Science Teachers Understanding and Practices in the Context of Collaboration

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Abstract

This study is aimed to determine the understanding and practice of science teachers on inter-collaboration and intra-collaboration. The study was conducted using a questionnaire developed by researchers and has high reliability with Cronbach's alpha value of 0.945 and 0.922 for inter-collaboration and intra-collaboration items respectively. A total of 867 science teachers responded to the questionnaire. Descriptive statistic, independent sample t-test and the Pearson Correlation test were used to analyse the data. The findings revealed that science teachers understand and practiced of intra-collaboration and inter-collaboration were in medium level. The finding shows that there is a significant moderate positive correlation between the understanding and practices of teachers on inter-collaboration (r=0.67, p=.00). While for correlation between the understanding and practices of science teachers on intra-collaboration, the results shows that there is a significant high positive correlation between the understanding and practice of science teachers on intra-collaboration (r= 0.734 and p = .00). Therefore, if teachers give collaboration as their ultimate goal in pedagogical knowledge that is to be distributed among them as oppose to being held by individual they can better prepare to work as a team. However, trust, open-mindedness and a high tolerance for ambiguity are necessary characteristics of the collaborative team.

Keywords: collaboration, inter-collaboration, intra-collaboration, science teacher, primary school

1.0   Introduction

Collaboration is not a thing of the past because there has been a rise of need in society to work together and think on issues of critical concern (Welch, 1998; Austin, 2000). This has been realized by Austin (2000) and Welch (1998) where the teachers' community need a shift in emphasizing group work from individual efforts, from independence to community. Collaboration among teachers is essential as there are several researches done that it has positive effect on cognitive and behavioural profiles of learners (Roberts, 2005; Serce & Yildrim, 2006). Therefore, teacher collaboration should be enhanced to increase teachers' capacity, provide opportunities for professional development within the parameters of the school environment, and ultimately, to increase the professionalism and satisfaction of teachers (Eaker *et al*., 2002; Martin-Kniep, 2004).

In this modern age, collaboration is described in a variety ways of systems (Austin, 2000; Noam, 2001 cite in Overall, 2005), dialogue (Senge, 1990 cite in Overall, 2005; Clark et al., 1996), creative problem solving (John-Steiner, 1992) and inter-organizational relationships involved in information technology (Black & Lynch, 2002). Though we live in an age of collaboration, but only a handful of research exists that describes the characteristics or discusses the predictors of teacher collaboration. These researches indicate that collaboration in schools (intra collaboration) is rare and difficult to sustain (Little, 1990; Zahorik, 1987; Huberman, 1993).

According to Rotherham and Willingham (2009), collaboration is one of the 21st century teaching skills whereby teachers need to collaborate with each other and at the same time with the society to empower their teaching skills. Nevertheless, If we look at UNESCO's publication "The four pillars of Education, Learning: The Treasure Within" collaboration is a key element of each of the four pillars which are learning to know, learning to do, learning to live together and learning to be. Teachers need to extend beyond their areas of expertise, collaborating with their peers in other subjects to link and bind the learning in one area to the other. This is a holistic overview of the education process, building and valuing each and every aspect of the 21st Century students' education.

In the last two decades, it is warranted that teacher collaboration has received more attention from scholars and policy-makers (Little, 1990, Hargreaves, 1991; Lima, 2001). However, as stated by Little (1990) and Lima (2001), there is no consensus regarding a precise concept of collaboration. The studies of teacher collaboration usually have limited approaches that failed to grasp even the intermediate level of collegial involvement in schools, in which it is important as the clear analytical framework is absent (Lima, 2005). Lima (2001) argues on that in consequence, there is little agreement to none as to whether and to what degree collaborative processes actually takes place in schools. Therefore, it is pertinent that this study

aims to explore understanding and practice regarding collaboration i.e. inter-collaboration and intra-collaboration among science teachers. Objectives of this study are as follow:

i.   To identify the understanding of science teachers on inter-collaboration and intra-collaboration.
ii.   To identify the practice of science teachers on inter-collaboration and intra-collaboration.
iii.   To identify the relationship between the understanding and practice of science teachers on collaboration

2.0   Methodology

The study was conducted using survey method. Cluster sampling method is used in selecting science teachers and 867 science teachers from 7 states in Malaysia, namely Sabah, Penang, Kedah, Perlis, Terengganu, Kelantan, and Johor were involved.   Data was collected by using a questionnaire. There are two main parts in the questionnaire i.e. Section A: demographic and Section B. Section B consists of 21 items divided into two parts: 11 items of inter-collaboration and 10 items of intra-collaboration. Respondents rated the understanding of collaboration on a 5-point Likert-type scale ranging from 1 (strongly agree) to 5 (strongly disagree) and for the practice of collaboration with a corresponding 5-point Likert-type scale from 1 (always) to 5 (not at all). These items were adapted from the research done by Hashimah Mohd Yunus and Nooraida Yakob (2015). Likert-type scale is made to determine the tendency of respondents with more ease.

