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Exploring school culture experienced by science teacher in promoting scientific literacy in Central Java

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Abstract. This study aimed to describe school cultures experienced by science teachers from three districts in Central Java, such as Kudus, Magelang and Brebes, from which some junior high schools are being promoted to be school models of scientific literacy, to explore symbolic nature of science teaching quality, and to identify possible barriers for its promotion. School culture was defined as science teacher's perceptions of shared beliefs, values, and moral of the extend to which teachers experienced three constructs like professional collaborations, collegial communications, and self-determinations during their service to schools. Self-assessment with 17 items, from the 2015-2016 Georgia Leadership Institute for School Improvement Inc., was used with some modifications. 50 science teachers from these Districts completed the questionnaire. Observation was implemented to describe physical school environments. Open interviews were conducted to school principals, science teachers and students. Data analysis was focussed on the extend to which school culture components were strong, weak, and the meaning of symbolic nature. Findings showed (i) science teachers experienced good collegial relationships and self-determinations, but weak professional collaborations, (ii) science teaching quality was not contextual and lack of connectedness to socio-scientific issues and students' creative portfolios, and (iii) school was lack of shared vision and mission that could be the most barrier for school improvement.

1. Introduction

To prepare students for their future, many science educators in Central Java agree to provide students with better science education, and scientific literacy promotion has been considered as the focus of school reform, through which a school model of scientific literacy (SMCL) is being created in this province. SMCL is translated as models of junior high schools (JHS) that implement principles of 21st century education focussing on scientific literacies. Some real supports were given to science teachers, such as (i) teacher workshop on future education was implemented to improve their awareness of new era skills, and (ii) on-service trainings at three targeted districts, Kudus, Magelang, and Brebes, were conducted to improve their quality of science teaching including the use of authentic assessments and content mastery. However, changing the quality of a school can be a challenging task without primarily considering the importance of school cultures [1]. School culture can be seen as one of responsible factors for school improvement [2]. Under negative school cultures, educators might face difficulties in promoting scientific literacy in school.

School culture, defined as a set of shared norms, values and beliefs, rituals, symbols, and stories, colours the life of school [3]. All hidden expectations govern teachers, academic staff, parents and students in working together, solving problems and coping with failures [4]. Culture governs what is of



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worth for a school and how members should think, feel, and behave. All values, norms and other moral agreements are the fundamental aspects of the next attitudes, intention, and behavior. As mentioned by Ajsen[5], human behaviour is influenced by what is believed, subjective norms, attitudes, and intention. Senge[6] mentioned that quality of schools was influenced by school members' mindset and their interaction with other aspects of schools. What is believed and how people interact each other create a particular culture in schools. MacNei[7] school culture should be firstly considered before changing a school. Explicitly teachers' educational practice is influenced by school culture[8]. In term of school management, school culture influences professional management[9].

Scientific literacy seems to be the primary goal of science education. New Indonesian curriculum 2013 put emphasis on competency rather than transfer of knowledge. It is seen as a fundamental goal of science education as supported by politicians and policy makers in European countries in recent years[10]. Scientific literacy has been the focus of promotion of basic skills in Norway schools [11]. It has been seen as the important factor for environmental actions as mentioned Saribas[12]. To support literacy, teachers use different ways of thinking and teaching in class. They encourage students to better understand science (1) as body of knowledge, (2) as way of thinking, (3) as ways of investigating, and (4) the interaction of science with technology and societies. Vieira (2014) implemented some models of science teaching (writing an essay, debate, case study, news-based teaching) can improve scientific and technological literacies[12, 13]. Students ask a question and find the answer to questions derived from curiosity about everyday experiences[13, 14]. In sum, science teachers need to focus on (1) beyond science, not merely content of science, but also its connectedness to other related areas (technology, societies, environments), (2) contextual science teaching and learning, and (3) authentic assessment focusing on performance-based assessments rather than tests. In other words, they need to change their own teaching habit.

