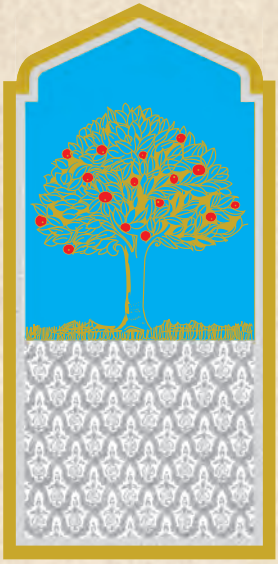

AL-SHAJARAH

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FRAMEWORK FOR INCULCATING ISLAMIC VALUES THROUGH PROBLEM SOLVING IN MATHEMATICS AND LESSON STUDY APPROACH

Madihah Khalid

Abstract

The purpose of this paper is to relate the development of a framework for inculcating Islamic values among elementary school children. The teaching of Islamic values is to be integrated in the teaching of mathematics problem solving. Meanwhile, lesson study have been identified as the best professional development strategy for the purpose of coaching the teachers to teach effectively. The paper discusses the importance of upholding Islamic values in the current time and looks at the opportunities for value inculcation across the curriculum in particular for the subject of mathematics. The framework developed is represented by three layers of concentric circles. In the innermost circle, Islamic values are separated into three aspects, akhlaq, adab *and virtues from the sunnah of the prophet. Subsequently, the second inner circle comprises four components of problem solving i.e. thinking and reasoning, communication, collaboration and attitude. These elements have been selected as important elements to inculcate values. Finally, lesson study, comprising plan, teach and reflect phases have been chosen as a medium to coach teachers to the processes identified and mentioned in the outermost circle. Muslim scholars' views, and their theories on education and writings on values and character traits, have also been considered in developing the framework. The tradition of the Muslim mathematicians during the Islamic civilization is also included.*

Keywords: mathematics teaching and learning, inculcation of values, problem-solving, values framework, lesson study

Introduction

Ethics and values are the basis of many civilizations and form fundamental parts of morality. Values are principles or standards of behaviour or one's judgement of what is important in life"[1] that determine one's conduct. Values are also shaped by particular long lasting beliefs shared by the members of a culture, religion or community.[2] Besides universal values, we may say that believing Muslims subscribe to Islamic values, while people of other communities subscribe to their own values. Islamic values are generally strictly observed by practicing Muslims because they are prescribed by God Almighty in the Quran and were practiced by the Prophet, Muhammad (ﷺ). These values are not the result of spiritual development, but that which have been enshrined by Islamic law since fifteen centuries ago. The Prophet is a shining example of perfect moral behaviour, and he saw it as his priority to restore the *ummah*'s behaviour as narrated in a *hadith* "I was only sent to perfect good a*khlaq*".[3] The Qur'an praised the Prophet as someone with the most beautiful conduct and that his moral character is the Qur'an. The importance of moral character was further highlighted when the Prophet said that "the best among you are those who have the best manners and characters".[4]

However, in the daily newspapers or any news portal today, robberies, murderr and violence against women, children and the elderly seem to dominate the headlines.The same can also be said about news related to corruption, frauds and scams. We cannot help but wonder what is happening to the world today, and sadly, to Muslim countries such as ours. People seem to have lost direction as a result of poor moral values and care less if they have broken the moral code of conduct. As educators, we can play a very big role to improve this situation especially during the schooling age of children.

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[1] *Oxford Dictionaries*, "Language Matters." Value. Last modified 2016. http://www.oxforddictionaries.com/definition/english/value.

[2] Stacey, A. 2016. "Defining Values: Who determine our Code of Conduct." *The Religion of Islam.* February 28. Accessed May 21, 2016. http://www. islamreligion.com/ articles/10719/defining-values.

[3] *Musnad Ahmad*.

[4] *Sahih Bukhari* 4:759.

Hence it is important for us to examine our education system because education plays a significant role in inculcating values and norms into children. During the school-going age, children are at the conventional level of moral development,[5] where their moral reasoning is to conform to the social order. It is therefore, crucial that all lessons are injected with moral underpinnings.

According to Al-Attas,[6] the aim of education is to produce a good man. A good man according to him is a man who possesses *adab*, someone who is "sincerely conscious of his responsibilities towards the true God; who understands and fulfills his obligations to himself and others in his society with justice, and who constantly strives to improve every aspect of himself towards perfection as a man of *adab* [*insan adabi*]".[7] This concurs with what was earlier said by Al-Ghazali, that the aim of education is for the formation of good character, cultivation of virtue and also the eradication of ignorance.[8] He stated that when students take their lessons seriously and put them into practice, then the teaching of moral values becomes effective.[9] He also stressed on the importance of teachers as models of good character and moral values because students usually emulate their teachers in a subconscious manner. Similarly, Al-Farabi is believed to have said that the aim of education is to lead individuals to perfection, and the goal of humanity's existence in this world is to attain happiness, which is the highest perfection. He described a perfect human being as one who has obtained theoretical virtue, having completed his intellectual knowledge and acquired practical moral virtues, hence becoming perfect in his moral behaviour. Ibn Sina sees the aims of education as the overall growth of the individual: physical, mental and moral, followed by preparation of

[5] Kendra Cherry, "Kolberg's Theory of Moral Development." Last modified 5th September, 2016, https://www.verywell.com/kohlbergs-theory-of-moral-developmet-2795071

[6] Syed Muhammad Naquib Al-Attas, *The Concept of Education in Islam*, (Kuala Lumpur: International Institute of Islamic Thought and Civilization (ISTAC), 1980).

