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The Relationship Between Application of Moral Values and Behaviour among Secondary School Students to the Effectiveness of Scientific Investigation

Nur 'Aisyah Asyikin Adnan, Siti Nur Diyana Mahmud, M. Khalid M. Nasir

Faculty of Education, Universiti Kebangsaan Malaysia (UKM)

Email: nuraisyahasyikin09@gmail.com, diyana@ukm.edu.my, mdkhalid@ukm.edu.my

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Abstract

Studies on applying moral values and behaviour may increase student engagement in science subjects. This study aims to investigate the relationship between the application of values and student behaviour toward the effectiveness of scientific investigation. The application of moral values is important among students in all aspects. This study focuses on applying moral values to students when conducting scientific investigations. These virtues can be applied across curriculum elements when teachers guide students in the laboratory or classroom. Correlational and descriptive designs were used in this study. This study also was conducted using a quantitative method. The sample was selected based on random sampling. High school students in Forms One, Two and Four were involved. One hundred and forty students participated as the study sample. The application of student values and behaviour uses a questionnaire containing a Likert scale, while scientific skills use objective questions containing fifteen answer options. Major findings for this study shown in students' attitude when not all students enjoy scientific investigation. Students show a high level of behaviour (awareness, knowledge, and courage). Finally, this study found no significant relationship between the application of values and student behaviour towards the effectiveness of scientific investigation. As science textbooks state, moral values and student behaviour are related to the scientific investigation process. The next researcher should find out what these elements contribute to science learning.

Keywords: Application of Values, Behavior, Scientific Investigation, Science Process Skills, Effectiveness

Introduction

Education is the backbone of national development in the current era of globalisation. Due to the emphasis on science and technology in developing people with strong scientific skills, science education has become a trend that triggers competitiveness among scientists.

Therefore, this study focuses on students' behaviour when teachers apply moral values to them while doing scientific investigations. Therefore, applying values such as gratitude, responsibility, honesty, and trust is important for students to hone their scientific skills. The application of moral values is important among students in all aspects. This study focuses on applying moral values to students when conducting scientific investigations. These virtues can be applied across curriculum elements when teachers guide students in the laboratory or classroom. Therefore, this noble value will encourage positive student behaviour. Positive student behaviour will cause students to be able to focus on the teacher's teaching during the scientific investigation.

According to Zol Azlan (2000), the stigma of thinking that science subjects are complex still exists among students. Students can further strengthen their scientific skills when conducting experiments if they have a positive mindset shown through their behaviour. Behaviour and applying moral values can further develop scientific skills in students when doing scientific investigations.

Bandura (1986) emphasised student behaviour observation to ensure learning effectiveness. Social learning theory can be applied in the classroom by conducting a series of exciting introductions to draw students' attention to the topic being studied. In this case, the teacher can use moments of surprise during the intro to attract the students' attention.

Additionally, students observe and imitate the behaviour of teachers, peers, and successful individuals as they learn. Teachers, peers, and successful individuals are models that can positively or negatively influence student behaviour. According to McClelland's Theory of Achievement Needs (1961, 1985), every student has the motivation to succeed, but with different needs.

The findings of this study provide practical information about the application of student values and behaviours to increase the effectiveness of scientific investigations. The efficacy of scientific inquiry will therefore produce scientific skills in students. All science teachers must help students by applying values and knowing that positive behaviour changes.

Related Past Study

Scientific Investigation

Scientific development requires a country that can produce intelligent people skilled in science. Pupils who need to be born with the characteristics of intelligent people are those who have a strong identity, superior skills, noble personality, deep knowledge, high skills, critical and creative thinking, the ability to act rationally, problem-solving skills, the ability to create opportunities and new resilience, and the ability to respond to the global environment (Education Bulletin 2005; Muhammad, 2005).

