

Science and special education teachers create inclusive classroom practice in science: Are they working interdependently?

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Abstract: The purpose of this research was to examine how co-teachers collaborate interdependently to make the science classroom inclusive for all students. Seven participants; two science teachers of School Smart; two science teachers of School Brainy; support teachers of School Smart and Brainy respectively; and Lily, the head of the inclusion program of School Brainy were selected purposively. As a qualitative description study, data were collected through semi-structured interviews, classroom observations, and instructional document analysis. Data collected were analyzed through a deductive approach using co-teaching as a predetermined framework. The findings indicate that the co-teachers in two schools were teaching collaboratively through co-planning, co-instructing, and co-assessing. Co-teachers from both schools claimed that most of the time spent collaborating was on co-instruction rather than co-planning and co-assessment. In School Smart, the co-teaching between science and the support teacher, called an alternative teaching model, is operating more effectively in terms of planning, scheduled meetings to discuss instructional planning and its implementation compared to School Brainy. Co-teachers in School Smart work more interdependently and collaboratively than the co-teachers in School Brainy.

Keywords: *science inclusive practice, co-teaching, collaborative teaching, independent classroom practice*

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INTRODUCTION

Welcoming students with disabilities (SWD) into the general classroom in developing countries has been a challenging issue (Sharma, Forlin, Deppeler, & Yang, 2013), and such is portrayed by Indonesia. Minister of National Education Regulation (*Permendiknas*) No. 70 of 2009 has mandated that SWD can attend the general education system to learn with their peers. At the school level, however, teachers still struggle with including SWD in their classrooms. When SWD feel welcome in the regular science classroom and teachers engage in strategies to support the inclusion of SWD, inclusive practices are demonstrated. The effectiveness of inclusive practice can be indicated when teachers engage in working together with their colleagues and professionals (Salend, 2011) as well as parents (Collier, Keefe, & Hirrel, 2015) in the way they prepare teaching and learning to support SWD in the general education classroom.

Shaddock, Giorcelli, and Smith (2007) claim some strategies that support inclusive practices are working based on the student's needs, using flexible approaches, building and modifying instruction from simple to complex forms, "adopting a team approach"; and differentiated instructions (p. 10). Differentiated instruction refers to the ways teachers plan and apply various approaches and strategies (Smit & Humpert, 2012; Tobin & Tippett, 2014), including a student-centered approach (Marlina, Efrina, & Kusumastuti, 2019) or active learning process (Ismajli & Imami-Morina, 2018) to meet every student's needs and characteristics (Hidayati, 2020; Strogilos, 2018) and to provide equity and excellent education for all students (Bruin, 2018). Differentiated instruction also addresses the learning phase of each student (Pozas, Letzel, & Schneider, 2020; Sharp, Jarvis, & McMillan, 2020). On the other hand, a team approach means school stakeholders, e.g., principal, teacher, and support teacher working collaboratively (Garcia-Melgar et al., 2022; Shaddock et al., 2007; Sheppard, 2019) to ensure the success of all students in the academic fields (Vlcek, Somerton, & Rayner, 2020). Collaborative action has the potential to be an effective strategy for supporting inclusive practice (Chao, Lai, Ji, Lo, & Sin, 2018; Mulholland & O'Connor, 2016). For the purpose of this paper, a team approach is defined as co-teachers, consisting of one science teacher and one special education teacher working collaboratively (cooperatively) and/or interdependently (co-dependently, being reliant on each other in mutual roles and responsibility in co-teaching) to make science classrooms more inclusive.

Science teachers in Indonesia tend to adhere strictly to the mandated curriculum prepared by stakeholders at a higher level (UNESCO, 2004), such as the local or central governments, without making any modifications or adjustments to meet the learning needs of specific students (not only SWD). For that reason, co-teaching does not always go as effortlessly as could be expected. This situation occurs in Indonesia, particularly with implementing the newest Curriculum of 2013 prepared by the National Education Standards Agency (*Badan Standar Nasional Pendidikan/BSNP*), which requires science teachers to strictly abide by this curriculum.