[7] Ibid.

[8] K. Totah, *The Contributions of Arabs to Education.* (PhD thesis, Columbia University, New York, 1926).

[9] J. Mark Halstead, "Islamic Values: A Distinctive Framework For Moral Education?" *Journal of Moral Education*, Vol. 36, 2007, 283-296.

this individual to live in a society through a chosen trade according to his aptitude. Education in Islam, according to Ibn Khaldun, is not just an integral part of civilization, but more importantly, for someone to know Allah's law that was prescribed for the purpose of attaining *ma'rifat* by practicing the rituals and is always oriented towards inculcating Islamic values.[10]

It can be seen from above that all of the scholars mentioned character and moral values as the most important part of education besides seeing to the overall growth of an individual which include the physical, mental and spiritual element. The significance of these elements are reflected in the Malaysian National Philosophy of Education (NPE), which is stated as follows:

> Education in Malaysia is a continuous effort towards enhancing potentials of individuals in a holistic and integrated manner in order to create individuals who are well-equipped intellectually, spiritually and emotionally. This effort aims to produce knowledgeable, ethical and responsible Malaysian citizens who can contribute towards the harmony and prosperity of the community and nation.[11]

NPE is supposed to act as a guide for all educational activities in Malaysia, which sets the values and principles of the Malaysian education system from the primary to the tertiary levels. NPE's aims and objectives are to produce individuals who are knowledgeable and full of integrity, who will contribute as responsible citizens. A balanced emphasis should be on all of the four elements – physical, intellect, emotional and spiritual. However, an over emphasis of intellect in today's educational institutions has made other elements, especially spiritual, neglected or overlooked (see Figure 1). The balance seems to be more skewed towards intellect due to the disproportionate focus on the academic side of education. Therefore, it is not surprising that the state of the society is what it is now. Although there are other factors that lead to this situation, the

[10] Ibn Khaldun, *Muqaddimah*, (Jakarta: Pustaka Firdaus, 2008).

[11] Ministry of Education. *A Preliminary Report on Malaysian Education Blueprint 2013-2025*, (Kuala Lumpur: MOE, 2004).

increase in white collar crime and minimal concern about integrity, honesty and ethical behaviour is a cause for concern.[12] Sadly, this is happening a lot in Malaysia now, where the increasing trend in white collar crime is said to be alarming.[13] Therefore, there is an urgent need for schools to stress on the inculcation of values to children.

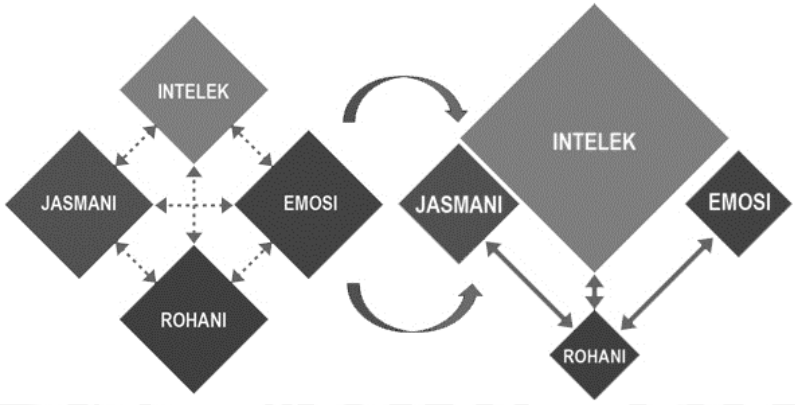

Figure 1: The emphasis on intellect instead of balance in today's education[14]

While the development of values in a child starts from home, there exists ample opportunities for teachers to teach the principles of values education through existing subjects and topics or across the curriculum, including mathematics. Although mathematics has often been thought of as a value-free subject, it can be argued that since mathematics deals with everyday life, it is an appropriate subject to incorporate values to be inculcated in the students, especially through problem solving. One of the best Islamic real-life problems that can be turned into a class task that teaches value is related to the law of

[12] "Online Lawyer Source". *White Collar Crime Statistics*. Accessed 12 May, 2016 from http://www.onlinelawyersource.com/white-collar/statistics/

[13] Affendy, Liew & Puah. "Common Indicators of White Collar Crime In Malaysia." Proceedings of 29th International Business Research Conference 24 - 25 November 2014, Novotel Hotel Sydney Central, Sydney, Australia.

[14] Dzulkifli Abdul Razak. *Memupuk Insan Seimbang Cabaran Kepemimpinan*. (Kuala Lumpur: Penerbit USIM, 2014).

inheritance (Fara'id), where students can be apply Algebra. Although the work of Al-Khwarizmi, Al-Karaji and Al-Samaw'al in Algebra and that of Thabit bin Gurra, Ibrahim bin Sinan, Al-Farabi and Abu Sahl in Geometry will be too advanced for the children that this framework is targeted, their stories would inspire the Muslim children to revisit the glorious achievements of Islamic mathematicians.