To evaluate the understanding and practices of teachers on the two variables, inter-collaboration and intra-collaboration, analysis based on the difference of the maximum and minimum range has been used. Thus, three levels will be used, namely low, medium and high. The mean value obtained for inter-collaborative understanding is 43.96 ± 5.35 and intra-collaborative is 43.52 ± 5.07. Therefore, the level of which is categorized according to the quartiles of the mean ± one standard deviation values. Refer to Table 1 and Table 2.

Quartile value	Level	Explanation
31.76 below	Low	Teachers have a low level of understanding in the inter–collaborative
31.77 – 46.50	Medium	Teachers have a medium level of understanding in the inter–collaborative
46.51 above	High	Teachers have a high level of understanding in the inter–collaborative

Table 1: Quartile value for teachers understanding in the inter–collaborative

Quartile value	Level	Explanation
35.90 below	Low	Teachers have a low level of understanding in the intra–collaborative
35.91 – 48.63	Medium	Teachers have a medium level of understanding in the intra–collaborative
48.64 above	High	Teachers have a high level of understanding in the intra–collaborative

Table 2 : Quartile value for teachers understanding in the intra–collaborative

While for inter-collaboration practice, the mean value is 39.15 ± 7.36 and mean value for intra-collaboration is 42.27 ± 6.37. Therefore, there are three levels to measure the levels of collaboration practice which are (Table 3 and Table 4):

Quartile value	Level	Explanation
38.45 below	Low	Teachers have a low level of practice in the inter–collaborative
38.46 – 48.58	Medium	Teachers have a medium level of practice in the inter–collaborative
48.59 above	High	Teachers have a high level of practice in the inter–collaborative

Table 3: Quartile value for teachers practice in the inter–collaborative

Quartile value	Level	Explanation
38.45 below	Low	Teachers have a low level of practice in the intra–collaborative
38.46 – 48.58	Medium	Teachers have a medium level of practice in the intra–collaborative
48.59 above	High	Teachers have a high level of practice in the intra–collaborative

Table 4: Quartile value for teachers practice in the intra–collaborative

Then, Pearson-r is used to determine the correlation between the teachers understanding and practice of inter-collaboration and intra-collaboration.

3.0   Findings and Discussion

3.1   Science teachers understanding on inter-collaboration and intra-collaboration

Findings show that science teachers have understanding of inter-collaboration and highly understanding of intra-collaboration. Refer to table 5.

	Score	Standard deviation	Categorization
Inter-collaboration	43.96	5.35	Medium of understanding
Intra-collaboration	43.52	5.07	Medium of understanding

Table 5: Descriptive analysis on understanding of teachers on inter collaboration and intra-collaboration

From the result, the understanding of teachers on inter-collaboration (collaboration among teachers from different school) is more than the understanding of intra-collaboration (collaboration among teachers in same school). The research done by Horn (2007) shows that shared responsibility and trust can be significant factors in teachers' collaboration and an indication of how well colleagues work together for a common goal to be achieved. In the same research also, the researcher identified the inter-collaboration among the teachers is higher.

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So, teachers as a part of the community should tolerate and negotiate in collaborating with other educators from different organization as found by many scholars. Therefore, inter-collaboration among science teachers can be concluded as only happen if the teachers negotiate themselves to achieve the shared goals (Paul, Willsen & Binker, 1993).

This finding also shows that teachers understood about the inter-collaboration and intra-collaboration. Hargreaves (1991) explained that in their most robust form, collaborative cultures extend to joint work, mutual observation, and focused reflective inquiry. In these cases, teachers interact knowledgeably and assertively with each other, rather than simply being congenial and complacent. The negotiated order theory as stressed by Strauss (1978) is a vital part in applying the collaboration among teachers. As the characteristics of negotiated order theory which are interaction among teachers, mutual agreement and reintegrate to agreement, teachers are well doing in collaboration if they implement these in their carrier. As stressed by Strauss (1991), in the organizations studied, apparently there could be no organizational relationships without accompanying negotiations. Therefore, the teachers should negotiate in order to have a successful collaboration among them. Teachers alone cannot meet all of the children's needs, but when team up with other professionals they can certainly make a difference. However, all collaborations seek new resources. Collaboration is effective, but it also takes time, dedication and resources. Although most partners have limited funds, collectively they can give a stronger impact.

