning style and tailoring instruction accordingly.

Students have different strengths and preferences in the ways they perceive and process information (Felder and Spurlin, 2005). Students learn in many ways, by seeing and hearing; reflecting and acting; reasoning logically and intuitively; memorising and visualising and drawing analogies and building mathematical models; steadily and in fits and impulsively (Felder and Silverman, 1988). The students' centred activities offer a friendly lecture to students and even to those lecturers who tend to keep the traditional style of classroom (Gök, 2011). A teacher is therefore required to know what he must do

to a rise the interest of students in his subject and ensure its sustenance. A teacher does not really have to be a psychologist or a mind reader of his students. The learning-styles view has acquired great influence within the educational field, and is frequently encountered at levels ranging from kindergarten to graduate school (Pashler et al., 2008). A vital purpose of higher education is to educate future leaders who are motivated to bring disparate people together to solve critical complex challenges facing our society (Ritchie and Hammond, 2005). To fulfil this important mission of higher education, educators must do more than simply teaching quality related course contents: they must also address student's enthusiasm, passion, and desire (Cho et al., 2015).

Learning styles and motivation are closely linked to academic achievement. Drissi and Amirat (2016) finding stated that students taught using the system adapting with learning style performed significantly better in academic achievement than students taught the same course without adaptation with learning style. One of the significant challenge faced by teacher is to be tolerant and matching the teaching strategies with the students learning styles in order to recognise learning differences among their student's and also to improve their academic achievement (Tulbure, 2012). Arthurs (2007) confirmed that the coherence between teaching strategies and learning styles has a positive impact on the academic achievement. Selmes (1987) reviewed the difficulties in learning from students' and teachers' perspectives. She discovered five types of learning styles, such as deep approach, surface approach, organisation, motivation and hard work.

Natural science and social science education occupy a very distinguished place at school, college, and university stages of education all over the world (Rana et al., 2015). Therefore, it is necessary to do an assessment of the motivation and learning styles students of natural science and social science. The purpose of this study was to assess the extent of motivation and learning styles between students of natural science and social science. In this article, we describe the intense interest and discussion about leaning motivation and learning styles between natural and social science students. This article also discusses about the relationship between learning motivation and learning styles to determine the approach and methods of teaching and learning that are appropriate to achieve successful learning. Effective teaching and learning requires flexibility, creativity and responsibility in order to provide an instructional environment to respond the learner's individual needs. Moreover, academic achievement is closely linked to learning motivation and learning styles.

2 Literature review

2.1 Learning motivation

Motivation is the key factor to understand student's academic persistence and performance (Robbins et al., 2004). Stipek (2002) convinced that motivating students to achieve is challenging and often becoming a frustration task for today's teacher. There are many other factors that may influence students' in achievement process such as reasoning abilities, cognitive styles and personality characteristic. For example, persons with low goal instability (high motivation) would theoretically be more inclined to participate in a career planning program (Reardon and Bertoch, 2010). Bandura (1977) by explaining socio cognitive theory discussed that students motivation is a concept that

emerged from an individual's learning activities and experiences, and it varies from situation to situation or context to another context.

Learning behaviour has been viewed as a product of either intrinsic or extrinsic motivation. Usually intrinsically motivated behaviours have been viewed as those that are engaged primarily for the pleasure and satisfaction derived for performing them, whereas extrinsically motivated behaviours are those that are engaged in as primarily (Hayamizu, 1997). Intrinsic motivation has been defined as:

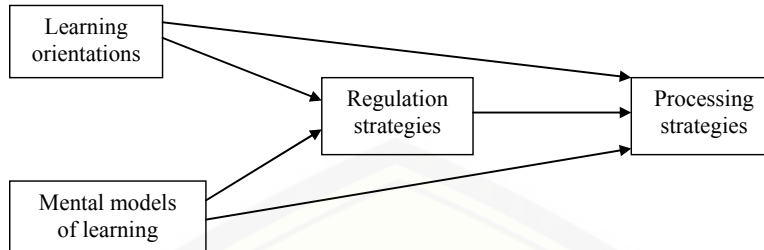
- a participation in an activity purely out of curiosity, that is, for a need to know about something
- b the desire to engage in an activity purely for the sake of participating in and completing a task
- c the desire to contribute (Dev, 1997).