School is where children go for organized education. It is also here that extensive enculturation occurs, which encompasses other activities which are not only aimed at increasing knowledge and ability, but also at acquiring norms and values. Teaching also includes the usage of educational aids or manipulation which serve in a meaningful way to improve results and also to heighten the readiness for taking on responsibilities. Accordingly, schools, apart from its main function as a place for teaching, also has the task of providing moral education. Often, teaching values have been associated mainly with the religious or moral subjects. However, Bishop[15] stated that values are an inherent part of all educational subjects at all levels, from the "systemic level, institutional macro-level, through the meso-level of curriculum development and management, to the micro level of classroom interactions." Nonetheless, Bishop[16] then remarked that the notion of studying values in Mathematics education is a relatively recent phenomenon. *Values* are at the heart of *teaching* in any subject, but are rarely explicitly addressed in the *mathematics teaching* literature.[17] Fortunately over the years, there has been an increase in the number of research in mathematics education incorporating values.[18]

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[15] Alan Bishop. "Values in Mathematics and Science Education: Similarities and Differences. *The Montana Mathematics Enthusiast, 5*, (2008) 47–58.

[16] Ibid.

[17] A. Bishop, W. T. Seah, C. Chin, "Values in Mathematics Teaching – the Hidden Persuaders?" *Second International Handbook of Education*, 2003, 717 – 765.

[18] See C. S. Lim and Ernest. "Values in Mathematics Education: What is Planned and What is Espoused?" Paper presented at the Conference of the British Society for Research into Learning Mathematics, Nottingham, UK, March 1997; W.T. Seah, "Values in the Mathematics Classroom: Supporting Cognitive and Affective Pedagogical Ideas", *Gazi Journal of Education, 1(1),* 2013. 45-63; W.T. Seah, and A.J. Bishop, "Teaching More Than Numeracy: The socialization Experience of a

This rationale for emphasizing Islamic values in schools across the curriculum and in mathematics education has been discussed above. The remainder of the paper will explain Islamic values particularly in the mathematics classroom; reminisce the Islamic golden era where mathematics is part of the Islamic tradition; consider the suitability of problem solving process for inculcation of Islamic values in mathematics classroom; examine lesson study as a suitable vehicle of research and at the same time acting as a professional development tool for teachers to coach and familiarize them to the processes of problem solving; present the conceptual framework and finally conclude.

Islamic Values

The mention of Islamic values would naturally lead people to think of those values practiced by Muslims. While this might be true in some cases, it cannot be assumed that Muslim values and Islamic values are the same. Since Islam is practiced by a very diverse group of people, Muslim values are usually culture bound and can differ from country to country (‘*urf*), while Islamic values are already ordained in the Quran and are from the *sunnah*, as was already defined before. As an example, honour killing is not part of true Islamic values although it is practiced in some Muslim communities because Islam upholds the sanctity of human life. Islamic values can be categorized into three:[19] 1) *akhlaq*, which refers to the duties and responsibilities set out in the *shari’ah* and Islamic teachings[20] 2) *adab*, which refers to manners associated with good breeding,[21] and 3) virtue – the qualities and character possessed by a good Muslim,

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Migrant Teacher.” In J. Bobis, B. Perry and M. Mitchelmore (Eds.), *Numeracy and Beyond: Proceedings of the Twenty-Fourth Annual Conference of the Mathematics Education Research Group of Australasia* (Vol. 2, 2001, 442–450); Turramurra, “Australia: Mathematics Education Research Group of Australasia”; W.T. Seah, “The Perception of and Interaction With, Value Differences by Immigrant Teachers of Mathematics in Two Australian Secondary Classrooms”, *Journal of Intercultural Studies*, *23*, 2002, 189–210.

[19] J.M. Halstead, “Islamic Values: A Distinctive Framework for Moral Education?” *Journal of Moral Education*, Vol. 36, No. 3, 2007, 283-296.

[20] Ibid, 283.

[21] Ibid.

following the example of the prophet Muhammad.[22] Yusuf Al-Qaradhawi divided *akhlaq* or moral values further into six categories of relationship: self, family, society, the animal world, the physical world and the creator.[23] On the other hand, *adab* means "good manners" and finally, virtue which include sincerity, responsibility, humility, kindness, helpfulness, etc. The list of good values and manners is profound and Al-Ghazali stressed the meaning of education in sowing good character in children so that they could evaluate between right and wrong.[24] He also recommended that the teaching of Islamic values starts as early as possible. The attempt for the development of values framework in this study is to have something conctere that teachers can adhere to in trying to shape students' akhlaq at the elementary level. Many people have argued that the teaching of values would be more effective and meaningful if taught across the curriculum, which the writers agree. This paper will however focus on the curriculum framework for the teaching of Islamic values only in mathematics education for the purpose of research on inculcating Islamic values through problem solving in the subject of mathematics.

