How to Integrate Character Education in Science Learning?

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Abstract: Character education plays an important role in our lives. The Government of Indonesia is promoting the strengthening of character education in all aspects, including in education. Each teacher is expected to integrate character education in every subject, including science subjects. However, the findings show that science teachers have difficulty in integrating these two things. The purpose of this paper is to express the pattern of character education integration in science learning. The research method used is the development research by using ADDIE model training design (Analysis, Design, Development, Implementation and Evaluation). Based on the results of the application of the ADDIE model in the field, the results show (1) the science teacher's understanding of the basic concepts of character education (2) the training materials required by science teachers and (3) pattern of character education in science learning. The study concludes that the integration of character education in science learning is practiced in the context of relevant learning, planned in instructional design and assessed through appropriate assessment instruments. The results of this study are expected to be applied in science learning in the classrooms.

1 INTRODUCTION

There is a mutual agreement that every school should be responsible and contribute to moral development and character formation of its students (Nucci et al, 2014). Lickona et al (2002) offers 11 principles of applying character education in schools. One is the principle of character education that must be integrated into the academic curriculum, including learning activities in the classroom and all interactions. Teachers as an important component that determines the success of the learning process in the classroom should be able to integrate character education on each subject. The development of teacher professionalism becomes a necessity because the teacher is one of the determinants of character education success in school (Berkowitz and Me'inda, 2003).

One pattern of professional development of teachers is through training (Villegas, 2003; Kennedy, 2005). The importance of character education training for teachers has been suggested by Berkowitz (1999). He unravels six barriers to character education training, one of which is the limited perception of time to provide character education when becoming a teacher candidate. Lickona et al (1993) mention that teachers almost never receive good character education training while being a student or when already a teacher. On the other hand, character education delivered by a trained teacher is more effective than external experts (Berkowitz, Bier, and Schaeffer, 2003). As a result to this, the training of character education for teachers in schools becomes important.

There is a pattern shifting the type of teacher training from traditional patterns to modern patterns (Avalos, 2011). Little (1993) suggests four models of teacher development, i.e., teacher collaboration and other networks, subject matter associations, collaboration targeted at school reform, and special institutes and centers. This study aims to describe the process of training science teachers in integrating character education with science learning conducted by a team of university lecturers and Science teacher association.

2 METHODS

This research is categorized as developmental research type 2, namely the application of a model (Richey and Clein, 2005). The selected model is the

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ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model adapted from Aldoobie (2015).

Data and information were obtained through the following research steps (1) analyzing and discussing the problem. Based on the request of the teacher association, the issues are the application of character education in science learning (2) conducting FGDs among researchers and MGMP organizers (4) analyzing participants' needs through initial competency tests and in-depth interviews (5) designing objectives and materials training (6) conducting training and (7) evaluating training.

The subjects of this study were teachers who were members of science teacher association in Cirebon. There were 18 teachers with different background: physics, chemistry and biology teachers.

3 RESULTS AND DISCUSSION

3.1 The Profile of Science Teacher Knowledge on Basic Concepts of Character Education

The initial profile of the trainees is an important part of the Analysis phase of the ADDIE model to determine the next step. The initial data on teacher's understanding of the concept and application of character education in science learning is obtained through the comprehension test instrument which is done through Authentic Assessment Based on Teaching and Learning Trajectory (AABTLT) technique. AABTLT is an evaluation technique designed to see how effective the learning process is. AABTLT was prepared by the researcher by considering five basic frameworks of authentic assessment of Gulikers, Bastiaens, and Kirschner, (2004).

Before giving the materials, the instructor first arranged the order of the teaching design (teaching trajectory) along with the competence that must be possessed by the participants. During the lesson, the instructor provided questions to measure participants' understanding. The level of participants 'understanding was seen from the authentic answers given by the participants in the form of the participants' learning sequence (learning trajectory). Learning trajectory illustrates the development of participants' thinking in conceptual understanding (Ebby and Petit, 2017)

The instrument of AABTLT includes the basic concepts of character education that include the reasons for the importance of character education, definitions, functions and objectives of character education, the pillars of character education, the characteristics and role of teachers in character education.

The results of data analysis show that the average value of science teachers' understanding of the concept of character education was 64.22. This average indicates that the science teacher's understanding of the concept of character education was quite good. Figure 1 shows scores for each teacher.