Students with intrinsic motivation would develop goals such as, the goal to learn and the goal to achieve. A mastery goal, the desire to gain understanding of a topic, has been found to correlate with effective learning strategies, positive attitudes toward school, the choice of difficult tasks as opposed to a simple task, perceived ability, effort, concern of future consequences, self-regulation, the use of deep cognitive processes, persistence, achievement, choice and initiative (Archer, 1994; Miller et al., 1996). Extrinsic motivation refers to motives that are outside of and separate from the behaviours they cause; the motive for the behaviour is not inherent in or essential to the behaviour itself (Hoyenga and Hoyenga, 1984). Extrinsic motivation thus contrast with intrinsic motivation, which refers to doing an activity simply for enjoyment of the activity itself rather than its instrumental value (Ryan and Deci, 2000). Researchers have studied factors such as family expectations, teacher expectations, money, and peer acceptance (pleasing others). All of these factors involve proving a competence to another. Extrinsic students prove one's competence while intrinsic students improve their competence (Schraw and Dennison, 1994).

2.2 Learning style

Learning styles refers to the view that different people learn information in different ways. The concept of learning style describes individual differences in learning based on the learner's preference for employing different phases of the learning cycle (Kolb and Kolb, 2005). Learning styles are characteristic preferences for alternative ways of taking in and processing information (Litzinger et al., 2007). Learning style is consisting of four aspects (Figure 1) : processing strategies, regulation strategies, mental models of learning and learning orientations (Vermunt, 1998). Processing strategies are thinking activities that students use to process information and learning contents in order to obtain and attain their certain learning goals. Regulation strategies are activities that student regulating the cognitive activities to plan a learning process, to monitor a learning progress, to control the processing strategies, and to diagnose the cause of difficulties in their own learning processes. Learning orientations refers to whole domain of personal aims, intentions, expectations, motives, attitudes, doubts, students may experience during their studies. Mental models of learning is viewed as coherent of whole learning conceptions and misconceptions that students have about learning processes (Vermunt, 1996).

Figure 1 A model of regulation of constructing process



Source: Vermunt (1998)

A learning styles model classifies students according to where they fit in a number of scales belonging to the ways in which they receive and process information (Mahnane and Hafidi, 2016). The scale of inventory learning styles (ILS) which was developed by Vermunt can be seen in Table 1.

Table 1 Scales of inventory learning styles (ILS)

<i>ILS aspect</i>		<i>Scales of ILS</i>
Processing strategies	1	Deep processing
	2	Stepwise processing
	3	Concrete processing
Regulation strategies	1	Self-regulation
	2	External regulation
	3	Lack of regulation
Learning orientations	1	Personality interested
	2	Certificate-oriented
	3	Self-test-oriented
	4	Vocation-oriented
	5	Ambivalent
Mental models of learning	1	Construction of knowledge
	2	Intake of knowledge
	3	Use of knowledge
	4	Stimulating education
	5	Co-operative learning

Source: Vermunt (1998)

3 Method

3.1 Problem of research

Is there lack of linkage between learning motivation and learning styles students of natural science and social science?

3.2 Hypothesis of research

Based on the overview of the research literature, the hypothesis of the study was formulated as follows:

H1: Learning motivation between student of natural science and social science are difference significantly.

H2: Learning styles between student of natural science and social science are significant difference.

H3: Learning motivation and learning styles will be relation positively.

3.3 Data collected

This study analysed two important educational factors learning motivation and learning styles. The student that participated in the study gave a questionnaire online about their learning motivation and their learning style. The online questionnaire was given at the time of mid-term where students already undergoing of mid exam. Samples were students of natural and social science at University of Jember and Sebelas Maret University. The questionnaire used to measure student's learning motivation is the motivated strategies for learning questionnaire (MSLQ) and inventory of learning styles (ILS) is use to measure student learning styles.

MSLQ is a self-report instrument designed to assess student in higher education and college students' motivational orientation and their usage of different learning strategies for college and higher education courses (Pintrich et al., 1993). MSLQ Criteria was designed to measure college undergraduates' motivation as they relate to a specific study. The study is seen as the unit of measure, with the idea that ideally situated between the very general level of 'all learning activities' and the very specific and unworkable level of 'every learning situation within the course' (Duncan and McKeachie, 2005). In this research, the MSLQ questionnaire was developed by Shia (1998), it consists of six factors: two intrinsic factors and four extrinsic factors. The number of items in the questionnaire is 50 questions. Intrinsic motivation factors include: mastery goals (12 items) and the need for achievement (ten items). Extrinsic motivation factors include: authority expectations (family and lecturer) (four items), peer acceptance (eight items), power motivations (eight items), and fear of failure (eight items). In the questionnaire, each college students gave themselves a rating for each question on a seven-point Likert scale (1 = does not describe me; 7 = absolutely describes me). The questionnaire of learning motivation was included in the reliable criteria with a value of Cronbach's alpha = 0.857.