To fulfill the Indonesian Curriculum requirements and SWD needs, a collaboration between science teachers and special education teachers as co-teachers is needed. Even though collaboration has not been authorized by inclusion regulations (viz: the No Child Left Behind (NCLB) or the Individuals with Disabilities Education Act (IDEA) (Hernandez, 2013), it has been recommended in inclusive classroom (Austin, 2001) and become an option for offering educational services to SWD in general classrooms (Damore & Murray, 2009). Further, support from co-teachers is believed to be a way to carry out these regulations to advantage all children (Seeley, 2015), the most essential factors (Gebhardt, Schwab, Krammer, & Gegenfurtner, 2015) for their better outcomes (Hang & Rabren, 2009; Rivera, McMahon, & Keys, 2014; Sweigart & Landrum, 2015). Collaboration between science teachers and special education teachers can be formed as co-planning, co-instructing, and co-assessing.

Previous research on inclusive education practices in Yogyakarta revealed that the gap between regulations on inclusive education and its practices still exists (Suprihatiningrum, 2016), the concept of inclusive education is not understood, and teachers lack awareness of how to ensure all students fully participate in learning with their peers in regular classrooms (Suprihatiningrum, 2017). For this reason, further research on how teachers engage as co-teachers in inclusive practices is needed. The purpose of this research was to examine how co-teachers collaborate interdependently to make the science classroom inclusive for all

students. The main research question that drove this study focused on how co-teachers in School Smart and School Brainy work interdependently in co-planning, co-instructing, and co-assessing to make science classrooms inclusive for all.

METHOD

A Qualitative Description (QD) study was conducted in two identified schools providing inclusive education (as the site selection criteria) in Yogyakarta, Indonesia. These are School Smart, a private middle school, and School Brainy, a public middle school. QD was employed in this research because this method is “important and appropriate for research questions focused on discovering the who, what, and where of events or experiences and gaining insights from informants regarding a poorly understood phenomenon” (Kim, Sefcik, & Bradway, 2017, p. 24). A qualitative methodology has the potential to reveal new perceptions, recognize multiple realities of situations and interpretations, and changes in the structure of education as shown by Denzin and Lincoln (2008, p. 8), and also to better understand “social problem” (Creswell, 2014, p. 4) which in this study are inclusive practices in the science classroom.

Seven participants, i.e., two science teachers (*Rose, Laurent*) of School Smart; two science teachers (*Monty, Sully*) of School Brainy; *Andi* and *Julie*, support teachers of School Smart and Brainy, respectively; and *Lily*, the head of the inclusion program of School Brainy; were selected purposively. *Julie* is best described as an itinerant support teacher, as she is directed by the Department of Education of Yogyakarta to visit School Brainy every Friday and Saturday.

Data collection techniques and procedures for this study involved participants in three stages of data collection: semi-structured interviews, science classroom observations, and instructional planning documents (i.e., lesson plans and syllabi) analysis. Individual interviews were conducted within 90-120 minutes for each participant and focused to explore how the participants designed and planned science lessons (co-planning), how the participants conducted and managed science classrooms (co-instructing), and how the participants monitored and assessed SWDs’ learning progress (co-assessing). Science classroom observations were obtained four times in two classrooms, while instructional planning documents of science teacher participants were collected last. All data collected were analyzed through a deductive or “top-down” approach using the co-teaching framework (co-planning, co-instruction, and co-assessment) for data coding and establishing themes.

FINDINGS AND DISCUSSION

The findings established that although each co-teacher was adopting a co-teaching model, it was being implemented in different ways. The findings are reported according to three themes that emerged from the data. These are co-planning, co-instruction, and co-assessment.