The science students' curriculum combines knowledge, moral values, skills, and scientific attitudes. A learning approach centred on problem-solving, and inquiry is essential in science teaching and learning. This knowledge involves theories for every incident that happens around us, requiring students to have high thinking skills so that they can apply them in their daily lives. Therefore, applying values such as gratitude, responsibility, honesty, and trust is essential for students to increase their scientific skills. The application of moral values is essential among students in all aspects. This study focuses on applying moral values to students when conducting scientific investigations. These values can be applied across curriculum elements when teachers guide students in the laboratory or classroom. Therefore, this noble value will encourage positive student behaviour. Positive student

behaviour will cause students to be able to focus on the teacher's teaching during the scientific investigation.

Scientific attitudes and values such as cooperation, systematic confidence, honesty, and accurate data recording will be applied practically, usually carried out in small groups (Christensen & McRobbie, 1994; KPM, 2002 & 2005). Educational experts agree that, in general, the practical scientific approach includes three different teaching techniques, which are descriptive, investigative, and discussion skills (Hoftein & Lunetta, 2003; Marzano, 1992; Smith, 1971; Tamir, 1977). Practical methods contain three essential techniques that must be present in teaching: preexperiment, laboratory work phase, and post-experiment (Smith, 1971; Tamir, 1977). Charles and Senter (2002) say teachers must have good management skills when using different techniques. Teachers must use different approaches to acquire different skills (Griffin, 2005).

In the study, Nurzatulshima et al (2009) explained these three techniques in depth. For example, in the pre-experimental phase, the teacher asks questions and gives explanations to motivate students to participate in the activities to be carried out. Questions that arouse students' curiosity are strongly encouraged. Students will be guided to identify existing problems and form hypotheses. They will create various solutions based on relevant theory and existing knowledge. They then plan to conduct the investigation, including methods for selecting solutions, equipment and materials needed, task assignments, and appropriate data collection methods. This situation helps develop critical and creative people and helps them solve problems.

During the practical work or laboratory work phase, using investigative techniques, students will bring and assemble all the equipment and materials provided. The data will be recorded in a suitable form for easy processing and analysis. At this stage, the teacher is a facilitator, helping students develop critical thinking by asking questions. Questioning, controlling, helping, and encouraging activities will be used to ensure students continue with the activities provided.

In the final stage, post-experiment, where the discussion technique is used, teachers and students will question, answer, recall, discuss, and relate the theory to the results obtained. The teacher also encourages students to analyse the data and interpret the information obtained. A discussion will be held to obtain the results of the practical activities. All the activities during the hands-on session show that the hands-on approach includes various techniques that help develop the necessary human capital.

Application of moral values

The history of value education in Western countries such as the United States began in the 16th century, intending to raise children or young generations who are moral, diligent, and contribute to society (Mabary, 2017). Value education, or character education, is one of the education programmes that has been a national development priority in this country since 1945 (Lily Damayanti, 2014).

In Malaysia, the development of value education began in the 1980s, when the Malaysian Ministry of Education (KPM) made changes in education related to "humanising education" by formulating a more explicit and comprehensive national education concept (Ahmad, 1991). Based on the changes in education, the application of moral values was given more profound attention starting with the new curriculum in 1983. This element of moral values continued to be emphasised in the latest curriculum change, the Secondary School Standard Curriculum (KSSM), by applying skills and values associated with students meeting

the challenges of the 21st century through the Malaysian Education Development Plan (PPPM) 2013-2025.

The principles established in science teaching in Malaysia are moral values that have a friendly relationship with religion (Lilia, 2011; Nik Azis, 2008; Tan, 1997). This morality is based on 16 moral beliefs or moral values driven by faith and spirituality from the religious beliefs cultivated by Malaysian society: Islam, Christianity, Buddhism, Hinduism, Sikhism, and Confucius (Robiah, 2011). Reasons why moral values should be adapted across coursework, especially in science learning, are listed below.