Values in Mathematics Classroom

There is a widespread misunderstanding that mathematics is a value-free subject. However, many educators should be aware that values are imbedded in the teaching and learning in mathematics classrooms, whether implicitly or explicitly. Seah[25] stated that there are three different aspects associated with values and mathematics education – values through mathematics education, i.e. to incorporate values into existing mathematics curricula and approaches to teaching mathematics; values of mathematics education, i.e. the socio-politico and cultural values that are implanted in mathematics; and values for mathematics education i.e. the ways where teachers employ what they and the students value to enhance mathematical understanding

[22] Ibid.
[23] Ibid, 106-109.
[24] A. Suhid, "Teaching of Islamic Adab and Akhlaq in Human Capital Development", *Southeast Asia General Studies Journal*, 8. 2007. 167-178.
[25] W.T. Seah, "Values in the Mathematics Classroom…", 53.

and competence. This paper, however, will focus on the teaching of values through mathematics education, aptly known as teaching mathematics through problem solving.

Mathematics encompasses skills and functions which are parts of everyday life. Hence honesty can be inculcated in classroom activities of buying and selling; understanding money can lead a person to be frugal with money; reading of maps and direction can be associated with finding the direction of the kiblah and stressing on the importance of prayers; and estimation can be taught through estimating how much to buy when marketing so that everything can be used. This will eradicate wastefulness, all of which may be incorporated through the teaching of problem solving or the problem-solving approach.

Tradition of Islamic Mathematics

Mathematics covers almost every aspect of human life, although some people may not realize it. Mathematics, being the language of all sciences, has been used to describe the patterns and structures found in nature and plays a central role in the modern world. Some pursue mathematics for its beauty and intellectual challenge while others such as scientists or engineers applies it as part of their everyday jobs. Solving or applying it to everyday problems has led the people to discover new terrains that enrich the field itself. The development of Al-Jabr and Geometry during the Islamic Civilisation for instrance, can be attributed to the needs of the people in performing their duties in Islam. Al-Khwarizmi mentioned that his primary reason for composing his book, *Kitab al-jabr wa-l-muqabala* was "to help people solve the problems they encountered in their daily lives such as their inheritance (fara'id), their wills and testaments, their share allocations, judgments, commerce and all that they deal with among themselves such as surveying lands, digging of canals, engineering, and such things,"[26] although it also contain abstract theoretical considerations.

The level in the study of trigonometry during the Islamic ritual requirement in the religion. The need to locate the position of the Ka'aba for daily prayers in Islam has steered Muslim mathematicians to use spherical geometry which led to the

development of sine and cosine laws, and the knowledge of latitudes and logitudes. This and the religious requirement for pilgrimage to Mecca has led to the invention of astrolobe for the purpose of determining the direction to Mecca from other cities. These are just a few examples of the inventions by Muslim scientists that developed out of the need to solve everyday problems. Thus the importance of problem solving should be stressed in any classroom that may consequently led to new inventions.

Mathematics Problem Solving

Carson[26] provided the following definition of problem solving in mathematics: problem solving is the means by which an individual uses previously acquired knowledge, skills, and understanding to satisfy the demands of an unfamiliar situation. The student must synthesize what he or she has learned and apply it to a new and different situation. Problem solving is considered a teaching method that develops the students' thinking skills which enables them to apply conceptual knowledge to real life situations[27] and stimulates students' learning. Haji[28] stressed that students should be given the chance to participate freely in problem solving. The teachers' role is to guide students through the use of metacognitive skills and develop critical thinking and problem solving skills to solve a given problem, hence enabling them to apply these skills to solve real life problems[29]. In addition, the problem solving approach develops moral skills in students and teaches them to be responsible for their own education in searching for information, analyzing the problem

[25] Ibid

[26] Krulik and Rudnick, "A Problem With Problem Solving: Teaching Thinking Without Teaching Knowledge." *The Mathematics Educator*, 17(2), 2007, 4.

[27] Ibid.

[28] Haji, "Using The Teaching Techniques Of 5Es (Engage, Explore, Explain. Elaborate And Evaluate) In Teaching Technology-Integrated Science Subjects: A Survey At Selected International Schools In Selangor," (PhD dissertation, International Islamic University Malaysia, 2014).

[29] A. Hassan, K. Mohd Yusof, M.K. Abd Hamid, M.H. Hashim, A. Abdul Aziz, and S.A. Syed Hassan, "A Review And Survey Of Problem-Based Learning Application In Engineering Education." Conference on Engineering Education, JB, 2004.

and presenting the best solution[30].

Problem solving is one of the methods employed by our Prophet Muhammad (ﷺ) in teaching about the religion of Islam. It was narrated that the prophet presented a good example in problem solving when he was called by the Arab tribes at the time of building the *Kaabah* in order to solve the problem of which tribe should place the Black Stone on the wall of the *Kaabah*. The Prophet (ﷺ) suggested that each tribe choose one representative to carry the Black Stone on a piece of cloth and then he would place it himself in the proper place. His wise solution was accepted by all tribes.

Problem solving is an effective approach for educating students about life by promoting interest and context, developing thinking and common sense and giving students the power to strategize. In particular, it is an approach which encourages flexibility, the ability to respond to unexpected situations or situations that do not have an immediate solution and helps to develop perseverance in the face of failure. A problem-solving approach can provide a medium for students to construct their own ideas about what they are learning and to take responsibility for their own learning. While these are all important problem solving skills, they are also important life skills and help to expose pupils to values education that is essential to their holistic development. Additionally, problem solving is considered as one of the most important skills in the 21st century that a student should possess where the ability to solve non-routine problems in everyday life and in the workplace is desired.