Will central Javanese science teachers be ready to change their habit of teaching? To satisfy the expectations, based on anthropocentric theory of school promotion, teachers need positive school culture, in which the soul of every school teachers and members support the quality of schools. This survey aimed to (1) describe school cultures experienced by science teachers from three major districts in Central Java from which some junior high schools are being promoted to be school models of scientific literacy movement, (2) explore symbolic nature of science teaching quality, and (3) identify the possible barriers for the promotion of scientific literacy. Central Java was selected as the location of research because this province has been awarded some educational projects of school improvement by both national and international donors (USAID, AUSAID, World Bank, etc).

2. Methods

A randomly-selected group of 50 JHS science teachers from Kudus, Magelang and Brebes districts, participating in science teacher training in 2017, was invited to complete Self-Assessment of School Cultures. This instrument developed by Georgia Leadership Institute for School Improvement Inc., was used with some modifications and translated into Indonesian, focusing on (1) professional collaborations (2) collegialities (3) self-determination. Questionnaires ask teachers to fill with scales 1 = Never 2 = Rarely 3 = Sometimes 4 = Often 5 = Always or Almost Always. After finishing the questionnaires, data were recorded and analysed qualitatively by the extent to which school culture components were strong or weak. School observation was conducted to portray the physical environments. Interviews were also done with some key school heads, science teachers and administrative staff to collect data about their perceptions, beliefs, and school visions. A collection of teacher science lesson plan was analysed to identify its science topics discussed, teaching-learning design, and student assessment. Kudus are representing socio-cultures rich in Islamic traditions. Magelang is representing socio-cultures located in center of central Java, and Brebes is representing socio-cultures rich in population and local industries.

3. Results and Discussion

3.1. School Culture: Professional Collaboration, Collegial Relationship and Self-Determination

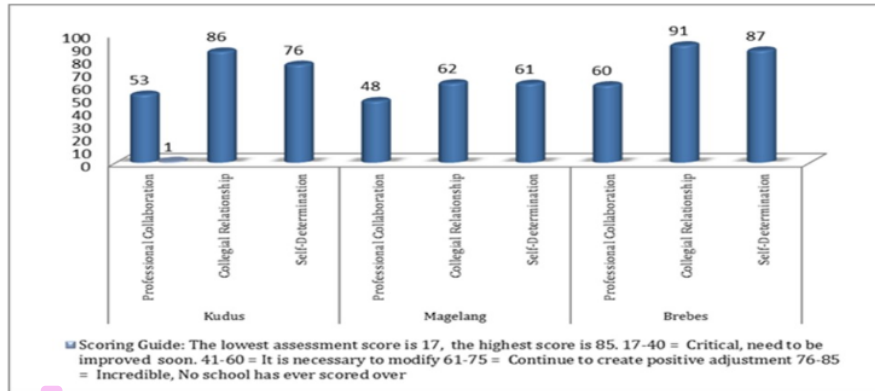


Figure 1. School Culture: Professional Collaboration, Collegial Relationship, and Self-Determination

Figure 1 shows (1) many science teachers from Kudus, Magelang, and Brebes, experience weak professional collaboration, but they have had already strong collegial relationship and self-determination. Teachers and staff only sometimes discuss cooperatively such big problems as science curriculum issues, school agendas, and school resources, however they (2) acknowledged (>80%) good collegial relationships and self-determinations. In other words, many science teachers together with school staff were not always connected or involved in the discussion of important school potentials and problems. Their professional collaboration among teachers and academic staff did not always happen. Consequently, these schools need to be monitored and adjusted to create more positive school culture for supporting the scientific literacy movement at schools. This findings could also bring a significantly serious challenge if the schools from these districts were then selected as pilot models of scientific literacy movement, because (1) science teachers were not aware and motivated to improve their schools, they did not have enough knowledge of science curriculum issues, (2) they were low-motivated teachers, (3) they were lack of peer support and (4) they were lack of team working. The implementation of the scientific literacy promotion would be not supported by the school members

