

# Attitudes of Secondary School Science Teachers toward Teaching Diverse Students

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Teachers' attitudes are crucial to promote inclusive science practices, including those with special educational needs (SEN). This study aimed to investigate science teachers' attitudes toward teaching diverse student and to identify the elements that may influence teachers in a positive manner toward including SEN students in science classrooms. 202 science teachers in the Banjarnegara Regency, Indonesia participate this study. A survey was conducted and analyzed by a three-way ANOVA test to know the relationship among teachers' variables and their attitudes toward teaching diverse student groups. The results suggested that 71.8% teachers have moderately positive attitudes concerning teaching diverse student groups in general education classrooms. There were no statistically significant interaction effects among teachers' variables. Teachers' personal experiences in interacting with SEN students were found to be the main effect that contributes teachers in acquiring positive attitudes toward involving SEN students in regular classrooms ( $p < 0.01$ ).

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*Sikap guru sangat penting untuk mendukung praktik pembelajaran IPA yang inklusif, termasuk pada Anak Berkebutuhan Khusus (ABK). Penelitian ini bertujuan untuk menyelidiki sikap guru IPA dalam menghadapi peserta didik yang beragam dan mengidentifikasi faktor-faktor yang mempengaruhi secara positif sikap guru IPA dalam mengikutsertakan ABK pada pembelajaran IPA. Survei dilakukan pada 202 guru IPA di Kabupaten Banjarnegara, Indonesia menggunakan kuisisioner ATTDs dan dianalisis dengan tes ANOVA tiga arah untuk mengetahui hubungan antara variable guru IPA yang diteliti dan sikap guru IPA terhadap pembelajaran di kelas. Hasil survei menunjukkan bahwa 71,8% guru IPA memiliki sikap yang cukup positif terhadap seluruh skala ATTDs. Secara statistik tidak ditemukan efek interaksi yang signifikan antara ketiga variabel. Pengalaman guru IPA berinteraksi dengan ABK ditemukan sebagai aspek utama yang memberikan konstibusi signifikan pada perbedaan sikap guru IPA dalam memperoleh sikap positif untuk melibatkan ABK di kelas IPA reguler ( $p < 0,01$ ).*

## A. Introduction

Science teachers have a crucial responsibility for helping students learn science in schools. As educators, teachers play a major role in achieving the national education goals set out in the National Education System Act of the Republic of Indonesia of 2003, No. 20 in order to develop students' personalities, intelligence, character, and the skills needed to solve problems and become agents of change for the nation. Consequently, educators should possess competencies to teach not only content knowledge, but also the values, attitudes, and skills that students will require in their future lives (Abduh & Zainuddin, 2016).

In addition to paying attention to learning objectives, teachers also have to consider students' individual characteristics in order to ensure that each student's right to education is fully satisfied. The United Nations (UN) declared in 1948 that everyone has a right to education. Moreover, this basic idea was later reinforced by UNESCO in 1990 the Education for All (EFA) initiative in 1990, which aims for all children, young people, and adults to have equal opportunities to benefit from education designed to meet their basic learning needs. A further framework within the field of education (to be achieved by 2030), which has become one of the most important Sustainable Development Goals (SDGs), is SDG goal 4; this goal is "to ensure inclusive, equitable quality education, and promote lifelong learning for all." The main aim of this framework is to establish and promote quality education as a foundation for improving both people's lives and sustainable development (Osborn et al., 2015).

With regard to the diversity of students' characteristics, abilities, and limitations in science classrooms, the participation of teachers plays a fundamental role in building an inclusive environment and providing unique learning experiences to a diverse range of students. The concept of science contains knowledge related to natural events and the development of how science associated with technology is used in society has become an important part of the science curriculum in elementary, junior, and senior secondary schools. Therefore, science teachers must play a crucial role in teaching science concepts for all students can understand, including those who face barriers regarding their participation in science learning. For students with disabilities and as well as those with special educational needs (SEN), special education practices should be incorporated into science lessons (integrated science, physics, biology, and chemistry) in order to ensure there are equal opportunities for all students, as well as to maintain equal access to the required scientific literature.

Compared to previous generation, teachers in contemporary, inclusive classrooms, teachers face increased levels of pressure as their roles diversify, compared to previous generations (Subban & Sharma, 2005). While science teachers must be ready for diversity among their student groups; they are not yet prepared to handle students with SEN. Furthermore they are also required to be psychologically and practically prepared to take on the dynamic role of an inclusive educator (Mullen, 2001). Following this, the commitment and attitudes of teachers are very important when it comes to promoting inclusive practices in science lessons for diverse learners, including students with SEN. Therefore, this study aims to discover secondary school science teachers' attitudes toward teaching diverse student groups in general education classrooms and identifying elements that may influence teachers in a positive manner toward including students with SEN.