Problem solving in mathematics education is defined as "engaging in a task for which the solution method is not known in advance."[31] In the process of problem solving, students must utilize their knowledge in trying to find a solution to a problem, a process which would lead to new mathematical understandings. Other traits that students could acquire by learning the method of problem solving in mathematics are, "ways of thinking, habits of persistence

[30] H.I. Hilwani, Pedagological Approach in Teaching with ICT: Implication Towards Secondary Students Intrinsic Motivation, Jeddah KSA. (M. Ed thesis, International Islamic University Malaysia, 2014).

[31] "National Council of Teachers of Mathematics". *Principles and Standards for School Mathematics*. (Reston: VA, 2000, 52).

and curiosity, and confidence in unfamiliar situations that will serve them well outside the mathematics classroom."[32] Therefore, problem solving should be considered an integral part of mathematics learning, and it should not be viewed as exercises that students perform at the end of every topic from the school textbook.

Other benefits of problem solving include 1) It makes learning mathematics interesting and enjoyable; 2) Mathematics is learned in a new way with greater understanding; 3) It produces positive attitudes towards mathematics; 4) It teaches thinking, flexibility and creativity; 5) It encourages logical reasoning; 6) It encourages mathematical communication; 7) It teaches general problem solving skills; and 8) It encourages cooperative skills.[33] Presenting a problem and developing the skills needed to solve that problem is more motivational than teaching the skills without context. It allows the students to acknowledge that there is a reason for learning mathematics, and hence they become more deeply involved in learning it. Teaching through problem solving offers students all of the benefits mentioned and at the same time helps students to decide any rule, if necessary, a situation requires or if they need to develop their own rules in situations where an existing rule cannot be directly applied.[34]

Taplin[35] listed three types of problems to which students should experience in the classrooms:

i. "Word problems, where the concept is embedded in a real-world situation and the student is required to recognize and apply the appropriate algorithm/rule (preparing pupils for the challenges of life)"
ii. "Non-routine problems which require a higher degree of interpretation and organization of the information in the problem, rather than just the recognition and application of an algorithm (encouraging the development of general knowledge and common

[32] Ibid.
[33] MOE New Zealand "nzmaths". Accessed June 27, 2016, https://nzmaths.co.nz/why-teach-problem-solving
[34] B. Taplin, Teaching Values Through A Problem Solving Approach to Mathematics. Accessed May 9, 2016, http://www.mathgoodies.com/articles/teaching_values.html
[35] Ibid.

sense)"

iii. "Real problems, concerned with investigating a problem which is real to the students, does not necessarily have a fixed solution and uses mathematics as a tool to find a solution (engaging pupils in service to society)."[36]

The first type of problem (in (i)) requires direct application of rules and concepts, where students just need to select appropriate existing knowledge to solve them. Fermi problems (where information given is not enough to solve a particular problem and requires children to locate the necessary information) can also fall under this category. In non-routine problems, children are encouraged to use their logical thinking, which can reinforce their understanding of the concept taught. They need to apply problem solving strategies that they may have applied before but in other situations. Finally, in the 'real' problems, students need to plan, carry out and check or extend their solution using certain models. As an example, Polya suggested a 4-step model that includes 1) understanding the situation 2) planning the solution 3) carrying out the plan and finally 4) checking and extending the solution. Of course there are other models of problem solving such as Bohan, Irby and Vogel,[37] who suggested 7-steps to come up with a solution. The kind of task that is suitable for teaching through problem solving mostly comes under category (iii), that will hopefully turn students into producers of knowledge rather than consumers. Suitable problems are those that requires students to investigate and enquire by asking themselves certain questions[38] to understand the situation. They are encouraged to communicate with their friends to collaboratively solve the problem and employ their mathematical thinking and reasoning. Through cooperative learning that is being suggested in the problem solving model, students will also acquire the value of collaboration.

We have now established the benefits of teaching through

[36] Ibid.

[37] Ibid.

[38] Questions such as: Will it work all the time? Are there reasons for this to happen? Can I generalize that? Is there any connection between …

problem solving and how this process of teaching would be able to inculcate the Islamic values that we want the children to acquire. There are of course disadvantages of teaching through problem solving and among them are teachers' discomfort and students' insecurity because both parties are used to the traditional way. Teachers' obsession on completing the syllabus made them to teach the topics on the surface where they resort to focus on procedures rather than understanding. The length of time taken is another reason since teaching through problem solving requires a lot of preparation. The next question would be whether our teachers would be ready to implement it. The normal way of teaching teachers about curricular changes is to have them undergo a training by attending a workshop or continuous professional development (CPD), and one of the most practical[39] and sustainable[40] CPD to date is the lesson study.

The Lesson Study

Lesson study (or *jugyo kenkyu*) is a CPD with origin from Japan, which has gathered popularity in many countries globally. Lesson study started to gain the attention of mathematics educators and researchers with the publication of *The Teaching Gap: Best Ideas from the World's Teachers for Improving Education in the Classroom* by Stigler and Hiebert in 1999 and is credited for the more superior way of teaching by the Japanese teachers. In lesson study, teachers come together and work collaboratively to plan, implement, and then reflect upon the research lesson as shown in Figure 2. After deliberation during the reflection stage, improvements would be made during the re-planning stage, and the cycle continues until a satisfactory lesson plan is produced.