1. Creating intelligent people that live in an integrated and holistic manner, as stated in the National Education Philosophy (FPK), by promoting education aligned with moral, moral, and spiritual growth in student learning (KPM, 2013).
2. One of the actions to reduce secularism in scientific education (Lilia, 2011; Nik Zaharah, 2007) is because it still has a new scientific component that will not show the value of belief in the divine even though there are elements of real value in the course work.
3. Building the domain of spirituality in moral values without fault by associating the sociological phenomenon of scientific research with God because the drive of faith is a measuring level in an individual's personality (Nik Zaharah, 2007).
4. Build students with noble character and the ability to create moral principles in themselves, their parents, and society (Tajul et al., 1992).

Clement (2013) agrees that spirituality is also related to scientific knowledge because religion has its values and truth structure. Astley and Francis (2010) say this encourages school curriculum content to combine spirituality with science subjects by showing the relationship that interprets the belief factor about God's creation. This combination is because students and teachers experience conflicts and contradictions between spiritual practises and the philosophy of science, for example, when analysing and studying development theory which is about all the changes in human creation (Asghar et al., 2007; Basel et al., 2014; Yasri et al., 2013; Yasri & Mancy, 2014).

Although integrating moral values in academics is provocative in today's scientific age, Malaysia's educational approach that applies assimilation theory and efforts to limit spirituality in science literacy has taken steps to foster scientific attitudes and beliefs in school learning. In conclusion, many moral values in the curriculum need to be applied during science teaching. However, not all virtues can be applied at once. The virtues that want to be shown must coincide with the teaching topic and its implementation in the classroom.

Attitude

Education research is focused on the scientific mindset, but this mindset prevents the research from growing in line with its significance. This problem may be because educational researchers have left this field to scientists. However, studies have proven that scientific understanding positively relates to scientific attitudes. Srivastava (1983) measured science attitudes and found that the amount of scientific knowledge or public exposure to science courses affected attitudes towards science. All four groups—teachers with science education, teachers without science education, students with science education, and students without science education—exhibited positive attitudes, according to a study of the behaviour of teachers and students with and without science education. It was discovered that scientific knowledge and public exposure to science courses positively influence people's attitudes towards science and that knowledge of science influences people's attitudes towards science.

Additionally, Ghosh (1986) discovered a strong correlation between science aptitude, behaviour, and academic motivation, although boys' and girls' attitudes and aptitude in the subject did not differ. In a study on college teachers' attitudes towards science, Saheb and Sathiyaairirajan (1979) discovered significant differences between the attitudes of science- and non-science-related college teachers. Changes in society's views have also changed their behaviour towards science (Patil, 2012). Craker (2006) believes that behaviour is learned, not inherited. Johnstone and Reid (1981) found that behaviour can be changed and developed through mechanisms related to behavioural stability, where there are situations in which behaviour can change. According to Craker (2006), the student's relationship with science education leads to a change in behaviour towards science, which depends on the quality and duration of the relationship with science, the teacher's teaching methodology, and the student's learning environment.

According to Kolman (1938), behaviour change requires three key elements: internalisation, internalisation of identity, and compliance. Compliance is a behaviour change motivated by the consequences of a person's expectation of receiving rewards or avoiding punishment from other people, society, or a group of people. Identity is a description of one's beliefs. Any significant change in one's beliefs is explained through identity. This change affects a person's behaviour in terms of praise or equality. In a change in belief based on flattery or praise, the individual adopts a new behaviour because of the desired relationship between belief and flattery (Kolman, 1938).