Student learning styles was collected by ILS questionnaire. The ILS appears to be a useful instrument for investigating variations in conceptions of learning among students in higher education (Richardson, 2007). ILS diagnostic instrument is used to measure aspects of study method, study motives, and mental models about studying in higher education which consists of 16 scales. The numbers of statements in the questionnaire is 53 questions, consisting of four domains such as domain processing strategies (12 items), domain regulation strategies (12 items), domain learning orientations (11 items), and domain mental models of learning (18 items). For each statement in the questionnaire student had to indicate on seventh point scale to what extent the statement is descriptive

of his or her behaviour. Answer could range from 1 (does not describe me) to 7 (absolutely describes me) using Likert scale. The learning style was included in the reliable criteria with a value of Cronbach's alpha = 0.859.

3.4 Sample

Participants were 320 students in the faculty of education in University of Jember (150 students) and University of Sebelas Maret (170 students) Indonesia, which is consisting of 249 female and 71 male students. In addition, respondents also consisted of 188 students of natural science education including majors in physics and biology education, and 132 students of social science education, including majors in civics, economics and taxation. The participant of this study consisted of regular enrolment students in the first, third and five years of bachelor degree. The sample in this research is represented on the study population. Participants fill out an online questionnaire about learning motivation (MSLQ) and student learning styles (ILS) generally in good condition without any pressure from teacher or others.

3.5 Data analysis

Data were collected through questionnaire which analysed descriptively and by means of Statistical Package for the Social Sciences (SPSS analysis version 19). SPSS is a software which is capable of handling large amounts of data and can perform all of the analysis covered in the text, and also commonly used in the Social Sciences and in the business world (Wellman, 1998). In this research SPSS used to assess the extent of student's learning motivation and learning styles. Descriptive analysis is used to interpret student profile or background information. For inferential analysis, a t-test was selected to compare mean score of subject major based on learning motivation and learning styles. A Pearson correlation test was also conducted to determine the relation between learning motivation and learning styles.

4 Result

Learning motivation is defined as an "individual's characteristic ways of processing information, feeling, and behaving in learning situation" (Griffith, 1984). The results showed in Table 2, that intrinsic motivation has an average value greater than extrinsic motivation.

Table 2 Learning motivation based on intrinsic and extrinsic criteria

		<i>N</i>	<i>Mean</i>	<i>Std. deviation</i>	<i>Std. error mean</i>
Intrinsic	Mastery goal	320	5.4505	.73635	.04116
	Needs for achievement	320	5.7656	.64152	.03586
Extrinsic	Authority	320	4.4758	.64691	.03616
	Peer acceptance	320	4.4250	.83559	.04671
	Power motivation	320	4.5098	.75290	.04209
	Fear of failure	320	5.0793	.65092	.03639

Table 3 Learning motivation based on major subject

		<i>N</i>	<i>Mean</i>	<i>Std. deviation</i>	<i>Std. error mean</i>	<i>t</i>	<i>df</i>	<i>Sig</i>
Motivation	A	188	5.1614	.48489	.03536	1.998	318	0.047
	S	132	5.0496	.50300	.04378			

Notes: A = natural science and S = social science

The study also reviews the differences student learning motivation based on natural science and social humanities major subjects. Table 3 shows that natural science students have higher learning motivation than students majoring in social humanities. Analysis of the independent sample t-test showed a significant difference between learning motivation of student of natural science major and social humanities, where a significance level is 0.047 ($0.047 < 0.05$).