3.2. Symbolic nature of science teaching quality

Observation was conducted to collect data of physical appearances of classes and other important buildings from three best schools where teacher training was implemented. Three science teachers teaching science were recorded and analysed. Findings showed many classroom were lack of students' creative portfolios displayed, science-corners, and socioscientific news-based discussion. All classroom buildings were only colored by such official photos as the Indonesian President and his vice-President, as well as Indonesian national heroes. Their science teaching recorded was still dominated by teachers and lack of connectedness to other disciplines such health, environments and communities. This reality seems to support the view that school was lack of professional collaboration.

Interviews with some selected science teachers, focussing on, "what to teach science, how to teach and how to assess your students?". One of science teachers (Siti), one of best teachers from Magelang district, showing her lesson plan and then convinced me, "*I usually teach science according to topics presented by the National Curriculum 2013.... I sometime used lab activities and finally I used tests to monitor students' learning achievement*". After checking her lesson plan, her answer was very

similar to that of her lesson plan. This reality was likely to support that (1) teacher was lack of knowledge of how to connect science topics to socio-scientific issues, (2) she was either lack of a variety of contextual science activities, and (3) finally she did not know much about authentic assessment. This findings seems to be common among Central Java science teachers, they are under pressure to be more focussed on national exam.

Interviews with one of the most popular school heads from Brebes, was focussed on, "what are you most worried about as a school principal?". He directly answered, "*oh yes, I am so worried about the parking lots and other limited school facilities, students did not have enough school facilities, including optimum science lab*". He never mentioned about challenges of the 21 first century education problems, focusing on scientific literacy, thinking skills and collaboration. This finding showed that the school principal was lack of great educational vision and mission, namely preparing students for the changed future. After interviewing other school principals from different district, similar responses were identified, namely school heads seems to be driven to be more focussed on national exam. This reality seems to hinder the development of educational quality with future visions.

One of the foci of classroom observation was on the extend to which science teachers develop their science lesson plan based on (1) connection of science to other socio-scientific issues (technology, societies, environments, health, etc) (2) contextual teaching and learning, and the use of authentic assessments. Science topics were presented as follows (1) the nature of science and scientific methods, (2) classification of living and non-living things (3) organisation of life, (4) physical and chemical changes, (5) Energy and Life System, (6) Heat and temperature, and (7) Interaction of living and non-living things. The following table presented teachers' responses when they were asked (1) where and when topics was discussed?, (2) what did students do in science, and (3) how were students assessed?

Table 1. Quality of Science Lesson Plan

Components of Science Lesson Plan	Answer	Expected
1. Who were learning science?	Students	Self-regulated
2. Learning Sites, where the topics was discussed?	Classroom	Students Multiple context
3. What did students do in science?	Reading books, Lab	Problem-solving
4. How students were assessed? What were the learning dimensions measured ?	Tests	Authentic Assessment

Table 1 presented facts that lesson plan was still colored by conventional approaches in which students learn science in one context of learning (classroom or lab), not multiple context, reading books but not problem solving activities, and tests but not authentic tasks. This table also strengthen the symbolic nature of the teachers' difficult task to change their ways of teaching, from conventional approaches to contextual teaching paradigms, by which students are prepared to be more self-regulated, solve some real problems related to science, and finish more authentic tasks.

3.3. Barrier for school improvement

Table 2 presents some possible (hypothetical) effects on teachers' efforts in promoting scientific literacy movements in their respected schools. Limited shared information and assistance were listed as the top difficulties. Job dissatisfaction was the following trouble. Other big consequences were recorded from the lack of school heads' vision, that can create no good leadership, professional development and communication. Limited professional teamworking can bring a significant effect on teachers's performance and school management. Lack of knowledge and of motivation can be the root of cause of school management problems.