Internalization involves actual changes in beliefs and evaluations of the object of behaviour. The Expectancy Value Theory also relies on internalisation to change behaviour among students. This theory holds that a person's behaviour is a function of their intention towards a particular object. According to Cialdini et al (2004), social influence, beliefs, and behavioural changes are influenced by emotions, which are affective components that work according to a person's state and cognitive processes. Positive or otherwise, behaviour considered strong resilience can be converted into emotions (Leventhal, 1970; Maddux & Rogers, 1980; 1983; Janis et al., 1965)

According to researchers, emotions cause concern (Leventhal, 1970; Maddux & Rogers, 1980), which can produce empathy (Shelton & Rogers, 1981) and ultimately positive feelings towards a person, thing, or issue (Janis et al., 1965), and they can reinforce behavioural change in certain circumstances (Leventhal, 1970). Self-efficacy, issue involvement, behavioural accessibility, and resource characteristics are the most critical aspects influencing emotions. Positive or otherwise, behaviour considered strong resilience can be converted into emotions (Leventhal, 1970; Maddux & Rogers, 1980; 1983; Janis et al., 1965). This newly formed emotional behaviour challenges existing societal beliefs or traditions. In this way, cognitive dissonance is created, which is associated with psychological discomfort. Since behaviour differs from person to person, society to society, and country to country, measuring this behaviour change is challenging (Davis, 1965).

Theory in the Application of Moral Values and Students' Behaviour

In this study, the effectiveness of scientific investigation is also seen from the perspective of two appropriate theories: McClelland's achievement motivation theory (1961) and social learning theory (Bandura, 1986).

McClelland's Theory of Achievement and Motivation (1961)

Developing the value-expectancy theory of human motives focuses on the need for achievement, relatedness, and power. The need for achievement is an unconscious drive to improve and live up to a standard of excellence. People with a strong need for achievement measure themselves against specific goals. They prefer moderate risk in favor of individualistic leisure activities that involve individual achievement and performance. The need for power is an unconscious drive to influence others. People with a strong need for power often assert themselves by taking leadership positions.

They often have competitive interpersonal skills. The need for relatedness is an unconscious urge to be part of a warm and close relationship, such as a friendship. People with solid relational needs would like to spend time with close friends or significant others, like writing letters or talking on the phone with friends or family, working in groups, and being sensitive to other people's reactions.

Intrinsic motivation arises naturally in individuals who do an activity without expecting or demanding a reward. However, not all intrinsic motivation arises naturally. There is also intrinsic motivation that arises from learning and experience that brings satisfaction. For example, reading storybooks and playing musical instruments are intrinsic motivations for learning and experience. Harter (1981) identified five dimensions of intrinsic motivational tendencies in learning. These dimensions are challenges, work incentives to satisfy interest and curiosity, independent coping attempts, independent evaluation of what needs to be done in class, and internal success criteria.

Extrinsic motivation comes from external incentives, motivating individuals to do what benefits them. This extrinsic motivation can come from praise, incentives, prizes, grades, and creating a conducive environment and climate that encourage students to learn. For example, if the teacher praises the student for success, the student will try harder. Reinforcement is an extrinsic motivation that can influence the behaviour of a student. In the classroom, teachers need to know what type of reinforcement should be given and how often it should be given. Reinforcement can be given regularly, such as supportive praise or encouragement. According to Kazdin (1984), reinforcement is more effective when given regularly in the early stages of learning. Therefore, when students begin to master an assignment, they should receive frequent praise and support.

So, applying values can happen through external or internal motivation. Teachers can use various methods to show good values to students. The teacher can provide a reward or praise if the student succeeds in experimenting. Therefore, students will feel enthusiastic about getting good experimental results. For self-motivation, students clean the equipment after use without being told by the teacher to be recognised as good students. The application of values does not only look at elements of teaching but also the way teachers instil a sense of motivation in students.

Social Learning Theory (Bandura, 1986)

Bandura (1986) introduced a learning theory focusing on the thoughts and feelings of observing others. According to this theory, learning is influenced by social, individual, and behavioural factors (Santrock, 2016). Social factors include environmental factors such as daily observation of teacher behaviour. Individual factors include personality, affective, and cognitive factors such as expectations, beliefs, attitudes, and intelligence. In addition to social learning theory, social cognitive theory, learning through observation, learning through imitation, and learning through modelling are also used to describe this theory.