3.2 Practices of science teachers on inter-collaboration and intra-collaboration

While for practice, the level of primary science teachers is medium for inter and intra-collaboration in their career. Refer to Table 6.

	Score	Standard deviation	Categorization
Inter-collaboration	39.15	7.36	Medium level of practice
Intra-collaboration	42.27	6.37	Medium level of practice

Table 6: Descriptive analysis on practice of teachers on inter collaboration and intra-collaboration

In this research, the practice of science teachers on inter-collaboration (collaboration among teachers from different school) and intra-collaboration (collaboration among teachers in same school) shows the mean score of 39.15 and 42.27 respectively. This indicate that the science teachers in this study are moderate practicing the inter collaboration and the intra-collaboration. This might due to the working place and the chances to meet each other. Since the inter-collaboration involve teachers from different school, they have less chance to meet,

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thus less collaborate. On the other hand, the teachers are practicing intra-collaboration because the chances to meet are high if working together in the same school, thus they collaborate more. The main benefit of inter-collaboration and intra-collaboration is teachers are able to increase their knowledge and skills through interconnected areas such as achieving the goals, maximize student success, professional development, co-planning and co-teaching opportunities, increased communication and improved technological skills. Although there are many research studies conducted in the US and the UK on collaborative professional learning communities of teachers, there is comparatively fewer studies in this area in Malaysia. Further, there are no large studies conducted in this country on teacher collaboration involving several school boards.

Teacher collaboration enhanced and shaped opportunities for teacher learning. The teacher collaboration has the potential to move the field of teaching forward by energizing teams of teachers within schools to activate and guide teacher improvement, thereby sustaining the learning (Dallmer, 2004). Hence, there is a need to increase our knowledge of collaborative inquiry, and to show teacher practice can be enhanced through close collaboration with other colleagues. According to the Vygotsky theory, the ZPD is a space where people interact to get knowledge for their development. Vygotsky's theory views human development as a socio genetic process by which people gain mastery over cultural tools and signs in the course of interacting with others in their environments (Brown, 1993). Moran and John-Steiner (2003) (cite in Overall 2005) explained that based on the Vygotskian framework, "all mental functions are first experienced socially, learned in interaction with others. So when teachers collaborate, they are interacting and communicating to accomplish a shared goal. Vygotsky's theory stresses the fundamental role of social interaction in the development of cognition and he believed strongly that community plays a central role in the process of "making meaning." Therefore, when a teacher collaborate with other teacher, a social interaction is taking place, thus they are working together for the shared goal.

According to the result of this research, the overall practice of teachers on collaboration is moderate. This could be due to various reasons like time, space, event and many more as suggested in the cooperation model. This model is usually used to describe relationships (Monsour, 1995 cite Overall, 2005) with the teachers regarding the share funds, space, collections and shared time for the benefit of students (Fitzgibbons, 2000; Fine, 2001). Therefore, when a teacher does not commit in the collaboration arrangement, it will spoil the shared goal of the group of teachers in that particular school.

3.3 Correlation between the understanding and practices of teachers on inter-collaboration and intra-collaboration

For the correlation between the understanding and practices of teachers on inter-collaboration, finding shows that the r value is 0.67, p=.00. Based on Hinkle, Wiersma and Jurs (2003), a value of 0.51 to 0.70, shows a moderate positive correlation. Thus this finding showed that there is a

significant moderate positive correlation between the understanding and practices of teachers on inter-collaboration.

The result indicates that if the understanding of teachers on inter-collaboration is less, then the practice is also less. This means that only the teachers who understand inter collaboration only highly practice it in their carrier development. This result is in parallel with the finding of Wiggins and Damore (2006), which stated that implementation of collaboration by teachers depend on their self-esteem. When teachers' understanding of collaboration is high, the practice of collaboration in teaching profession is also high.

This result is also supported by research done by Showers (1985), who interview the teachers about the application of collaboration for the professional development and he concluded that teachers with high understanding do practice well the collaboration. In addition, collaboration promotes skills that have been associated with reflective and responsive teaching (Osterman and Kottkamp, 1993; Zeichner and Liston 1987). There are many benefits of teacher collaboration whether it is happening inside a school or between a school and other educational agencies. Collaboration provides teachers with professional development opportunities such as co-teaching, co-planning, and many other positive experiences. However, there are many impediments and constraints that make difficult for the teachers to engage in interactions, to generate new insights into their teaching dilemmas, and to foster instructional innovations.