## B. Method

### 1. Participants

A total of 202 secondary school science teachers including integrated science, physics, biology, and chemistry teachers from public and private schools in Banjarnegara Regency, Indonesia were used as

the samples for this study. The age range of the subjects varied from 22 to 60 years, while the length of teaching experience was between approximately 1 and 33 years. The teachers also had varying levels of experience in terms of interacting with SEN students in their science classrooms: never, minimal (1 hour or less per month), some (2-10 hours per month), and considerable (11-80 hours per month).

## 2. Instruments

The instrument in this study was based on teachers' self-ratings produced by a questionnaire on the Attitudes Toward Teaching Diverse Students (ATTDS) instrument. The instrument was adapted from the Teachers' Attitudes Toward Inclusion Scale (TATIS), which was developed by Cullen, Gregory, and Noto (2010) and the Teachers' Attitudes Toward Teaching All Students (ATTAS-mm) scale, developed by Gregory and Noto (2018). The adaptation took into consideration the language used and limited the scale to five-point Likert scales (1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree). A total of 26 items were used, each of which had been previously applied in a pilot that tested 117 participants through an online survey of respondents in Indonesia.

Based on both principal factor analysis and Equamax using the Kaiser Normalization rotation method, four subscales were obtained to form components of teachers' attitudes toward teaching diverse student groups in general education classrooms. The reliabilities of both the subscales and the full scale exceeded 0.70, demonstrating good internal reliability (Table 1). The ATTDS instrument used in the pilot study was determined to be valid and reliable for measuring teachers' attitudes toward teaching diverse student groups.

Table 1

Reliability Analysis for Instrument's Full Scale and Subscales

Component	Title	$\alpha$ -score
Full Scale	Attitudes toward teaching diverse students.	.856
Subscale 1 (cognitive)	Teachers' perceptions and beliefs that all students can learn together in a general education setting.	.878
Subscale 2 (affective)	Teachers' concerns about including students with mild to moderate disabilities in general education.	.738
Subscale 3 (behavioral 1)	Developing personal and professional collaborations.	.706
Subscale 4 (behavioral 2)	Teachers' attitudes toward creating an inclusive environment.	.750

## 3. Procedures

The questionnaire was previously pilot tested and produced sufficient internal reliability to warrant its use in the survey study. The questionnaire was issued in order to capture teachers' attitudes toward teaching diverse student groups in general education classrooms as well as to learn about teacher-related variables that contribute significantly toward the differences in teachers' attitudes. These factors included a teachers' age, years of teaching experience, and personal experience of interacting with SEN students. Data collection through the questionnaire was conducted in two ways. First, the questionnaire was distributed to integrated science teachers through a science teachers' forum at the junior high school level. Second, the questionnaire was distributed to 10 senior high

schools in order to obtain data from physics, biology, and chemistry teachers in general education settings. The participants were informed of the survey study and were asked to fill out the questionnaire. The questionnaire was accompanied by a cover letter explaining the purpose of the study, information related to the study, and demographic information. The participants were volunteers, and each participant agreed to participate and complete the questionnaire without any obligation. The information was then collected personally from every participant, and used for research purposes.

#### 4. Data Analysis

Both descriptive and inferential statistical techniques were used to evaluate the data from the questionnaire in order to answer the research questions. The data were analyzed using SPSS 23.0 (IBM, 2015), and an average score was calculated for both the full scale and each subscale that constructed each science teacher's attitudes. Participants with higher mean scores ( $M > 3.8$ ) were considered to have highly positive attitudes toward teaching diverse student groups, while mean scores between 1.3 and 3.8 indicated moderate attitudes. Lower scores ( $M < 1.3$ ) were considered to indicate less positive or negative attitudes toward teaching diverse student groups.

A three-way ANOVA was used to examine the interaction effect among the three independent variables of teachers' age, years of teaching experience, and personal experience of interacting with SEN students. Moreover, through an analysis using the three-way ANOVA, both the interaction between two of the independent variables and the main effect of the teacher-related variables that contribute toward significant differences among the respective groups of teachers could also be revealed. For further analysis, Tukey's HSD post hoc test was performed to elucidate the exact differences among the demographic groups, which showed significant differences.

### C. Result and Discussion

This study was designed to investigate secondary school science teachers' attitudes toward teaching diverse student groups in general education classrooms as well as to determine the elements that may influence teachers in a positive manner toward including students with SEN. The results and discussion of this study are as follows.