Bandura (1986) emphasizes observing the behaviour of models to ensure the effectiveness of learning. Social learning theory can be applied in the classroom by conducting a series of exciting introductions to draw students' attention to the topic being studied. In this case, the teacher can use moments of surprise during the introduction to attract the students' attention. In addition, students observe and imitate the behaviour of teachers, peers, and successful individuals as they learn. Teachers, peers, and successful individuals are models that can influence student behaviour positively or negatively during scientific investigation.

Table 1
Application of Social Learning Theory

Model	Contoh
Teacher	The teacher sets a good example for the students, such as being on time and dressing well in the laboratory.
Peer	The best student's work is displayed in the laboratory for others to emulate.
Idol	Successful individuals are encouraged to share the secret of their success so that other students can follow suit.

Study Objectives

This study focuses on the effectiveness of scientific investigation among students. Therefore, this study relates two factors, the application of values and behaviour to determine the effectiveness of scientific investigation.

1. Knowing the application level of high school students' moral values during a scientific investigation
2. Identify the level of behaviour of high school students during the scientific investigation.
3. Investigate the relationship between the level of application of moral values and the level of behaviour towards the effectiveness of the scientific investigation.

Research Questions

The application of moral values and student behaviour will determine whether it affects the level of effectiveness of scientific investigation. This study has raised three questions based on the objectives stated above. Therefore, this study aims to find answers to the following questions:

1. What is the application level of high school students' moral values during scientific investigation?
2. What is the level of behaviour of high school students during scientific investigations?
3. Is there a relationship between the level of application of moral values and the level of behaviour towards the effectiveness of scientific investigation?

Methodology

Research Design

Correlational and descriptive designs were used in this study. This study also was conducted using a quantitative method. The sample was selected based on random sampling.

High school students in Forms One, Two and Four were involved. One hundred and forty students participated as the study sample. The application of student values and behaviour uses a questionnaire containing a Likert scale, while scientific skills use objective questions containing fifteen answer options.

Instrument

This study contains one questionnaire and one test question. The questionnaire will be used to identify student behaviour and application of moral values adapted from Gogolin and Swartz (1992) that are applied in scientific investigation, while the student's scientific investigation will be tested through test questions. Each question will have a solution based on an objective problem with four answer options. The Statistical Package for Social Science (SPSS) software version 23 was used to analyze the study findings.

Survey Participants

The research population was randomly selected high school students. This population was chosen because Forms 1–5 students must take science subjects and do scientific investigations. Secondary school students are still in the teaching and learning process, which focuses on the syllabus of the KSSM, where they need to conduct scientific investigations. Level three consists of Forms One, Two, and Three, while Level four consists of Forms Four and Five. These third and fourthform high school students were chosen because they are experiencing the science learning process that uses scientific investigation methods. Students from Form One carry out this scientific investigation until Form Five. A total of six classes of high school students were given a scientific investigation questionnaire by their homeroom teachers.

Data Collection and Analysis Procedures

The online structured questionnaires were designed using Google Forms, and the link was sent to six classes taking the science subject. The students came from all forms of secondary classes. Sending the Google Form through the homeroom teacher took about 2–3 days. Students were invited to participate in the survey. The survey was conducted online over one week.

Data Analysis and Results

Data Analysis

In total, 140 students responded to and completed the online survey and were included in the analysis. Data were analyzed descriptively by focusing on mean scores and correlations in SPSS software version 23. The data was compiled according to each aspect in the questionnaire section from the respondents involved. The locations involved are randomly selected secondary schools.

The first and second research questions will be analyzed using descriptive analysis to identify the application of values and behaviours among high school students. All data collected will be explained and summarized constructively according to the aspects listed. The first research question, the level of application of moral values, will be translated by interpreting the mean score. Nunally and Bernstein (1994) also suggested that the mean score be categorized in the interpretation as in Table 2 below.