Co-Planning in Science Instruction. The differences in the ways by which co-planning among the various co-teachers was coordinated were in evidence between the two schools. Co-teachers in School Smart collaborated in planning instruction for SWD in two ways. *Firstly*, through a formal annual meeting that involved the science teachers, the support teachers, the coordinator of curriculum, and the coordinator of inclusion. *Secondly*, informally through conversations and discussions during the academic year. In the formal meeting, the science teachers documented the instructional plan in one document, which was then checked by the coordinator of curriculum and signed by the principal. Collaboration happened when

co-teachers arranged lesson plans at a meeting chaired by the principal or vice-principal each Friday in preparation for the following week. In this meeting, the best approach for each student based on their needs was discussed. Ideas and knowledge were shared, and the most appropriate teaching method for certain topics was decided upon. In addition, science and support teachers decided who would teach every component of the topic, made modifications for learning materials and media, and designed tests with accommodations/adjustments to suit all students learning needs. Because the science teacher was responsible for instructional planning and preparation, the work relating to this aspect of teaching was carried out by the science teacher, with the support teacher acting as a consultant.

In School Brainy, it emerged from the data that the science teacher was the principal person who expected to develop the science instructional planning. The science teachers planned and prepared an instruction and lesson plans and managed topic administration. The itinerant support teacher, Julie, in this school did not contribute to the planning stage, as she mentioned:

I have never been asked to help science teachers make instructional documents, such as lesson plans. We don't have an allocated occasion to plan the science lesson together. It's the science teacher's job; it's her duty. I have only been consulted regarding what kind of teaching strategies would be best for students with special needs. For example, what is best for the blind student and which one is suited for the deaf (interview/Julie).

Even although the itinerant support teacher did not fully contribute to the science instructional planning, she claimed that she provided services of brief duration and information to the science teachers that may assist the teacher in modifying the environment or curriculum to provide optimal access for the SWD. As the itinerant support teacher reported:

Although I rarely involve in designing a lesson plan, the teacher always asks me when they face difficulty in teaching science for students with special needs. They ask whether the teaching method they would use is appropriate or not for those students (interview/Julie).

On the other hand, when the itinerant support teacher advised on teaching strategies, she was usually asked and required to work with SWD incidentally, sometimes without preparation of what was to be taught. However, she claimed her experience as a support teacher for more than 30 years made her confident and knew what she should do for every student she assisted (interview/Julie).

Lily, the head of inclusion, claimed that all teachers in School Brainy, including science teachers, do what is best for SWD, but the time required at the preparation stage for instruction sometimes acted as a barrier to well-developed inclusive teaching and learning.

Co-instruction in Science Learning. Science teachers in Schools Smart and Brainy reported that they are responsible for presenting the science grade-level core curriculum for all, including SWD. Document analyses showed that science teachers in both schools offered a variety of learning methods to engage all students in science learning. Based on the classroom observations, science teachers in these schools were the main providers of delivering science materials in the classroom. Classroom observations also verified that in School Brainy, should special accommodations or modifications to the lesson be needed,

then the science teacher designed and implemented them, whereas in School Smart, both the science teacher and the special education support teacher worked together to design and implement them.

In School Smart, after the science teachers and the support teacher worked collaboratively designing teaching activities, jobs were distributed between them in the science classroom and finalized at the beginning of the semester in the annual meeting. Therefore, every support teacher had their scheduled job for the entire semester, though, in reality, the fixed schedule was flexible based on the requirement of the science teacher and students because science teachers sometimes felt confident teaching without support from the special education teacher. According to science teachers of School Smart, Rose, and Laurent, the whole process of delivering science materials is the science teachers' duty and responsibility. Rose and Laurent also claimed that the support teacher helped them to adapt science lessons for the students who faced difficulties and needed additional supports, including SWD. To illustrate this, the special education teacher in School Smart, explained:

When I worked with the science teacher in a science lesson, the science teacher usually asked me to help some students who needed assistance, but not all students. I then explained the science material to the students according to what the science teacher explained to the whole class. I, sometimes helped the students to do their worksheets. I am the person who is responsible for transferring knowledge from the science teacher to these students (interview/Andi).