In education, the word collaboration is used to describe a mode of working together toward education reforms. It also describes a relationship that collaborative partners want to achieve. This relationship has been described as "working with, not working on" (Lieberman, 1986a, p. 29). In fact, parity and equality in this relationship are shared values. According to Johnston (1990), collaboration is away to "increase quality, bridge the gap between theory and practice and improve communication between schools" (p. 173). A collaborative relationship further implies that decision making is democratic (Hord, 1986). Hence, decision making at all stages of the work becomes an appropriate collaborative task (Oakes *et al,* 1986 cite in Lieberman, 1986b). Another potential of collaboration is the opportunity for collaboration which enables teachers to observe one another and exchange support, companionship, feedback, and assistance in a co-equal and a non-threatening fashion (Ackland, 1991).

This can also be related with the negotiated order theory whereby negotiations were patterned; they were contingent on specific structural conditions, who negotiated with whom, when and what about, etc.; they had different characters; they had different consequences for each other (Strauss, 1978). So when the understanding of teachers on collaboration is higher, they automatically can negotiate with others to fulfil the shared goals. Thus, the collaboration takes place with the negotiation of all the members.

For the correlation between the understanding and practices of science teachers on intra-collaboration, finding shows that the r value is 0.734 and p = .00. Based on Hinkle, Wiersma and Jurs (2003), a value of 0.71 to 0.90 shows a high positive correlation. Therefore, the result shows that there is a significant high positive correlation between the understanding and practice of science teachers on intra-collaboration.

Thus, the result can be related with the coordination model whereby the teachers are working together on a mutual understanding and trust towards a shared goal which is to increase the students' achievement in academic. According to the coordination model, there will be a coordinator who will organize the schedule for collaboration and even though coordination require a minimal amount of involvement by participants, however, it is indeed could become a catalyst for teachers to build a more intense relationships by developing trust among participants (Winer & Ray, 1994 cite in Overall 2005; Mattessich et al. 1992 cite in Overall, 2005, Grover, 1996 cite in Overall, 2005). So this supports that without the cooperation of all the teachers, it will be tough to engage in collaboration.

This result is in parallel with the finding of Wiggins and Damore (2006), which stated that implementation of collaboration by teachers depends on their self-esteem. The higher the understanding of teachers on collaboration, the higher is the practice of collaboration in teaching profession. This result is also supported by the research done by Showers (1985), who interview the teachers about the application of collaboration for the professional development and he concluded that teachers with high understanding do practice well the collaboration. According to Showers (1985), collaborating provides "a safe environment in which to learn and perfect new teaching behaviors, experiment with variations of strategies, teach students new skills and expectations inherent in new strategies, and thoughtfully examine the results" (p. 47). In addition, collaboration promotes skills that have been associated with reflective and responsive teaching (Osterman and Kottkamp, 1993; Zeichner and Liston, 1987). There are many benefits of teacher collaboration whether it is happening inside a school or between a school and other educational agencies. Collaboration provides teachers with professional development opportunities such as co-teaching, co-planning, and many other positive experiences. However, there are many impediments and constraints that make difficult for the teachers to engage in interactions, to generate new insights into their teaching dilemmas, and to foster instructional innovations.

4.0   Conclusion

This study extended the literature on understanding and practice of science teachers on inter-collaboration and intra-collaboration. Collaboration between science teachers in secondary schools allows students to receive knowledge in a more open way. Collaboration is not an activity to be done independently; it is an interdependent activity for all educators, not just science teachers. Trilling & Fadel (2009) argue that one of the successful professional

development programs tend to be Collaborative, building upon the collective experiences and expertise of other teachers and the wider community of educators. The 21**st** Century Professional Development **(**Pacific Policy Research Center, 2010) outlines that collaboration skills can be learned through a variety of methods (e.g., project-based learning, problem-based learning, and design-based learning). Research on teaching communication and collaboration skills encourages direct and mediated communication, working with others on team projects, and performance-based learning and assessment (Partnership for 21st Century Learning, 2009). Collaboration is not an activity to be done independently; it is an interdependent activity for all educators, not just science teachers. Nevertheless, collaboration plays a critical role in impacting learning outcomes for students and increasing their exposure to the education curriculum. Collaboration is not an easy task; it requires much planning time, trust, voluntary engagement, shared beliefs and values, shared decision-making, and hard work.

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