Table 2
Interpretation of the mean score

Mean score	Mean interpretation
1.00 – 2.00	Low
2.01 – 3.00	Middle low
3.01 – 4.00	Middle high
4.01 – 5.00	High

Source: Nunnaly & Bernstein (1994)

The third research question will be analyzed using correlation analysis to identify the relationship between the application of student values and behaviour and the scientific investigation's effectiveness.

Moral Value Application During Scientific Investigation

Table 3 below shows the descriptive statistics of part B (i), which applies moral values during the scientific investigation. Each item was analyzed based on the mean score.

Table 3
Moral Value Application During Scientific Investigation

No	Aspect	Mean score	Standard deviation	Interpretation
1	The importance of science in society	4.23	0.79	High
2	Self-concept in science	4.29	0.76	High
3	Fun in science	4.20	0.82	High
4	Motivation in science	4.28	0.78	High
5	Perception of science teachers	4.22	0.84	High
Total		4.24	0.80	High

The mean score for all items according to aspects in this section is 4.24. These results indirectly show that the level of student application among the respondents during the scientific investigation was high. This analysis's results also show that this study's first objective has been achieved.

Level of Student Behaviour During Scientific Investigation

Table 4 below shows the descriptive statistics of the mean score of part B (ii), which is the student's behaviour during the scientific investigation. Each item was analyzed based on the mean score.

Table 4
Student Behaviour During Scientific Investigation

No	Aspect	Mean score	Standard deviation	Interpretation
1	Awareness	3.97	0.89	Middle high
2	Knowledge	3.83	0.93	Middle high
3	Courage	3.92	0.81	Middle high
Total		3.90	0.88	Middle high

The mean score for all items in this section is 3.90. These results indirectly show that the level of application of values to students during scientific investigation among respondents is at a high level. This analysis's results also show that this study's second objective has been achieved.

The relationship between the application of values and student behaviour with the effectiveness of the scientific investigation

Spearman's Rho analysis was used because the data was not normal. Table 5 shows the results of Spearman's Rho analysis of the relationship between the application of student values and behaviour with the effectiveness of scientific investigations. The results of the analysis found that there is no significant relationship between B(i) Application of Values during Scientific Investigation (p=0.006) and B(ii) Student behaviour during Scientific Investigation (p=0.084) with the Effectiveness of Scientific Investigation because the p-value is more significant than 0.005. These results indirectly show that the third objective of this study has been achieved.

Table 5
Spearman's Rho Analysis

		Score
B(i) Application of Values during Scientific Investigation	Correlation Coefficient	0.230
	Sig. (2-tailed)	0.006
	N	0140
B(ii) Student Behaviour during Scientific Investigation	Correlation Coefficient	0.146
	Sig. (2-tailed)	0.084
	N	140

This finding is supported by Osman and Halim (2007), where this researcher also found that there is a weak and insignificant relationship (r = 0.114, p = 0.09) between behaviour toward science and scientific attitude (effectiveness of scientific investigation) for Form 2 students. For those who study Matriculation, there is no significant difference between behaviour and scientific attitude. This scientific attitude can be seen in the effectiveness of scientific investigations.

Although the application of values by teachers to students is high, its relationship to the effectiveness of scientific investigation is unrelated. Student behaviour also does not affect the effectiveness of scientific investigations. Weak relationships and the absence of relationships indicate that the effectiveness of scientific inquiry may be independent of the application of student values and behaviours. McClelland's Achievement Motivation Theory (1961) states that students need intrinsic and extrinsic motivation. This finding clearly shows that the effectiveness of scientific investigation can be a manageable amount of internal and external encouragement. Effectiveness may be increased through other aspects, such as the teacher's teaching method, as introduced in Social Learning Theory (Bandura, 1986).