During the planning stage, teachers identify their goals and objectives by studying the curriculum and planning the research lesson as best they could by scrutinizing every detail. Once a reasonable

[39] "Education World Lesson Study: Practical Professional Development." Accessed August 10, 2016 at http://www.educationworld.com/a_admin/admin/admin382.shtml

[40] Doig and Groves. "Japanese Lesson Study: Teacher Professional Development through Communities of Inquiry." *Mathematics Teacher Education and Development*. Vol. 13.1. 2011, 77- 93.

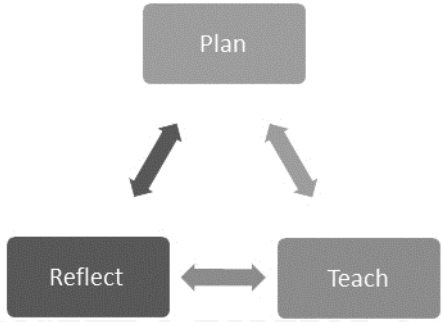


Figure 2: The cycle of Lesson Study

lesson is produced (now called the research lesson), it will be tested by one of the teachers in a real classroom, while other teachers will observe and take notes. Subsequently the teachers will come together again for the reflection stage to discuss the pros and cons of the lesson and improve the lesson plan accordingly. Following this, another teacher would then re-teach another class using the improved lesson plan, and the cycle will continue until a satisfactory lesson plan is achieved. Since every part of the process is research-based, all stages would be documented. The process is carried out with the presence of at least one knowledgeable other, someone who is an expert in curriculum and instruction.

The Conceptual Framework

Now that every step of the process in inculcating Islamic values has been explained, a diagram is designed to consolidate all the information. Figure 3 shows the visual framework that is developed according to the components and steps described above.

It was stated earlier that according to several Islamic scholars, the main aim of education in Islam is to produce a man of good moral values or character. This is achievable if there is synergy in efforts between home and school in each and every aspect of a child's life starting from a very early age. The innermost circle in Figure 3 is the main target of the research, i.e. inculcating Islamic values, which is made of three factors, that is *akhlaq*, *adab* and

Islamic virtue from following the *sunnah* of the prophet Muhammad (ﷺ).

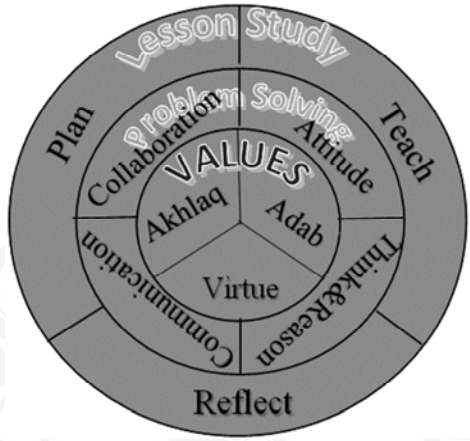


Figure 3. The framework showing problem solving in mathematics as an approach for inculcation of Islamic values and lesson study being the vehicle to train the teachers, to reach the target.

It has been recommended that values education be taught across the curriculum[41] and since mathematics is one of the core subjects at every school level, it would be one of the best subjects to be integrated with values education. It is undeniable that human beings from every culture and at any time have used mathematics[42], i.e. mathematics is an essential discipline because of its practical role to the individual and society. Consequently, the second ring around the target values circle represents problem solving as a process that will be employed for inculcating Islamic values. It can provide

[41] Bailey, *Teaching Values And Citizenship Across The Curriculum: Educating Children For The World*. (New York: Routledge, 2000); Gordan and Langoulant. *Teaching Values Across The Curriculum : A Resource For Middle And Secondary Teachers.* (Cottlesloe: Worldcat, 2004); M. Sahari, A.A. Mohd Sultan, M.T. Raffor, I. Sheikh Ahmad, A.M. Zainuddin, Z. Abdul Rahman, T.B. Tunku Ahmad, H. Rais, "Inculcation of Values Across the School Curriculum: Development and Validation of Teachers' Orientation Scale." *Intellectual Discourse*, Vol 7, No 2, 1999, 155-168.

[42] Bishop. *Mathematical Enculturation: A Cultural Perspective On Mathematics Education.* (Dordecht: Kluwer, 1998).

students with a context for learning mathematical knowledge, enhance transfer of skills to unfamiliar situations and is an aesthetic form in itself. A problem-solving approach can provide an avenue for students to construct their own ideas about mathematics and to take responsibility for their own learning. In order to ensure that values are inculcated through problem solving, the right task is crucial, because it can lead students' enhancement in both mathematics and moral values.

Four components have been identified as important for the success of the problem solving process that will in turn instill the desired values. The first component identified is applying logical reasoning and mathematical thinking, which is what students must do in solving problems in mathematics. During the process, students connect ideas and gain a deeper conceptual understanding using these elements of problem solving, questioning and debating about certain Islamic values that is embedded in the task. This will be different from the traditional way values are normally taught. The second component is communication, an important element for the reason of explaining strategies, processes or ideas so that the solution statement is evident from the details provided. Communication requires the use of appropriate mathematical language/ notation. Since language is a tool of thinking, communication is vital for reasoning and thinking and in this case students need to think to be able to ask questions, and not just accept anything at face value. The third component, collaboration, will encourage students to work together towards finding a solution. In addition, collaboration or cooperation itself is an important Islamic value. The final component, attitude, refers to students' mindset during the problem solving process, whether they strive hard or are laidback when solving a problem. These components form very important aspects of the process of teaching mathematics through problem solving.

