JPII 6 (2) (2017) 306-312

Jurnal Pendidikan IPA Indonesia

http://journal.unnes.ac.id/index.php/jpii

DEVELOPING CHARACTERS BASED ON LOCAL WISDOM OF BALI IN TEACHING PHYSICS IN SENIOR HIGH SCHOOL

I. W. Suastra[1]*, B. Jatmiko[2], N. P. Ristiati[3], L. P. B. Yasmini[1]

[1]Department of Physics Education, Faculty of Mathematics and Natural Sciences, Universitas Pendidikan Ganesha, Indonesia
[2]Department of Physics Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Surabaya, Indonesia
[3]Department of Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Pendidikan Ganesha, Indonesia

DOI: 10.15294/jpii.v6i2.10681

Accepted: July 12th, 2017. Approved: September 30th, 2017. Published: October 17th, 2017.

ABSTRACT

Human resources with good characters are badly needed in a national development. Hence, developing characters, especially the development of characters based on local wisdom is highly needed. This study was part of a study of local culture-based Physics model of teaching at senior high school, i.e., the need analysis and conceptual model prototype stage. The subjects were 20 physics teachers who had at least 10 years of teaching physics experience at public and private senior high schools in Singaraja, Bali. The study used questionnaire, observation guide, and interview as the instruments for collecting the data. The data were analyzed by a descriptive-qualitative analysis. The result showed that (1) Nine Balinese local wisdom-based characters could be developed in physics teaching; (2) The method that is appropriate for the local wisdom-based development of characters is inquiry from various perspectives, discussion, and demonstration; (3) The core procedure of teaching that can develop the students' character are exploration, focusing attention, inquiry from various perspectives (scientific, sociocultural, historical), elaboration, and confirmation.

Keywords: physics teaching; local wisdom-based character; senior high school

INTRODUCTION

Character building is very important and urgent (Samani & Hariyanto, 2012). We have to start from building characters, ethics, and good behaviors to develop the nation of Indonesia. This nation actually has a superior and noble civilization. Howerer, this idea has received less attention in educational process, as evidenced from the behaviors such as blaspheming using vulgar expressions both in a demonstration or a social media, broadcasting false news (hoax), bullying, engaging in gang fightings, doing dishonest acts (cheating, corruption, plagiarism), intolerance toward differences and laziness which are done by some people, children and the adults. This phenomenon could be taken to represent Indonesian characters. These phenomena indicate a failure in developing value education. The decadence of the students' morality which cause the bad characters is an indicator of the teachers' failure in integrating knowledge about values with positive actions (Lickona, 1999; Lopes et al., 2013; Abu et al., 2015; Aisah, 2014).

This statement is supported by Suastra (2010) who state that contemporary Science (Physics) teaching accommodates less local wisdom values that are full with virtues. Baker et al. (1995) states that of school Science teaching does not pay attention to the children's culture/ local wisdoms, then, as the consequence, the students will "refuse" or only accept part of science

***Address Correspondence:**
E-mail: i_wayansuastra@yahoo.com

concepts that they are learning. Local wisdom is defined as the truth that has become a tradition. Local genius which is also often called local wisdom can be understood as an effort of human beings who through their cognitions to act and behave toward an object, or an event that occurs in a particular space (Ridwan, 2007).

Wisdom, which etimologically means one's ability in using one's mind to position oneself in relation to an event, object or a situation, while the word local shows the space of interaction the event or situation takes place. Thus, local wisdom is substantially a norm that is binding in a community whose truth is believed by the community and whose existence is used as the reference in daily activities and behaviors.Thus, local wisdom is an entity that strongly determines the dignity of humans in their community (Geertz, 1992).

One form of local wisdom in the educational context (the student-teacher context) is expressed in the Brahmacari level, i.e., *aguron-guron* or *Asewaka Guru in Acarya* (the teachers who educate their students) by giving spiritual guidances, guidances about virtues, charity, dedication, or collectively called dharma. In addition to filling in the minds of the students with various knowledge (*Castrantara*), the teacher gives the first priority to character education (Punyatmadja, 1994).