The Support teacher in School Smart also claimed that her job in the classroom was to gather the students who needed assistance (not only SWD) in a small group; then before she introduced the students to the information related to the upcoming instruction, she helped the students improve their focus, so they were ready, willing and able to learn. During the lesson, the support teacher claimed she helped the science teacher to deliver the science material that being taught by the science teacher to this group, assisted students in working on their worksheets and assignment, and provided the students with remediation for material that had not been mastered by reviewing and re-teaching those concepts (interview/Andi). Other roles of the support teacher were to help the teachers to plan lessons, monitor the way the science teacher delivered science materials to SWD, and make sure they understood what the teacher said (interview/Andi). Clearly, therefore, teachers in School Smart applied a co-teaching model, which they called 'alternative teaching'.

In School Brainy, by comparison, co-teachers operated using the 'one teach-one assist' model, as the science teachers acted as the main person who delivered the science material, and the itinerant support teacher moved from one to another student who needed assistance or who was experiencing difficulties. Julie, the itinerant support teacher, claimed her role in the science classroom was as a teacher assistant. She sat adjacent to students who required additional support, helped students with their individual tasks, or explained science material using an appropriate model for students with visual impairment. Monty, a science teacher of School Brainy, said that she asked for support from the itinerant support teacher to clarify or modify materials typically presented in abstract or visual modes. Monty said:

When I taught a topic called the respiration system, I asked the itinerant support teacher to help me explain the material to the students with visual impairment using a science kit. We have so many science kits from the government, mostly in a tactile mode. I

explained it in front of the class, and she described it to that student who was visually impaired (interview/Monty).

The itinerant support teacher also claimed that she worked with the science teachers to provide modified science materials so that the language and content were accessible and appropriate for the SWD. For example, the itinerant support teacher transcribed the science materials into Braille format for students with visual impairments or worked as a content reader for those students. As language delay was a concern for students with hearing impairment, the itinerant support teacher helped them by simplifying content language in both printed and recorded materials. Also, the itinerant support teacher arranged a support language program for the students with hearing impairments by involving a lip-reading teacher from a special school, because in School Brainy, sign language was not recommended to be used, as the head of inclusion said:

She (the itinerant support teacher) helped us to arrange the support program for students with hearing impairments who cannot communicate with lip reading. She asked her colleague from the special school to teach our students, who will teach lip reading. Because our conversation mostly in speaking, then the preferable method for the deaf is by lip reading, not by sign language. We didn't recommend the sign language. As we know, when students graduate and they become part of society, they should communicate with others and of course lip reading is the best method to teach them speaking and understanding when others speak (interview/Lily).

Because this school only had one itinerant support teacher who supported SWD every Friday and Saturday, Lily, the head of the inclusion program, claimed science teachers did not always share instructional activities in the classroom, only for certain topics that needed assistance from the support teacher. In addition to the one teach-one assist model, Lily explained that another method they used was a pull-out system where the itinerant support teacher in School Brainy took the student with hearing or visual impairment and the slow learner out of the science classroom for short periods of time to work on specific skills. For example, when students did practical in the laboratory, some SWD, who were not intended to conduct practical, were taken out to the special room, namely the inclusion room, to get additional assistance with the science lesson.

Co-assessment in the science classroom. Data revealed that the assessment process in science learning in School Smart and Brainy did not fully engage support teachers. They only acted as consultants when science teachers created assessment forms and advised them on appropriate modifications for each student. Sometimes they also helped the science teachers to conduct the test, especially by giving specific instructions to the students on how they should do the test.