#### 1. Secondary school science teachers' attitude

Based on the descriptive analysis results of this study, more than a half of science teachers in this study showed moderately positive attitudes toward teaching diverse student groups in general education classrooms ( $n = 145$ , 71.8%), while the other teachers ( $n = 57$ , 28.2%) displayed positive attitudes toward the full scale of the ATTD instrument. The results suggested that secondary school science teachers in the Banjarnegara Regency had relatively positive attitudes toward teaching diverse student groups in general education classrooms. The mean score regarding full scale fell in the 1.3 to 3.8 range, expressing responses somewhere between "uncertain" and "agree." Moreover, the mean scores for each subscale (subscales 1, 2, 3 and 4) were also explored to identify secondary school science teachers' attitudes regarding teaching diverse student groups in general education classrooms in greater detail based on factor analysis results (Table 2).

Most secondary school science teachers had a relatively healthy attitude toward teaching these students in general education classrooms as a means of implementing inclusive education. The result is in keeping with the findings of Ahsan, Sharma, and Deppler regarding a study conducted in Bangladesh (Ahsan et al., 2012). Some studies in Indonesia have shown that, generally speaking, primary school teachers have a positive attitude toward inclusion (Huroiyati & Paramitha, 2015;

Kurniawati et al., 2012; Maulia & Kurniawati, 2017), while further evidence of positive teacher attitudes has also been reported in other countries (Avramidis & Norwich, 2002; Leatherman1 & Niemeyer, 2005). In terms of specific subjects, Patkin and Timor have revealed that mathematics teachers tend to have positive attitudes toward inclusion of students with learning disabilities and special needs in mainstream classes (Patkin & Timor, 2010). A similar result was found by Mauerberg-de Castro et al., who demonstrated that physical education teachers held positive attitudes regarding the inclusion of students with disabilities in regular settings (Mauerberg-deCastro et al., 2013). by contrast, other studies from different countries have also indicated that general education teachers tended to have negative perceptions regarding inclusion (Forlin, 2001). Therefore, it is likely that teachers' attitudes toward inclusive education will continue to vary across different areas and can be influenced by many factors.

Table 2  
Results on the ATTDs Instrument based on the Teachers Survey by the Current Study

Subscale	M	Low		Moderate		High	
		n	%	n	%	n	%
Teachers' perceptions and beliefs that all students can learn together in a general education setting (Cognitive).	4.02	0	0	70	34.7	132	65.3
Teacher's concerns about including students with mild to moderate disabilities in general education (Affective).	3.02	0	0	185	91.6	17	8.4
Developing personal and professional collaborations (Behavioral 1).	3.95	0	0	84	41.6	118	58.4
Teacher's attitudes toward creating an inclusive environment (Behavioral 2).	3.17	1	.5	148	73.3	53	26.2
Full Scale	3.70	0	0	145	71.8	57	28.2

According to data analysis regarding the mean scores of the full scale and the various subscales, this study found that secondary school science teachers' attitudes are fairly good over all. The positive moderate attitudes of secondary school science teachers in this study may indicate that the reforms, which have taken place in 2004 in Indonesia with the implementation of supportive laws and, increased public awareness of the needs and rights of people with SEN, have influenced science teachers in the Banjarnegara Regency. Although the majority of teachers stated that it is essential for every student to be educated according to his/her level of development and in correspondence with their needs, the results showed that there were still prejudices with respect to students with SEN. One possible explanation of this result could be that those general teachers have less knowledge regarding the characteristics of students with different disabilities (e.g., physically or mentally, or with emotional-social behavior, or academic problems). Teachers in general education settings, therefore, need the support of school counselors or school psychologists, as well as the appropriate training needed to handle every student and develop practical educational activities.

## 2. Teachers' personal experience of interacting with SEN Students toward their attitudes

A three-way ANOVA was conducted to determine the interaction effects among the variables of teachers' age, years of teaching experience, and personal experience of interacting with SEN students,

as well as their attitudes toward teaching diverse student groups in general education classrooms. The results of the data analysis, showed that there were no statistically significant three-way interaction effects among teachers' age, years of teaching experience, and personal experience of interacting with SEN students ( $F(2, 201) = 2.27, p = .11$ ). There was also no significant two-way interaction effect of teachers' attitudes among the variables of age and years of teaching experience ( $F(6, 201) = 1.12, p = .35$ ); years of teaching experience and personal experience of interacting with SEN students ( $F(8, 201) = 0.73, p = .67$ ), or age and personal experience of interacting with SEN students ( $F(8, 201) = 0.90, p = .52$ ).