The classroom teaching can develop the students' characters in order to make the students to become the better ones (Aisah, 2014; Khusniati, 2012; 2014; Dianti, 2014). Based on the issue above, this article will discuss the following points: (1) the aspects of the local wisdom-based character which can be developed in Physics teaching; (2) the methods that are relevant in Physics teaching to develop the students' characters based on local wisdom; and (3) the procedure of Physics teaching that can develop the students' characters based on local wisdom at senior high schools.

METHODS

This study was a two-year research and development. The first year part of the research was a study which analyzed needs in developing a teaching model and a conceptual model prototype design. The study involved 30 subjects who were senior high school Physics teachers who had taught Physics at least for ten years at senior high schools. The data collection instruments used were questionnaire, observation guide, and interview which had met the validity and reliability requirements. The data were analyzed by using a descriptive-qualitative analysis.

The stage of the analysis of Balinese local wisdoms that were needed as the basis for developing the students' character was preceded by a review of relevant sources, the description of the aspects and indicators. Then the results of this review were incorporated into a quetionnaire which was then given to the Physics teachers to be evaluated. The stage of teaching concepts review was done by reviewing relevant literature and focus group discussion (FGD) with senior high school Physics teachers who were selected as the sample of the study. The results were validated by three instructional experts. All of the data were analyzed descriptive-quantitively.

RESULTS AND DISCUSSION

The result of the analysis of the needs of local wisdom-based characters which can be developed in senior high school Physics teaching covers: religious, telling the truths and be honest (*satyam*), tolerant (*tat twam asi*), responsible (*sesana/swadharma*), curious, shy, having a preference for working hard and generous, showing a concern and friendliness toward nature, and having the habit of doing self reflection (*mulat sarira*) and the indicators are as shown in Table 1.

Table 1. Results of Balinese Local Wisdom-Based National Characters (n=20)

Character Aspect & Indicator	Mean
Religious	
(Obedient attitude and behavior in practicing the teachings of one's religion)	
Admires the greatness of God for the physical phenomena (natural phenomena) that are astonishing and secret.	4.75
Feels the greatness of God in relation to variations in this world.	4.67
Tells The Truths and Be Honest	
(The behavior that unites one's thoughts, expressions and acts)	
Willing to express something which one believes to be truer.Honest in doing Physics assignments or tests.	4.83
Open in expressing problems in learning both to one's friends and the teacher.	4.75

Character Aspect & Indicator	Mean
Tolerant (*TATTWAMASI, MENYAMA BRAYA)*	
(Friendly attitude without discriminating against religions, ethnics, socioeconomic status, and genders)	
Does not dicriminate against ethnics, races, religions in doing school assignments.	4.75
Willing to accept different opinions from friends when they are believed to be true.	4,67
Responsible (*SESANA* or *SWADHARMA*)	
(Feels and shows a responsible attitude toward tasks and responsibilities)	
Uses time effectively for completing tasks in the classroom and outside of the classroom.	4.83
Does physics assignments carefully and neatly and submits them on time.	4.67
Always tries to find information about physics learning materials from various sources.	4.83
Curious	
(Asks , discusses and investigates/finds out about various events in nature)	
Always reads books on science, technology and culture	4.58
Always wants to try to do an investigation in ralation to natural phenomena that are related to Physics.	4.42
Always wants to find out other answers to physics problems being solved	4.08
Jengah	
(Shows a shame attitude and behavior when one fails or cannot do tasks or when one cannot meet one's responsibilities)	
Ashamed if unable to complete the tasks assigned by the teacher	4.75
Ashamed when caught in the act of cheating in a physics test/examination	4.75
Ashamed when one cannot contributte in every learning activity	4.42
Likes to Work Hard and is Generous	
(Does a job until it produces a satisfactory result and gives benefits to oneself and others)	
Diligent in taking up a lesson to get a satisfactory result.	4.75
Likes to help or help friends who need help	4.00
Shows Concern and is Friendly with Nature	
(An attitude and act which shows that one always tries to keep and preserve the natural environment)	
Plans and does various activities to prevent damages to the environment	4.58
Able to make a good decision in prventing and overcoming damages to the environment	4.58
Reflects Oneself *(MULAT SARIRA)*	
(An attitude and act that shows that one always reflects on the thoughts, expressions, and acts that one has thought, made, and done that one intends to improve in the future)	
Always reflects on what one has done and corrects what one has done wrongly.	4.50
Does not like to find faults with others when having a difficulty or failure.	4.00

The criteria of assessment used to assess the national characters in this study had the score range of 0 – 5 from appropriate/suitable (4,00) to very appropriate/very suitable (5,00). Table 1 shows that there are 9 aspects of good/positive character from Balinese local wisdom/local culture that can be developed in Physics teaching at school, i.e., religious, telling the truths and being honest,tolerant, responsible, curious, jengah, and self-reflecting (*mulat sarira*).