Conclusion

This study aims to determine the relationship between the application of student values and behaviour towards the effectiveness of scientific investigation. However, the effectiveness of scientific investigation needs to be looked at even further when the application of student values and behaviours has little impact. Therefore, it is seen that teachers need to think of other solutions to increase the effectiveness of scientific investigation. Education is a foundation that integrates the cultivation of student values and behaviours. When the application of moral values and students' behaviour does not effectively increase the effectiveness of the scientific investigation learning process, teachers should give more cooperation to find out how to solve this issue. As science textbooks state, moral values and student behaviour are related to the scientific investigation process. The next researcher should find out what these elements contribute to science learning. Future studies are also proposed to measure the level of teacher knowledge about using information and communication technology (ICT) and its relationship to the effectiveness of scientific investigation. ICT can make learning science more interesting. This method should be used more often. Uses such as LCD, video, and photos are familiar to the current generation. Technology is a second life for the current generation. Learning that uses this technology can improve the quality of teaching-learning.

References

Ahmad, M. S. (1991) Reformasi Pendidikan, Rasional, Falsafah & Strategi. Dlm. Reformasi Pendidikan di Malaysia, disunting oleh Idris Jauz. Kuala Lumpur: Nurin Enterprise.

Bandura, A. (1986). *Social Foundations of Thought and Action*. Englewood Cliffs, NJ: Prentice Hall.

Berg, E. V. D. (2003). Teaching, Learning, and Quick Feedback Methods. *The Australian Science Teaching Journal* 28-34.

Charles, C. M., & Senter, G. W. (2002). *Elementary Classroom Management*. 3rd Ed. Boston: Allyn and Bacon.

Christensen, C., & McRobbie, C. (1994). Group Interactions in Science Practical Work. *Research in Science Education 24*: 51–59.

Clement, P. (2013). Values in Science and Science Education. *Journal INEDP 1*(1): 1–26.

Craker, D. E. (2006). *Attitudes Toward Science of Students Enrolled in Introductory Level Science.*

Ghosh, S. (1986). *A Critical Study of Scientific Attitude and Aptitude of the Students and Determination of Some Determinants of Scientific Aptitude*. Kalyani University, Department of Education (Doctoral dissertation).

Griffin, R. W. (2005). *Management.* 8th Ed. Boston: Houghton Mifflin Company.

Hoftein, A., & Lunetta, V.N. (2003). The Laboratory in Science Education: Foundation for 21st Century. *Science Education 88*(1): 28–54.

Johnstone, A. H., & Reid, N. (1981). Towards a Model for Attitude Change: European. *Journal of Science Education 3*(2), 205–212.

Nurazidawati, M. A., & Osman, K. (2019) Penerapan nilai Murni Melalui Interaksi T-A-M & Kitaran Pengajaran 5E dalam Modul Tauhidik STEM Kids. Jurnal Pendidikan Malaysia *44*(1) Isu Khas (2019): 67-82. DOI: http://dx.doi.org/10.17576/JPEN-2019-44.01SI-06

Kementerian Pendidikan Malaysia. (2001) PuLKOS: Pe*ndekatan Pengajaran & Pembelajaran Fizik*. Kuala Lumpur.

Kementerian Pendidikan Malaysia. (2006) *Pelan Induk Pembangunan Pendidikan 2006-2010*. Kuala Lumpur.

Kementerian Pendidikan Malaysia. (2013) Pelan Pembangunan Pendidikan Malaysia 2013-2025.

Kolman, H. C. (1938). Compliance, Identification, and Internalization: Three Processes of Attitude Change. *Journal of Conflict Resolution 2*(1), 51–60.

Leventhal, H. (1970). Findings and Theory in the Study of Fear Communications in L. Berkowitz (Ed.), Advances in experimental social psychology. *New York: Academic Press 5*: pp. 119–186.

Lilia, H. (2011) *Ilmu Pedagogi Kandungan Sains untuk Pendidikan Bersepadu. Dl. pendidikan sains berteraskan tauhid*, disunting oleh Salleh, K.6. Bangi: Institut Islam Hadhari, Universiti Kebangsaan Malaysia.