In School Smart, science teachers were concerned with two areas in the learning domain: cognitive and psychomotor, and test modifications were made to assess the student's learning progress. As mentioned by Rose and Laurent, they differentiate the assessment form by providing alternatives, such as project work (both individual or group), oral tests, interviews, practical tests, and games-based quizzes. In preparing these tests, science teachers were advised by the support teacher as to the content and the form of the test and whether it was suitable or not for students with specific disabilities. Because the tests were carried out at

the same place and at the same time for all students, the support teacher aided the science teacher by accompanying the SWD in the test when they needed detailed instruction to do the test. Support teachers sometimes marked students' work and submitted it to science teachers for further tabulating and checking.

Sully, a science teacher of School Brainy, claimed she tended to give more focus to the cognitive domain rather than the psychomotor and affective domains. Both Sully and Monty claimed they mostly used paper-based tests to monitor the student's progress. In terms of the assessment process, the itinerant support teacher in School Brainy contributed by accompanying the SWD when the test was being conducted, reading and interpreting the test material for students with visual impairments; marking the test, especially when it came in Braille format; but did not fully participate in modifying nor administrating the tests.

Discussion. This study sought to investigate the nature of the interdependence between science teachers and special education teachers and explore the ways they collaborated and cooperated to provide inclusive classroom practices in two middle schools in the Special Province of Yogyakarta, Indonesia. The significant finding is that the co-teachers in both schools worked collaboratively in different ways and levels of participation, but co-teachers in School Smart worked more interdependently than co-teachers in School Brainy. The collaborative actions of co-teachers in School Smart are best described as a co-teaching model, utilizing alternative teaching, while School Brainy applied a one-teach-one assist model. These findings imply that the traditions of co-teaching in these schools show the degree of inclusive practices in each school, in which School Smart practices more inclusive science teaching and learning than School Brainy. A survey of teachers' and students' perspectives on co-teaching models by Burks-Keeley and Brown (2014) found that a one-teach-one assist model is ineffective, although Pitts (2021) mentioned that this model is the most often to be implemented; while alternative teaching provides students more space to learn, they are able to learn more lessons and feel more confident in regards with lessons.

Although many researchers offer tools and strategies to create an effective co-teaching model, Pratt, Imbody, Wolf, and Patterson (2017) and Pancsofar and Petroff (2016) argue that there is no clear definition of a co-teaching framework and co-teachers still have misunderstandings about how to approach this framework into practice. As found in this study, there are different ways of coordinating and conducting co-planning in each of the two schools. In School Smart, time was scheduled and used effectively by co-teachers to discuss, plan and reflect on the instructional processes needed over the academic year. Support teachers provided details information about every SWD, their disabilities, and learning needs, while science teachers offered knowledge of pedagogy and science content. These two ways of sharing information between co-teachers were used to decide what learning supports should be arranged for each student. Co-teachers in School Smart, therefore, were interdependent in co-planning. As stated by Pratt et al. (2017), co-planning occurs naturally in an interdependent co-teaching relationship through long-term, biweekly and daily planning.

While in School Brainy, weekly scheduled meetings for science teachers and itinerant support teacher were difficult to set up, although the itinerant support teacher was often asked to advise what the best learning approach for SWD. This corresponds with the study of Murawski (2012) in which clearly states that co-planning is the most problematic element of co-teaching, and Haimowitz (2018) says co-planning becomes a challenging issue in terms

of planning time and scheduling meetings, although having sufficient planning routine is very important in co-planning (Simon, 2017). Co-teachers in School Brainy did not feel well-organized to provide for student needs in their classrooms, as also evidenced by the Walsh (2018) study that teachers feel unprepared to totally provide for the needs of SWD even though they welcome them in the classroom. This study proved that co-teachers in School Brainy did not work collaboratively in co-planning though science teachers depended on the itinerant support teacher when they found difficulties in deciding the appropriate learning approach for SWD. To make co-planning efficient, Murawski (2012) recommends ten tips, i.e., determine a routine time for co-planning, choose a free interruption place to discuss, save other ideas for another co-planning time, structure the topic to be discussed, establish typical roles and responsibilities, share co-teaching jobs equally, focus on the student's needs and issues, provide routine time for evaluation, save the planning in the document, apply the "what/how/who approach" (p. 11).