The Balinese local wisdom based characters were sought in the attitudes and behaviors of the people in their daily life which are inspired by the Hindu holy books such as *Begawad gita, Regveda, Atharwa veda, Silakramaning Agurongguron*, and *Tri Kaya Parisudha*. Other sources obtained from the philosophy that developed in Bali Community like *Tri Hita Karana*, which means a harmony between human beings and God (religious), human beings and their fellow human beings, and human beings and the universe. Suja (2000) states that the relation between human beings (*Prajah*) and God (*Prajapati*) is based on the concept of Kawula Gusti, which means God is Gusti (the ruler), while human beings are God's servants with their sincere bhakti. The relation between human beings and their fellow human beings is based on the concept of *Tat Twam Asi*, which teaches that all humans are the same. We all (without being restricted by whatever label) are friends *va suduiva kutum bhakam*. As humans, we have to love each others, helps each other, and treat others just like what you want to be treated. The harmony of relation with natu-

re is likened to "*kadi manik ring cecupu*". Human beings are compared to *manik* (fetus) while the universe to *cecepu* (womb). This concept contains the meaning that human beings live surrounded by nature, and from nature they obtain food or things that they need to be able to live. In this position, it appears that humans live freely in their being bound to nature. Human beings are free to take whatever from the nature, but they are responsible to keep the presevation of nature. If nature damages, then human beings will certainly perish. Based on this consideration,it is fit and proper that human beings have to respect nature.

The holy book, Veda, states "The earth is our mother, we are her children." *(Atharwaveda, XII)*, and "The earth is our mother, and the sky our father" *(Yayurveda, XXV)*. All of these local wisdom-based characters in principle are inspired by the Balinese persepctive on the universe as stated by Suastra (2017) that the spirituality is found in the cosmic elements (bhuwana agung/ macrocosmos) and human as the microcosmic element (buana alit) and humans are responsible to keep the harmony in the relation between humans and God, humans and their fellow humans and humans and nature where they live. Jengah (the feeling of shame when one does not succeedin doing something) is an everyday word doing is very c ommonny uttered by older family members (mostly parents) to the younger (especially children) in the purpose of giving motivation to do something again with harder efforts to succeed. It should be done soon seriously and with the feeling of responsibility in order not to be ashamed for oneself, for the family, and the community (village).

Curiosity comes from the concept in the song as the advice from the elders (father, mother, grandmother, grandfather) to children and grandchildren., de ngaden awak bisa depang anake ngadanin, geginane buka nyampat, ilang luhu buke katah, wiadin ririh enu liu pelajahan.This is an advice for not to become arrogant when you can do something, like when you are sweeping, the garbage diappears, but dust will come again. No matter how clever you are, there are still manyother things that you need to learn since knowledge has no limit. Thus, the message here is that you should not be easily satisfied with the knowledge that you have. Thus the message here is: you have to learn all your life because there is always something new for you to learn (i.e. long life education).

Based on the result of data analysis, it was found that the methods that can be developed for Physics are inquiry/investigation method (mean=4.75), discussion/question and answer (mean=4.63), and demonstration (mean=4.38). The most appropriate method to be developed is investigation/ inquiry.Inquiry method is the most appropriate for developing science process, critical thinking, and scientific atttitudes or scientific charatter (Hairida, 2016; Harlen, 1992; Neuby, 2010; Sumaji, 1998; Suastra et al., 2011; Neka et al., 2015; Trowbridge & Bybee, 1990; Wenning, 2005; Priyantini et al., 2015; Alpusari & Putra, 2015; Dwianto et al.,2017). Thus, Physics teaching does not only focus on the conceptual, process, and application dimensions, but it has developed the extention of the science education dimensions, i.e., to positive attitude, creativity, and the nature of science itself. (Enger & Yager, 2000); that is physics as product (Van Manen, 2016), physics as process (Van Joolingen et al., 2005), and physics as values (Ismail et al., 2013; Loke & Chow, 2007).