Table 4 Learning style domains

	<i>N</i>	<i>Mean</i>	<i>Std. deviation</i>	<i>Std. error mean</i>
Processing strategies	320	4.9615	.60048	.03357
Regulation strategies	320	4.9427	.66498	.03717
Learning orientations	320	5.2663	.69340	.03876
Mental models of learning	320	5.4097	.62442	.03491

Table 5 Learning styles based on major subject

	<i>Subject</i>	<i>N</i>	<i>Mean</i>	<i>Std. deviation</i>	<i>t</i>	<i>df</i>	<i>Sig</i>
Learning style	A	188	5.1929	.47688	2.079	318	.038
	S	132	5.0768	.51287			

Notes: A = natural science and S = social science

Table 6 Learning motivation and learning styles correlations

		<i>Learning styles</i>
Motivation	Pearson correlation	.957(*)
	Sig. (two-tailed)	.000
	N	320

Note: *Correlation is significant at the 0.05 level.

The learning process related to student learning styles is largely devices to help teacher assess individual learning styles and classify the learner into different style categories. According to the student learning styles in Table 4, mental models of learning have the highest average value compared with the three other domains, around 5.4097 (SD = 0.62442). Table 5 shows that there are significant differences between learning style of natural science and the social science (sig 0.038 > 0.05). Moreover Pearson correlation analysis in Table 6 shows that there is a positive relationship between learning motivation and learning styles of students.

5 Discussion

Learning is better conceived as process, not in terms of outcomes. To improve learning in higher education, the primary focus should be on engaging students in a process that best enhances their learning process includes feedback on the effectiveness of their learning efforts. Education must be conceived as a continuing reconstruction of experience: ... the process and goal of education is one and the same thing (Dewey, 1897). Learning motivation is a very important factor to reach the maximum learning achievement and become the key factor to introducing student academic persistence and their performance. According to Table 2, the students' intrinsic motivation of science and humanities subject in the faculty of education at the University of Jember and Sebelas Maret University are bigger than extrinsic motivation. It has been explained earlier that the intrinsic motivation comes from within a desire and self-awareness the importance of learning. This shows that students really aware the importance of learning and their desire to learn is not caused by external factors such as parents, friends, or lecturers. Academic intrinsic motivation is essential factor for college success and career. Broader conceptualisations were that intrinsic motivation involved personal relevance (e.g., learning science makes my life more meaningful), and self-efficacy involved assessment anxiety (e.g., I worry about failing tests). The student's motivation is highlighted as one of the mainly determinants for obtaining success in learning activities and must be prioritised in the planning of teaching strategies by the teachers. Teachers must continue to improve the intrinsic motivation of students through learning strategies which appropriate for the learning process goes well. Among the indicators of intrinsic motivation, the needs for achievement have the highest average value. Yong (2009) thinks that motivation is one of the most important and foremost variable that influences students' achievement. The need to get the achievement encourages students to study harder, because most of Indonesian people would like more to see the achievement than the process or the purpose of learning itself. Besides that, the Indonesian education system's oriented grades or GPA alone is considered to be other factors.

Significant difference was occurred in the learning motivation between natural science and social science students, where the average score motivation of science students is greater than social-science students. It means that first hypothesis (H1) was accepted. According to Webster's New Collegiate Dictionary, Science is the knowledge acquired through learning and evidence or knowledge that surrounds a general truth of the laws of nature, for instance obtained and demonstrated through scientific methods. While social science is the science that studies social problems in a society, that is expected to provide basic knowledge and general understanding of the concepts, developed to study human problems. Natural science learning puts more emphasis on the ability to analyse conducted observations and experiments. Moreover, natural science students have been accustomed to thinking in logical and structured manner. According to Mathewson (2005), natural science students often fail to demonstrate some fundamental understanding or skill needed to explore a novel topic. The natural science students are more motivated to learn, because of characteristics of subject matter or content knowledge that tends to be difficult filled with formulas, experiments makes them more eager not to fail and reaching achievement. Besides that, academic disciplinary environments are selected for levels of student engagement, such as engineering and mathematics, reducing the numbers of disengaged students early on by failing students out of introductory courses. While, social science students find a home in

majors like the arts, humanities where course's demands are lower and disengagement is higher (Arcidiacono, 2004; Brint et al., 2011). These patterns became evident with respect to variables measuring low educational values, high academic irresponsibility, low reading completion, high number of hours of passive time, and high number of hours of working time (Brint and Cantwell, 2014).