In School Smart, while the science teacher instructed most students, the support teacher instructed a mini group, including SWD for the purposes of pre-teaching, remediation, and separate assessment, called by Friend and Cook (2010), Friend and Barron (2016), Salend (2011) as an alternative teaching model. Support teacher in School Smart initiated the science instruction to this small group of students by outlining the lesson — what concepts they would learn —, introducing words and definitions, making them prepare the lesson, guiding them to practice some science skills and do their tasks and assignment through the individual worksheet, and providing remedial teaching. In this co-instruction stage, the co-teachers in School Smart worked collaboratively, though science teachers were more dependent on their support teacher in delivering science materials to students who need additional support. As the SWD in School Smart were students who had learning difficulties, according to (Friend & Cook, 2010), the alternative teaching model allows those who are struggling with a concept more focused specialized instruction and the most beneficial to students with those disabilities.

In School Brainy, the science teacher taught all the students while the support teacher offered individual assistance to certain students, and this service is defined by Friend and Cook (2010), Friend (2016) as one teach-one assist model. This finding echoes the study of Brendle, Lock, and Piazza (2017), who reported that this collaboration model is unable to meet the general and special education teachers as a team to plan and implement lesson plans into instruction. Because planning time did not occur, the itinerant support teacher of School Brainy reported she did not feel confident that the one-assist model worked to modify the science content, even though the one teach-one assist model was the easiest model (Keeley, 2015) and the most preferable model (Bryant Davis, Dieker, Pearl, & Kirkpatrick, 2012; Pancsofar & Petroff, 2016; Scruggs, Mastropieri, & McDuffie, 2007) to be implemented. On the other hand, the time constraint of the itinerant support teacher, as she only presented every Friday and Saturday, the co-instruction in School Brainy was not always conducted for each topic, rather for topics that needed special assistance, for example, when the science teacher utilizing the science props for SWD. As claimed by Salend (2011), this service model was effective when teachers needed to monitor particular tasks, such as assessing or giving immediate feedback to students. In addition, Wilson and Blednick (2011) added that one teach-one assist has other positive effects, i.e., students can receive: personal attention, a reminder to stay on task, individual confusion resolving,

informal assessment, and little planning time. However, Friend and Cook (2010) argued that this model might cause students to become too dependent on the assistance of a support teacher. Monty, one of the science teachers in School Brainy, stated that when the itinerant support teacher helped her to assist the SWD, her roles in the classroom became more manageable, and she gave her responsibility of teaching SWD to the itinerant support teacher while she focused on instructing other students. This confirms the previous findings of Strogilos, Stefanidis, and Tragoulia (2016), in which SWD are the sole responsibility of the support teacher while another teacher instructs throughout the class. Strogilos and Avramidis (2016) suggest the general teacher should not suppose the support teacher as the person solely leading the SWD; because as one teacher leads the lesson more intensively than the other teacher, it produces an unwanted imbalance of power in the classroom (Guise, Habib, Thiessen, & Robbins, 2017; Scruggs et al., 2007).

Co-assessment did not usually involve support teachers assisting science teachers in the two schools investigated. Whereas science teachers were the main players in planning, adjusting, conducting, and marking SWD tests, the support teachers only acted as consultants for modifications that best fit the individual needs of the SWD. Similarly, Olore (2017) study found that co-teachers spent most of their time working together to discuss student concerns and make instructional changes while spending less of their time working together to develop lesson plans and share resources.