The stages in Physics teaching for developing local culture-based characters are: (a) exploration; (b) focusing; (c) inquiry/investigationfrom vrious perspectives (scientific, sociocultral, historical); (d) elaboration; and (e) confirmation and reflection. The stages of physics teaching can be seen in Figure 1.

At the beginning of the lesson the students pray together according to their respective religions and beliefs. This is meant to improve the students' awareness of the greatness of God and to thank God who has created this world with various phenomena that hide misteries (spiritual character). In the exploration stage the students are invited to make observation, displaying a video or pictures of strange/ashtonishing natural phenomena (discrepant events), that will develop curiousity in them about the phenomena which will lead to some questions such as what, why, and how it can occurs. At this stage, there will develop jengah (ashamed when one cannot do or explain something), responsibility, the unfailing habit of telling the truths and being honest and concern about the natural environment.

EXPLORATION

Students are asked to express initial ideas and beliefs about the topics to be taught.

Teacher does not say that the students' ideas are true or false.

⇩

INITIAL ACTIVITIES

Teacher greets students and then leads a common prayer according to each's respective religion, and belief before the lesson starts.

Teacher greets students and then leads a common prayer according to each's respective religion, and belief before the lesson starts.

⇩

FOCUSING

Teacher facilitates and focuses on the problem being investigated.

Students prepare facilities to investigate the poblems and are being guided by the Stduent Working Sheets

⇩

INVESTIGATION /INQUIRY

Students in heterogenous groups 3-4 students each group) do the inquiry in the laboratory or in a room from various perspectivces (scientific, socio-cultural, and historical)

Teachers facilitate and assess student performance in investigation activities

⇩

ELABORATION

Students make a report of the result of their inquiries

Students present the results of the inquires in front of the classroom and other students criticize or give comments politely

Teacher asks questioins of open ended type to check the students' basic competence and to monitor the character of the students during the lesson.

⇩

CONFIRMATION

Teacher gives a confirmation about the problem aroused which cannot be solved by the students n the discussion.Teacherr gives a reinforcement or appreciation to the students who have contributed in the discussion

⇩

CLOSING

Teacher invites students to sum up the content of the lesson

Teacher invites students to reflect on themselves (*mulat sarira*) about the acts that have been done both to themselves and to others

Teacher gives enrichment tasks

End with a common prayer and greetings

Figure 1. Flow of Activities in the Physics Teaching and Learning Process

The elaboration stage enables the students to relate physics lessons that they learned with the real world. This enables them to develp their reasoning. Both inductive and deductive reasoning. Since this stage is done in a heterogeneous groups, then it enables the occurrence of interactions among themselve who are different in terms of socioeconomic status, race, ethnics, and religion. The nurturing effect of this activity in this phase is the development of religiousness, telling the truths and honesty *(satyam)*, tolerance *(tat twam asi)*, responsibility *(sesana/swadharma)*, curiousity, *jengah*, having a preference for working hard and generous, showing a concern and friendliness toward nature, At the confirmation phase the teacher has the role of giving an emphasis on scientific (correct) concepts and principles of physics and introducing and inviting the students to internalize good local character value.

Finally, at the final stage the teacher invites the students to reflect about their learning, thoughts, expressions, and acts that they have thought, said and done *(Trikaya Parisuda)*. If they are wrong the students have to apologize, and if there is something that is lacking then they have to correct it in order in the future things will be better. Therefore, the role of a teacher is very important in the teaching and learning process, i.e., he or she has the role of a model, an active, creative and wise cultural broker, so that the students will obtain a learning experience that contains good virtues and sense of responsibility toward themselves, other people and the natural environment and socioculture (Aikenhead, 2000; Elmubarok, 2008; Suastra, 2005).