Table 2. Barrier of negative school culture

Cultural Dimensions	Possible barrier on science teachers
1. Professional Collaboration is limited	<ul style="list-style-type: none"> • If teachers are less actively involved in schools, they are lack of information sharing and exchanged assistance [15]. • If sharing a common vision of school is limited, it reduce the quality of relationship among science teachers within school [16]. • If negative school culture is experienced by teachers, it would create job dissatisfaction [17].
2. School heads are lack of Vision	<ul style="list-style-type: none"> • There is no strong leadership, good professional development, and bad communication among school members [18].

3.4. Discussion

As supported by the findings, most schools in Central Java is lack of professional collaboration, even they have a good collegial relationship and self determination. Science teachers and academic staff did not always share their understanding of some important issues of teaching quality, such as curriculum, school resources and students. They did not have enough awareness of these important issues. In a strong school culture, teachers shared responsibility for educating students, supported excellencies, and prepared an individual to effectively lead a school. This negative aspect of school culture can not be used as the prediction of school effectiveness. It becomes difficult to reform the quality of education with neglecting the strong school culture [19]. Bradshaw [20]. believe that school climate affect how students behavior. If teachers are less actively involved in schools, they are lack of information sharing and exchanged assistance [14]. School culture is believed to have a closed link with student behavioral, academic, health and social –emotional achievement.

Other findings supports that collegial relationship is positively significant, (1) they celebrate school achievement, truly have a sense of community and sharing of ideas. Self-determination is also strong, teachers and staff always put emphasis on (1) preventing rather than repairing, (2) being interdependent (3) finding alternative solutions, and (4) enjoying their work. In other words, sense of community and determination are positive aspects of school culture that can support the effectiveness. Mindset of school members and their interaction are responsible factors for school management [21]. Culture affect all aspect of school life, starting from how school members dress, decorate their classroom, and willingness to change. It is the predictive indicator of academic achievement, school success, effective violence problem solution, healthy empowerment and teacher retention [22]. School climate has been related to student outcomes [23]. Teachers and academic staff living in a positive culture are those who are sharing the important thing, caring and concern, and ready to change and willing to take risks. The effect of positive school culture upon school management was also reported by some similar research findings, (1) positive school culture influence teacher practices, the more teachers are involved collaboratively in goal setting, the better teachers are implementing their teaching. School culture correlates with the management of professional development and found that two out of five (40%) constructs of school culture influence the school professional development management [24]. (2) students achieve higher scores on standardized tests in schools with healthy learning environments. The effect of school culture was also seen from this culture was studies, passed and changed in a school context. The way in which school principals support teacher leadership and collaboration, see the importance of professional development, and shared a common vision of school effectively influence the culture of school and the nature of relationship within school [25]. There is positive correlation between better school culture and job satisfaction [26].

4. Conclusion

Even school culture is significant for the development of school quality and seen as the fundamental steps for building school quality, some schools in Central Java showed their limited dimensions of school culture, such as professional collaborations, collegial relationships, and self-determinations. School culture was assessed with instruments developed by Georgia Leadership Institute for School Improvement Inc., used with some modifications, portraying (1) professional collaboration (2) collegiality (3) self-determination. Many schools in Central Java are lack of professional collaboration among teachers and other academic staff. Based on analysis of the symbolic nature of school culture, many schools are still colored by the conventional paradigm of science teaching. This limited collaboration could be the root cause of the difficulty of school improvement projects, including the scientific literacy movement.

A school is not only a place for teaching but also a home that provides moral direction and a sense of belonging. School principals and science teachers need to experience more trainings on school culture to prepare themselves for better educating students. (2) Since many science educators seem to underestimate the role of school culture, though it is influential, sharing of vision and mission is the first step to take in promoting the quality of scientific literacy teaching. (3) Though it takes time, promoting positive school culture is to be the priority in school management.

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