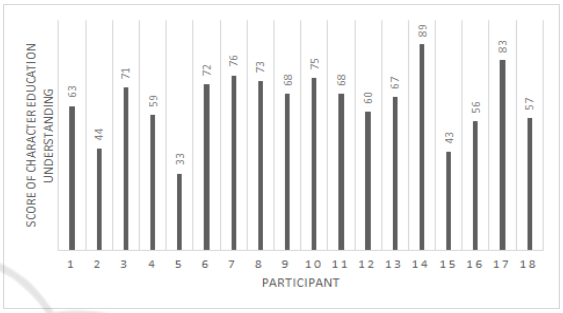

Figure 1: Science Teacher Understanding Profile of Character Education Concepts.

Meanwhile, based on the analysis of lesson plans made by teachers, the researchers concluded that teachers have not been able to create a science-learning design that integrates with character education. This finding is an important part of the process of Training Need Analysis (TNA) as well as the basis for the need for training (Salas and Cannon, 2001). Based on in-depth interviews on some teachers, it is found that they still had difficulty in creating lesson plans that implement character education in science learning. There are some obstacles, such as seeking the context of learning, especially in the preliminary phase, associating the values of characters in science learning and making the assessment instrument.

3.2 Training Design and Material

Good and effective training design is a training that shows flexibility, variety, accessibility, creativity, and cost effectiveness (Hansen, 2006). An important part in designing training design is the needs assessment analysis (Roberson, Kulik, and Pepper, 2003). Once the training needs are identified, the next step is to determine the training materials that can facilitate the training program participants in achieving the expected goals or competencies (Personal, 2014).

Based on the findings and training needs analysis, the competencies that science teachers must possess in integrating character education in learning include: (1) finding the right context to lead learners to the discovery of the desired character (2) creating the learning design (3) creating assessment instruments and (4) teaching practice. These four materials will be used as training materials in science teacher training.

3.3 Training Implementation

Once the training needs through TNA were identified and the training objectives along with the training materials were formulated, the next step was the implementation of the training. At this stage, the accuracy of the methods used by the instructor greatly determined the effectiveness of the training. The method chosen was the method of giving examples.

The method of giving a real sample in training is important (Roelle et al, 2017; Dyer et al., 2015; Renkl, 2014; Gulwani, 2014). The method was used starting from finding the right learning context, the preparation of the lesson plan, the implementation of learning to developing the assessment instruments.

The topic of science raised by researchers is the material of atoms. The selection of this material considers trainees who have different backgrounds. This material is quite common and very useful for all science teachers – physics, chemistry and biology.

Training materials on learning context were done by expert skeleton concept maps from Novak (2010) or brainstorming from Wilson (2013). The context of learning in essence needed to be determined so that a relationship or linkage between the concepts of science, the desired character and the examples of phenomena in everyday life can be easily identified. These three components are interrelated and cannot be separated. Teachers can find the context of learning from anywhere, depending on the idea. Figure 2 below illustrates an example of finding a learning context on atomic matter.

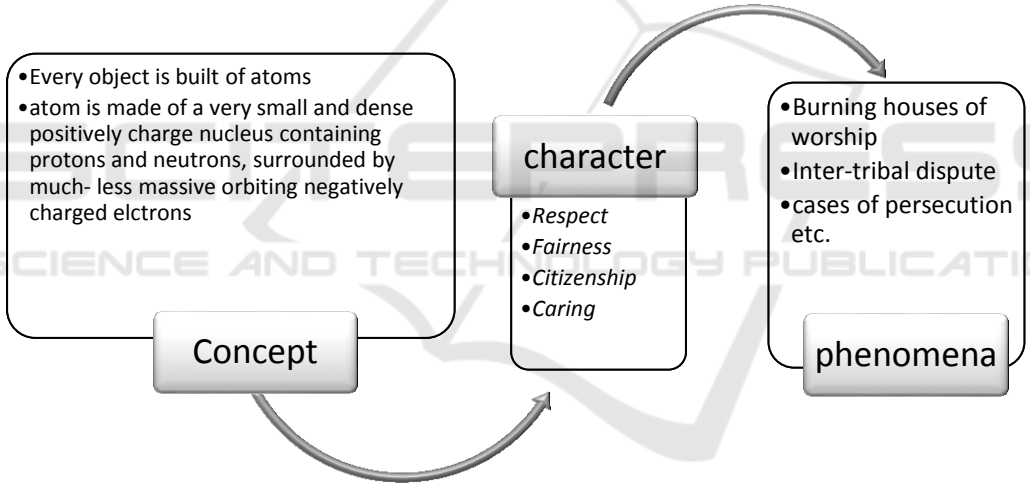

Figure 2. Ways to find learning context.