CONCLUSION

There are nine Balinese local wisdom-based characters which can be developed in Physics teaching at senior high school. These characters were sought from various sources as references, advice given by parents to children or the generation after them, and the results of discussions with community leaders and experienced teachers (at least 10 years experience). Conceptually, the core stage of Physics teaching at senior high school to develop characters based on Balinese local wisdom consisted of exploration, focusing, inquiry/investigation, elaboration, and confirmation.

Teacher is very important in the teaching and learning process, i.e. as a model and an active guide, who is active and creative in developing physics knowledge, science process skill, and good students' characters, there is a need to do a research with wider scope with a larger number of respondents and a wider area and the empirical testing of the teaching model at school. There is a need to do a further research to know the effect of the model that has been developed especially in developing the local wisdom based-characters.

REFERENCES

Abu, L., Mockhtar,M, Hassan, Z, Suhan, S.Z.D. (2015). How to Develop Character Education of Madrassa Students in Indonesia. *Journal of Education and Learning*. *9*(1),79-86.

Aikenhead, G. S. (2000). Renegotiating the Culture of School Science. *Improving Science Education: The Contribution of Research*, 245-264.

Abu, L., Mockhtar,M, Hassan, Z, Suhan, S.Z.D. (2015). How to Develop Character Education of Madrassa Students in Indonesia. *Journal of Education and Learning*. *9*(1), 79-86.

Aisah, A. R. (2014). The Implementation of Character Education Through Contextual Teaching and Learning at Personality Development Unit in The Sriwijaya University Palembang. *International Journal of Education and Reserach*, *2*(10), 203-214.

Alpusari, M & Putra, R. A. (2015). The Aplication of Cooperative Learning Think Pair Share (TPS) Model to Increase Process Science Skill in Class IV Elementary School Number 81 Pekanbaru City. *International Jornal of Science and Research (IJSR)*, *4*(4), 2805-2808.

Baker, D & Taylor, P.C.S (1995). The Effect of Culture on the Learning of Science in non-WesternCountries: The Results of a Integrated Research Review. *International Journal Science Education*, *17*, 695-704.

Borg, W.R & Gall,M.D (1989). *Educational Research*. New York: Longman.

Dianti,P (2014). Integrasi Pendidikan Karakter dalam Pembelajaran Pendidikan Kewarganegaraan untuk Mengembangkan Karakter Siswa. *Jurnal Pendidikan Ilmu Sosial (JPIS)*, *23*(1), 57-64.

Dwianto,A,I.Wilujeng,K.Prasetyo,I.G.P.Suryadarma. (2017). Development of Science Domain Based Learning Media Tool which is Integrated with Local Wisdom to Improve Science Process Skill and Scientific Attitude. *Jurnal Pendidikan IPA Indonesia (JPII) 6*(1), 23-31.

Elmubarok, Z. (2008). *Membumikan Pendidikan Nilai*. Bandung: Penerbit Alpabeta.

Enger, S. R., & Yager, R. E. (2000). *Assesing Student Understanding in Science: A Standard-Based K-12 handbook*. California: Corwin Press, Inc.

Geertz, C. (1992) *Kebudayaan dan Agama*. Yogyakarta: Kanisius Press.

Gardner, H. (2007).*Five Minds for The Future* (Alih Bahasa Tome Beka). Gramedia Pustaka Utama.

Hairida, H. (2016). The Effectiveness Using Inquiry Based Natural Science Module With Authentic Assessment to Improve The Critical Thinking and Inquiry Skills of Junior High School Students. *Jurnal Pendidikan IPA Indonesia (JPII)*, *5*(2), 209-215.

Harlen, W. (1992). *The Teaching of Science*. London: David Fulton Publishers.

Irzik, G. (2001). Universalism, Multiculturalism, and Science Education. *Science Education, 85*(1), 71-73.

Ismail, K. H., Anwar, K., Energi, S., Selamat, J. H., & Energi, A. (2013). Personality Profile of Students' Council: A Comparative Study Between Genders. *Asian Social Science, 9*(4), 77-88.

Khusniati, M. 2012. Pendidikan Karakter Melalui Pendidikan IPA. *Jurnal Pendidikan IPA Indonesia (JPII) 1*(2), 204-210.

Khusniati, M. 2014. Model Pembelajaran Sains Berbasis Kearifan Lokal dalam Menumbuhkan Karakter Konservasi. *Indonesian Journal of Conservation*. *3*(1), 67-74.