Lily, Di. (2014) *Pendidikan Karakter dalam Kurikulum Sains Sekolah Rendah Kajian Perbandingan Malaysia - Indonesia*. Sarjana Pendidikan, Fakulti Pendidikan, Universiti Kebangsaan Malaysia, Bangi.

Mabary, T. G. (2017). *Values, Moral, and Character Education in Colonial America through the Nineteenth Century: A Qualitative Historical Study*. Doktor Falsafah, The Faculty of the Graduate Education Department, Southwest Baptist University.

Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A Revised Theory of Fear Appeals and Attitude Change. *Journal of Experimental Social Psychology* 19, 469–479.

Marzano, R. J. (1992). *A Different Kind of Classroom: Teaching with Dimensions of Learning*. Alexandria VA: ASCD.

McClelland, D. C. (1961). *The Achieving Society*. NY: Van Nostrand.

McClelland, D. C. (1985). *Human Motivation*. NY: Cambridge University Press.

Musa, M. (2001), *Ucapan Perutusan Tahun Baru 2001 oleh Menteri Pendidikan Malaysia. 11 Januari 2001.* (atas talian). Doi www.moe.gov.my/ucapan/ucap2001mp.htm . 5 Oktober 2004.

Nik, A. N. P. (2008). *Penelitian Terhadap Konsep & Amalan Pendidikan Nilai & Moral. Dlm. Pa, N.A.N. & Idris, N. (pnyt.). Perjuangan memperkasakan pendidikan Malaysia: pengalaman 50 Tahun Merdeka*, hlm. 259–307. Kuala Lumpur: Utusan Publication and Distribution.

Nik, Z. N. Y. (2007) *Kajian Penerapan Nilai Murni Menerusi Pengajaran Bermodul.* Doktor Falsafah, Fakulti Pendidikan, Universiti Kebangsaan Malaysia, Bangi.

Nunally, J. C., & Bernstein, I. H. (1994). Psychometric Theory: Third edition. New York: McGraw Hill.

Nurzatulshima, K. (2009). *Pengurusan Penglibatan Murid dalam Amali Sains (Management of Students' Involvement in Science Practical Work)*. Kertas Projek Master Sains. Universiti Putra Malaysia.

Ogunniyi, M. B. (1983). An Analysis of Laboratory Activities in Selected Nigerian Secondary Schools. *Journal of Science Education 5*(2): 195–201.

Patil, N. P. (2012). Role of Education in Social Change. *International Educational E-Journal 1*(2), 205– 210.

Robiah, K. H. (2011). *Nilai murni dalam Pengajaran Bahasa Melayu*. Kuala Lumpur: Dewan Bahasa & Pustaka.

Saheb and Sathiyagirirajan. (1979) "*A Study of The Scientific Attitude of College Teachers,"* Journal of Higher Education.

Smith, J. P. (1971). The Development of a Classroom Observation Instrument Relevant to the Earth Science Curriculum Project. *Journal of Research in Science Teaching 8*: pp. 231–235.

Srivastava, N. N. (1983). *A Study of Scientific Attitude of Science and Arts Students Belonging to Scheduled Castes, and Scheduled Tribes Vis-À-Vis Non-Scheduled Caste Communities*. University of Rajasthan, Department of Education, (Doctoral dissertation).

Tamir, P. (1977). How Are the Laboratories Used? *Journal of Research in Science Teaching 14*(4): 311–316.

Tan, S. K. (1997). Moral Values and Science Teaching: A Malaysian School Curriculum Initiative. *Science and Education 6*(6): 555–572.

Yasri, P., & Mancy, R. (2014). Understanding Student Approaches to Learning Evolution in the Context of Their Perceptions of the Relationship Between Science and Religion. *International Journal of Science Education 36*(1): 24–45.

Zol, A. H. (2000) *Strategi Pengajaran Pendekatan Sains, Teknologi & Masyarakat*. Selangor, Malaysia: Prentice Hall.