Thinking and reasoning are powerful processes that lead students to do the right thing. Students should be exposed to moral thinking and reasoning and not be expected to blindly follow rules and orders to become a better person. As part of the process of problem solving in mathematics, students will be exposed to these and thus use them in making moral judgements. The following

verse[43] from the Quran clearly indicate Allah's disapproval at those who do not reason,

which means "Indeed, the worst of living creatures in the sight of Allah are the deaf and dumb who do not use reason".

Communication is another important component of problem solving. Teachers know what students are thinking through communication, whether in writing, through gestures or words. Teachers could gauge students' attitudes, understand students' thinking or misconception, help students make sense of their learning and even recognize and appreciate another perspective[44], all through communication. Having a developed communication skill is an asset in itself because it is considered as part of the 21st century skills most sought out by employers. In addition, communication during problem solving would lead students to better communicate with other people in their life. Of course the best person to emulate in terms of communication is the prophet, who has the best communication etiquette. Islam encourages communication with our own selves, with Allah (ﷻ), with the Quran, with fellow human beings, in fact with all of God's creation.[45]

In order to encourage communication and as mentioned above, students should be trained to work in teams where collaboration is essential. Meaningful cooperation and collaboration is a basis of Islamic brotherhood and harmony among Muslims with an aim to encourage what is good and discourage what is evil. In the case of problem solving, collaboration among peers leads to instructional scaffolding. Prophet Muhammad (ﷺ) was reported to have mentioned the following in a hadith:

[43] Yusuf Ali, *Tafsir Al-Qur'an*, Verse 8:22.

[44] MOE Canada. *A Guide to Effective Instruction in Mathematics. Vol. 2 Problem Solving and Communication.* (Ontario: MOE, 2012).

[45] Dr. Pasha (2008). "Islam is All About Communication." *IslamicSolutions.com*. Accessed 12th. August, 2016 at http:/www.islamicsolutions.com

> "Truly the faithful are to one another like components of a building – each part supports the other."[46]

Problem solving that divides students into groups of cooperative learners will encourage communication and hence brotherhood, teamwork, interpersonal skill, and even leadership skill.

People used to think of learning mathematics as solving routine problems in a solitary manner. Studies conducted in Malaysia show that cooperative learning in mathematics enhances students' achievement and problem solving skills. It was also found that cooperative learning inculcates values such as independence, love, cleanliness, hard-work and rational thinking[47] and also enhances scientific skills and promotes enquiry learning.[48] Attitude is identified as another important component. Students' attitude and beliefs about mathematics is largely dependent upon the way mathematics is presented to them. A traditional way of teaching and learning mathematics will make students believe that mathematics is a fixed body of knowledge where formulae is memorized and a lot of practice is needed to master it. The Singapore mathematics curriculum framework identifies attitude as one of the five components of problem solving, where the emphasis in the framework on affective issues includes appreciation, interest, confidence, and perseverance, in learning mathematics[49] is highlighted. Helpful beliefs and attitudes is identified by Kaye Stacey[50] as one of the skills and abilities in problem solving. Alan Schoenfeld,[51] on the other hand, identifies beliefs as a mathematical

[46] *Muslim and Bukhari.*

[47] Nor Azizah, "Penerapan Nilai Murni Dalam Biologi Melalui Pembelajatan Koperatif." Prosiding Seminar Kebangsaan Sains Matematik, Fakulti Pendidikan UKM, 1996.; Nor Azizah and Chong Poh Wan. "A Review of Cooperative Learning Research and its Implication for Teacher Education." Proceeding of International Conference of Teaching and Learning, 24-25 Nov, 2000. 1266-1289.

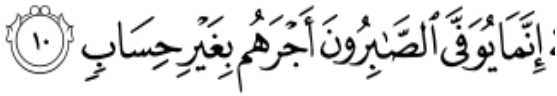
[48] Ong Eng Tek and Yeam Koon Peng. "The Teaching of Social Skills in Cooperative Learning." *Classroom Teacher* 5(2), 2000, 41-49.

[49] "Mathematics Framework". *Mathematics*. Accesses 21 August, 2016 http://lysigrey.wikispaces.com/Mathematics+Framework

[50] Kaye Stacey, "The Place of Problem Solving In Contemporary Mathematics Curriculum Documents." *Journal of Mathematical Behavior,* 24, 2005, 341 – 350.

[51] Alan Schoenfeld. *Mathematical Problem Solving*. (Orlando: Academic Press,

"world view" that determines how someone approaches a problem. Patience and perseverance is encouraged in problem solving in order to arrive at the solution and is also a character encouraged as mentioned in part of the Quranic verse (39:10),



> "… Only those who are patient shall receive their reward in full, without reckoning".