Lickona (1999). Character Education: Seven Crusial Issue. *Action in Teacher Education*. *20*(4), 77-84.

Loke, A. J. Y., & Chow, F. L. (2007). Learning Partnership—The Experience of Peer Tutoring among Nursing Students: A Qualitative Study. *Energi Journal of Nursing Studies, 44*(2), 237-244.

Lopes,J.Oliveira,C.Reed,L & Gable,R.A.(2013). Character Education in Portugal. *Chilhood Education*. *89*(5), 286-289.

Neuby,B. (2010). Inquiry Teaching in the College Classroom. *The Journal of Effective Teaching*. *10*(1), 4-21.

Neka, I, K. A. A. I. N. Marhaeni, I.W.Suastra. (2015). Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbasis Lingkungan Terhadap Keterampilan Berpikir Kreatif dan Penguasaan Konsep IPA Kelas V SD Gugus VIII Kecamatan Abang. *e_Journal Program Pascasarjana Universi-*

tas Pendidikan Ganesha. *5*, 1-11.

Priyantini, N. P. T. , Sadia, I. W, Suastra, I. W. (2015). Pengembangan Perangkat Pembelajaran Fisika SMA Bermuatan Karakter dengan setting Model Sains Teknologi Masyarakat dan Lingkungan untuk Meningkatkan Karakter dan Keterampilan Berpikir Kreatif Siswa. *Jurnal Pendidikan IPA, 5(1)*, 1-10.

Puniatmadja, I. B. O. (1994). *Çilakrama*. Denpasar: Upada Sastra.

Ridwan, N. A (2007). Landasan Keilmuan Kearifan Lokal, *IBDA, 5*(1)*,* 27-38.

Samani, M & Hariyanto. (2012). *Konsep dan Model Pendidikan Karakter*. Bandung: Pt. Remaja Rosdakarya.

Suastra, I. W. (2005). Merekonstruksi Sains Asli (*Indigenous Science*) dalam Rangka Mengembangkan Pendidikan Sains Berbasis Budaya Lokal di Sekolah. *Jurnal Pendidikan dan Pengajaran IKIP Negeri Singaraja, 3*(1), 377-396.

Suastra, I. W. (2010). Model Pembelajaran Sains Berbasis Budaya Lokal Untuk Mengembangkan Potensi Dasar Sains dan Nilai Kearifan Lokal di SMP. *Jurnal Pendidikan dan Pengajaran, 43*(1), 76-80.

Suastra, I. W., Tika, K., & Kariasa, N. (2011). Efektivitas Model Pembelajaran Sains Berbasis Budaya Lokal untuk Mengembangkan Kompetensi Dasar Sains dan Nilai Kearifan Lokal di SMP. *JPPP Lemlit*, *5*(3), 23-30.

Suastra, I. W. (2017). Balinese Local Wisdoms and their Implications in Science Education at School. *International Research Journal of Management, IT & Social Sciences (IRJMIS), 4*(2), 42-45.

Suja, I. W. (2000). *Titik Temu IPTEK dan Agama Hindu*. Surabaya: Pustaka Manik Geni.

Sumaji. (1998). *Pendidikan Sains yang Humanis*. Yogyakarta: Penerbit Kanisius.

Trawbridge, L & Rodger W Bybee. (1990). *Becoming a Secondary School Science Teacher*. London: Merril Publishing Company.

Van Joolingen, W. R., de Jong, T., Lazonder, A. W., Savelsbergh, E. R., & Manlove, S. (2005). Co-Lab: Research and Development of An Online Learning Environment for Collaborative Scientific Discovery Learning. *Computers in Human Behavior, 21*(4), 671-688.

Van Manen, M. (2016). *Researching Lived Experience: Human Science for An Action Sensitive Pedagogy*: Routledge.

Wenning, C. J. (2005). Level of Inquiry: Hirarchies of Pedagogical Practice and Inquiry Processes. *Journal of Physic Teacher Education Online*, *2*(3), 3-11.

Zamroni. (2000). *Paradigma Pendidikan Masa Depan*. Yogyakarta: Bigraf Publishing.