This study recognizes that collaboration and working interdependently in co-planning, co-instructing, and co-assessing between science and special education teachers are essential; however, co-teachers need more time to collaborate (Sundqvist, Björk-Åman, & Ström, 2021) and support from school leadership. This support can be provided by school leaders as recommended by Carty and Marie Farrell (2018); therefore, co-teachers can work more effectively together and become familiar with the co-teaching practices. Friend (2000) claims that the principal, as a school leader, should be fully knowledgeable and skillful about creating collaborative actions among teachers and other personnel. The co-teaching practices in School Smart proves that the higher level of interdependency between co-teachers creates more successful co-teaching. To become interdependent co-teachers, Pratt (2014, p. 11) promotes a new theory called “achieving symbiosis,” in which co-teachers should use their own differences, weaknesses, and strengths to overcome the barriers in co-teaching (Murawski & Dieker, 2008). In addition, co-teachers need a sense of belonging to create and maintain a positive co-teaching atmosphere (Pesonen, Rytivaara, Palmu, & Wallin, 2021). Besides providing teachers with the schedule to meet and plan, successful co-teaching requires administrative leadership, “professional development and similar teaching philosophies” (Pratt, 2014, p. 10; Wilson & Blednick, 2011, p. 14), training and support (Johnson & Brumback, 2013, p. 6), “logistic and parity” (Friend & Barron, 2016, pp. 8-9). As evidenced in School Brainy, the lack of collaborative teaching between science teachers and support teacher and limited interaction among them produce the barrier to effective inclusive practices. Khairuddin, Dally, and Foggett (2016) argue to guarantee the SWD meet their learning needs, both co-teachers should actively participate in the collaboration.

The results of this study also prove that the education of SWD in School Smart and School Brainy was implemented in a small group or individual instructional setting alongside their peers as the vital process toward inclusive practices in a general classroom. As inclusive

practice is defined as teaching approaches that recognize students' diversity, reduce the barriers to participation in learning, and enable access to the curriculum (Ainscow, Booth, & Dyson, 2006; Alexiadou & Essex, 2015; Atanasoska, Dimov, Iliev, Andonovska-Trajkovska, & Seweryn-Kuzmanovska, 2015), the co-teaching practices between science teachers and special education teachers show the level of the inclusive practices in School Smart and Brainy. This study proves that School Smart demonstrated more inclusive practices than School Brainy. As School Smart implemented an alternative teaching model, Eschete (2015) argues it creates a higher level of students engagement and is chosen as a preference co-teaching model, while one teach-one assist model, according to Eschete (2015), is considered to be the least effective and the lowest preference of the six co-teaching models. Additionally, School Brainy is not fully inclusive because the pull-out system — in which SWD were segregated from their peers —, is still applied.

The findings of this study should be seen in the light of some limitations that could be addressed in future research. First, as a qualitative case study, the findings rely largely on the participants' views of how they create inclusive science practices, and interpreting any hidden meaning in these views may result in considerable bias. Second, this study was conducted by a limited number of participants, meaning that the findings of this study cannot be generalized and can be applied only exclusively to the context of these two schools. As this study focused on science teachers and support teachers who worked collaboratively to promote inclusive science classrooms, other specialists and paraprofessional supports need to be investigated to shape a better description of science-inclusive practices. The way these educators work to produce better outcomes for SWD and how to measure the participation of each co-teacher is also essential to be conducted.

CONCLUSION

Co-teachers in School Smart work more collaboratively and cooperatively than co-teachers in School Brainy, as co-teachers in School Smart have more roles, tasks, and responsibilities to be shared in co-teaching compared to School Brainy. The co-teaching model implemented in School Smart was alternative teaching, whereas School Brainy applied a one-teach-one assist co-teaching model. In co-planning, science teachers and support teachers in School Smart collaborate more interdependently as they set aside time to plan, scheduling meetings to discuss instructional planning. In contrast, School Brainy did not provide time for co-teachers to sit together to hold conversations to discuss what they would do to provide better service for SWD. In co-instruction, the science teacher of School Smart depended on the support teacher to provide instruction to a small group of students who needed assistance while the science teacher was teaching the whole class. In School Brainy, the science teacher is the primary source of science instruction and the development of science material, with the support teacher acting as an assistant. In the co-assessment process, a collaboration between the science teachers and special education teachers in both schools was limited to consideration when the assessment was conducted rather than on designing the test and administration areas.

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