The outermost ring represents how the teachers will be practically learning the skill to teach mathematics through problem solving and at the same time integrate the teaching and learning of values the lesson study way. Since teaching mathematics via problem solving can be something new to the teachers, the lesson study will help them learn and understand the process of teaching it collaboratively with other teachers involved, together with the help of a knowledgeable other. Many countries around the world now are practicing lesson study as the Continuous Professional Development for their teachers, although the Japanese teachers are believed to have started it 130 years ago.[52]

> "In Japan, math educators have been thinking about how to develop problem solving for several decades. They studied George Polya's "How to Solve It", NCTM's "Agenda for Action", and other documents, and together, using a process called "lesson study", they began exploring what it would mean to make problem solving "the focus of school mathematics." Today, most elementary mathematics lessons in Japan are organized around the solving of one or a very few problems, using

1985).

[52] S. Shimizu, "Professional Development through Lesson Study: A Japanese Case." APEC International and Learning Mathematics through Lesson Study, Khon Kaen, 2006.

> an approach known as "teaching through problem solving."[53]

Each of the components in the process of lesson study have already been explained above. Planning, lesson implementation and reflection is researched and implemented collaboratively.

Conclusion

This article suggested an instructional and continuous professional development framework for better inculcation of Islamic values through the teaching of mathematics. The importance of emphasizing on the teaching of values in general and Islamic values in particular has been explained through the review of the current events and to attain the purpose of education in Islam. Many Islamic scholars were cited to call attention to this. Islamic studies, civic or moral studies, are the usual avenues for the inculcation of values. However, in this case mathematics has been chosen as the subject to integrate values in school children because it is the core subject in schools, where more than three hours are allotted for students to learn this subject. The nature of the subject that encompasses a wide spectrum of nature (it is often referred as the universal language of nature) and a variety of skills make it a suitable subject to incorporate values within the way it can be taught. In this case, problem solving has been chosen as the method to teaching mathematics. Taplin [54] in her article, describes problem solving as follows:

> "Problem solving is an important vehicle for educating students for life by promoting interest, developing common sense and the power to discriminate. In particular, it is an approach which encourages flexibility, the ability to respond to unexpected situations or situations that do not have an immediate solution and helps to develop perseverance in the face of

[53] McDougal and Takahashi, "Teaching Mathematics through Problem Solving." *Independent Teacher*, 2014. Accessed 21, August, 2016 http://www.nais.org/Magazines-Newsletters/ITMagazine/Pages/Teaching-Mathematics-Through-Problem-Solving.aspx

[54] Ibid, 37.

> failure. A problem-solving approach can provide a vehicle for students to construct their own ideas about mathematics and to take responsibility for their own learning. While these are all important mathematics skills, they are also important life skills and help to expose pupils to a values education that is essential to their holistic development."

Since many of our teachers are not adept at teaching mathematics via problem solving, lesson study has been identified as a vehicle for professional development to coach the teachers so that they are supported by other teachers in the lesson study team. Hopefully, the framework presented in this article is able to act as a guide in the implementation of the curriculum.

TRANSLITERATION TABLE

CONSONANTS

Ar=Arabic, Pr=Persian, OT=Ottoman Turkish, Ur=Urdu

	Ar	Pr	OT	UR		Ar	Pr	OT	UR		Ar	Pr	OT	UR
ء	’	’	’	’	ز	z	z	z	z	گ	–	g	g	g
ب	b	b	b	b	ڑ	–	–	–	ṛ	ل	l	l	l	l
پ	–	p	p	p	ژ	–	zh	j	zh	م	m	m	m	m
ت	t	t	t	t	س	s	s	s	s	ن	n	n	n	n
ٹ	–	–	–	ṭ	ش	sh	sh	ş	sh	ہ	h	h	h[1]	h[1]
ث	th	th	th	th	ص	ṣ	ṣ	ṣ	ṣ	و	w	v/u	v	v/u
ج	j	j	c	j	ض	ḍ	ẓ	ż	ż	ی	y	y	y	y
چ	–	ch	çh	ch	ط	ṭ	ṭ	ṭ	ṭ	ۃ	-ah			-a[2]
ح	ḥ	ḥ	ḥ	ḥ	ظ	ẓ	ẓ	ẓ	ẓ	ال	al[3]			
خ	kh	kh	kh	kh	ع	‘	‘	‘	‘					
د	d	d	d	d	غ	gh	gh	ğ	gh					
ڈ	–	–	–	d	ف	f	f	f	f					
ذ	dh	dh	dh	dh	ق	q	q	k	q					
ر	r	r	r	r	ك	k	k/g	k/ñ	k					

[1] – when not final
[2] – at in construct state
[3] – (article) al - or 1-

VOWELS

		Arabic and Persian	Urdu	Ottoman Turkish
Long	ا	ā	ā	ā
	آ	Ā	Ā	–
	و	ū	ū	ū
	ي	ī	ī	ī
Doubled	ي	iyy (final form ī)	iy (final form ī)	iyy (final form ī)
	و	uww (final form ū) uvv (for Persian)	uv	uvv
Diphthongs	و	au or aw	au	ev
	ى	ai or ay	ay	ey
Short	ـَ	a	a	a or e
	ـُ	u	u	u or ü o or ö
	ـِ	i	i	i

URDU ASPIRATED SOUNDS

For aspirated sounds not used in Arabic, Persian, and Turkish add h after the letter and underline both the letters e.g. جھ jh گھ gh

For Ottoman Turkish, modern Turkish orthography may be used.

AL-SHAJARAH

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