The analysis of learning styles reveals that for all four domains of processing strategies, regulation strategies, learning orientations, and mental models of learning, there are varied average value. However, a mental model of learning earns the highest score. This is because the students learn to construct their knowledge about subject matter. According to Saljo (1979) construction of knowledge is fairly close to the 'reconstructive' conceptions of learning. In the mental model of learning categories of ILS is consisting five scale construction of knowledge, intake of knowledge, use of knowledge, stimulating education and co-operative learning. From this scales more of student viewed learning as constructing their own knowledge and insight, most of learning activities are seen as task of student. Student are also attaching a lot of value to learn in cooperation with fellow students and sharing the task of learning. Sharing and cooperating when they are finishing and completing the task from teacher becomes the other major factor of the highest of mental model of learning in student learning styles. Some university students adopted different approaches to studying, there is 'deep' approach based upon understanding the meaning of course materials, whereas other students adopted a 'surface' approach based upon memorising the course materials for the purposes of assessment. Student with deep approach is more active in the learning process than student with surface approach. Active student more concern with the conception of subject matter in the learning process, while passive student role and see learning as something that just happen to them, in other words, student vary in their conception of learning and of themselves as learners (Richardson, 2007).

There was a significant difference between students learning styles of natural science and social science. It means that second hypothesis (H2) about learning styles was accepted. The difference is due to the learning style characteristics are very different in natural science and social science. Learning in natural science tends to be structured, including conduction of the experiments, proving the formula, stringing tools, so that the analytical skills are mostly needed. Natural science students cannot learn by just memorising, but they tend to make the analysis and verification. Chiappetta and Koballa (2009, p.105) provides that there are four dimensions of natural science: science as a way of thinking, science as way of investigating, science as body of knowledge, and science and its interactions with technology and society. As a way of thinking, science is a mental activity (thinking) for people who are engaged in the field of study. Activities mental push to reveal the natural phenomena based on their sense of curiosity. As a way to investigate, science uses many approaches to build knowledge. This process involves: observation, suspect, hypothesise, predict, measure, manipulate variables, calculate, experiment, and create the model. Science as a body of knowledge consists of facts, concepts, laws and principles, theories, and models. Science and its interactions with technology and society, mean that basic science will not develop without the support of sophisticated equipment. The social science students who tends to be communicative because of the structure of the material being taught has a more general nature and fickle. Tulbure (2012) describes that educational sciences students with a predominant converge learning style seem to achieve higher results than the students in Economics when cooperative learning strategy is used. Furthermore, the significant differences between

natural science and social science caused by teaching strategies of teacher are also different. Problem solving strategies are usually use by teacher in natural science learning process, while cooperative learning strategies more often used in social science classes. This result was not in line and partially sustained with literature (Nilson, 2010) that general characterisation of students who are often seen as a social and unemotional, preferring to work with things rather than people.

Based on the analysis using the Pearson correlation, there is a positive relationship between motivation and learning styles of students. It means that the third hypothesis (H3) was accepted. This research conducted by Aziz et al. (2006) which states that students' learning styles have positive relationship with their motivation. Students are currently learning have great curiosity. The curiosity often embodies a lot of interest, even more than in the solving of the problems or a phenomenon. Students are motivated to get the answer to the problems and seek the truth through reasoning in his mind or way of thinking. Through reasoning, something can be evidence when a student learns to build their idea. Search for answers is manifested in a learning activity or learning style, where each learner has different learning styles depends on their motivation to learn. This result was appropriate with Sengodan and Iksan (2012) who found that the relation between learning styles and type of intrinsic motivation is in strong relationship. Learning styles and motivation are two main important factors which influence students' achievement. Students, who have a high intrinsic motivation, can explore their ability or potential to achieve the desired learning goal. Character is in line with the characteristic of hard work learning style, when a person can complete a task perfectly even though it is difficult. Students from this category are capable of working independently and diligently to achieve success.

6 Conclusions

Based on the results, it can be concluded that there was significant difference between student of natural science and social science in learning motivation and learning styles. In addition, learning motivation has strong relationship with learning styles. The results of this study give useful information for improving the teaching and learning process of teachers and students. It is important for teachers to be aware to students with specific learning styles. This study indicates that intrinsic motivation plays an important role in the selection of learning styles, practiced by science and social science students. Furthermore, this result will help to make teaching and learning processes to run smoothly and effectively. Identifying students' learning styles and types of intrinsic motivation early in their academic career would be an alert to the natural science and social science students for improving his or her potential academic weakness and adapting with their abilities.

It is suggested that, teachers also have to plan and implement activities based on students' learning styles to encourage student participation in the classroom effectively. Selection of appropriate learning style can increase students' motivation.

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