Based on figure 2, when the teacher wants to get the right context to teach the atomic concept integrated with science learning, the teacher can start from the concept of science to be taught, such as atomic material: proton and electron. According to the theory of modern atoms, every object is made up of atoms. The atom consists of an atomic nucleus containing a positively charged proton and neutron that is neutral (uncharged) and surrounded by negatively charged electrons (Knigt et al., 2007). For selected characters such as respect, justice, citizenship and caring, the teacher can take an elaborated concept and interpreted according to the appropriate character.

In the concept of atoms, every object including humans is composed of a kind of "creature" whose names are protons and electrons. It means that every human being, whoever it is, from whatever tribe it comes from, whatever its skin color, has the same basic elements of protons and electrons. Therefore there is no reason for each other to insult, condescend, or abuse. Precisely the differences that exist in every human being require them to know each other, to love, to respect, and to care. This is a character that can be grown through atomic theory. Furthermore,

the teacher will be easy to find the context of events in daily life that contradict the existing values such as cases of bullying, clashes between tribes, murder cases etc.

Once the teacher can create a learning context, the teacher will be easy to design the lesson. An example of a brief learning design of the concept of atoms is given in Table 1. The design of this lesson is purposely made simple to show the location of atomic learning integration (the concept of science) with character education.

Table 1: The Design of Learning Atomic Materials integrated with Character Education.

Steps	Activities
Opening	• Teacher explains learning objectives (as per curriculum) • Teachers recount recent events known to students, such as crimes that are being reported on television such as brawls between villages, between tribes, murders and so on. (learning context) • Teacher asks questions about the cause of the phenomenon (connect with the character to be built) • Teacher directs students to learning
Main Activities	• Teachers discuss the concept of atoms according to the basic competencies in the curriculum • Teachers associate the concept of atoms (the basic charge of every object: protons and electrons) with the phenomena displayed in the introductory activity and the need for students to have characters such as: respect, justice, citizenship and caring for others • Teachers can explore other concepts that are considered relevant
Closing	• The teacher briefly summarizes the atomic theory • Teacher gives "new meaning" to atomic theory which has been learned with character education • Teacher asks students to reflect on the learning that has been done

After successfully designing the lesson and being able to implement it, the teacher is also expected to make the assessment instrument. Examples of questions that teachers can give to their students about the context of atomic learning and character education can be questions like this: Once you understand that every object including humans is composed of the same basic elements of protons and electrons, how will your responses and attitudes to the student's brawl phenomenon what happened in our city? What effort can you make to prevent similar events in the future? The above examples can be inserted to the test instrument. Just like the concept of assessment in general, the assessment of learning must be thorough both cognitive, affective and psychomotor.

After the training participants were able to develop lesson plans and assessment instruments, the next step was to provide examples of microteaching learning practices followed up by coaching in teaching practice in each school.

3.4 Feedback

After the training is completed, there was awareness from science teachers that teaching character education to students is not the responsibility of religious teachers alone, but the responsibility of all teachers. Moral values and norms are an inevitable part of teaching from the concept of holistic learning and greatly affect the well-being of students as a whole, including academic success (Arthur, 2011). Through training, teachers recognize that they must be effective moral educators, who bring great lessons with pedagogical techniques that maximize students' interest, involvement, and learning (Lapsley and Woodbury, 2016).

As a result, through the development of this training design, there is an understanding that character educators should be able to repackage the information in an effective way so that it is easy to be delivered in teacher training and easy when applied into an educational policy (Walker, Roberts, and Kristjánsson, 2015). The effort can be made through the discovery of the relevant learning context

4 CONCLUSIONS

The main problem faced by science teachers related to character education is the pattern of integration. Through the application of the ADDIE model training design initiated by science teacher association with the university's lecturers team, it was concluded that the pattern of integration of character education and science subjects lies in the context of learning. By using direct examples of brainstorming and expert skeleton concept maps, relevant learning contexts can be found and can be integrated from learning design, learning implementation and learning evaluation.

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