Moreover, there was also no statistically significant difference in the mean score for teachers' attitudes toward teaching diverse students in general education classrooms among groups of teachers with different ages ( $F(4, 201) = 0.79, p = .54$ ) and years of teaching experience ( $F(4, 201) = 1.56, p = .19$ ). However, there was a main effect for teachers' attitudes, shown by statistically significant differences, among groups of teachers who had different levels of experience in interacting with SEN students ( $F(3, 201) = 11.60, p = .00$ ) as shown in Table 3.

Table 3  
The Significance Levels in Three-Way ANOVA for the Effects of Teachers' Ages, Years of Teaching Experience, and Personal Experience with Students with SEN

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	14.31 <sup>a</sup>	39	0.37	2.65	.00
Intercept	721.78	1	721.78	5210.64	.00
Age	0.44	4	0.11	0.79	.54
Teaching Experience	0.87	4	0.22	1.56	.19
Interaction with SEN Students	4.82	3	1.61	11.60	.00
Age * Teaching Experience	0.93	6	0.16	1.12	.35
Age * Interaction with SEN	1.00	8	0.13	0.90	.52
Teaching Experience * Interaction with Students with SEN	0.80	8	0.10	0.73	.67
Age * Teaching Experience * Interaction with Students with SEN	0.63	2	0.32	2.27	.11
Error	22.44	162	0.14		
Total	2807.31	202			
Corrected Total	36.748	201			

Note. a. R Squared = 0.39 (Adjusted R Squared = 0.24)

Multiple comparisons with Tukey's HSD post hoc test revealed that THE group containing science teachers with no experience of interacting with SEN students ( $M = 3.93, SD = 0.45$ ) in their classrooms had significant differences compared with both the group that had minimal time (1 hour/month) interaction experience ( $M = 4.15, SD = 0.41$ ) and teachers who had considerable (more than 10 hours/month) interaction to the students with SEN ( $M = 4.54, SD = 0.52$ ). The other findings

showed that the group of the science teachers who had minimal time (1 hour/month) interaction experience with students with SEN ( $M = 4.15$ ,  $SD = 0.41$ ) had significant differences compared to both the group of teachers that had some (2-10 hours/month) interaction experience ( $M = 3.59$ ,  $SD = 0.68$ ) and the group that had considerable interaction experience (more than 10 hours/month) to the students with SEN ( $M = 4.54$ ,  $SD = 0.52$ ). The group of teachers who had some time (2-10 hours/month) interaction experience to the students with SEN ( $M = 3.59$ ,  $SD = 0.68$ ) also had statistically significant differences compared with the group of teachers that had considerable interaction experience to the students with SEN ( $M = 4.54$ ,  $SD = 0.52$ ).

Data analysis revealed that there were no statistically significant interaction effects among age, years of teaching experience, and personal experience with SEN students ( $F(2, 201) = 2.27$ ,  $p > .05$ ). The findings also showed that there was no statistically significant difference in the mean scores concerning teachers' attitudes toward teaching diverse student groups in general education classrooms between groups of teachers with different ages ( $F(4, 201) = 0.79$ ,  $p > .05$ ) and years of teaching experience ( $F(4, 201) = 1.56$ ,  $p > .05$ ). Indeed, in previous studies, the relationship between these variables and attitudes has been inconsistent and the results have varied. Dukmak & Emirates found that there was no relationship between teachers' attitudes toward inclusion and their age (Dukmak & Emirates, 2013). However, this finding also showed that teachers' years of experience were negatively correlated with their attitudes toward inclusion. Dapudong found that there was no significant difference regarding teachers' attitudes toward inclusion when grouped according to age and teaching experience, a result that was replicated in this study (Dapudong, 2014). The findings of Dapudong implied that young and old teachers with either shorter or longer periods of teaching experience could hold either very favorable or unfavorable attitudes toward inclusive education for children with special educational needs (Dapudong, 2014).

Forlin, Loreman, Sharma, and Earle, indicated that prior teaching experience showed significantly more positive attitudes among teachers, but that the age of pre-service teachers produced no significant differences regarding attitudes (Forlin et al., 2009). Moreover, some studies, Center & Ward (1987); Berryman, (1989); Clough & Lindsay, (1991), have revealed that both younger teachers and those with little teaching experience have a supportive attitude toward integration (Avramidis & Norwich, 2002). Furthermore, teachers with less working experience have been shown to display more positive attitudes toward inclusion than teachers with higher levels of working experience (Barnes & Mercer, 2005; Todorovic et al., 2011).

A significant difference was found in the independent variable of teachers' personal experience of interacting with SEN students ( $F(3, 201) = 11.60$ ,  $p < .05$ ). Tukey's HSD post hoc test revealed a significant difference between different groups of teachers regarding the variable of personal experience in interacting with students with SEN. The significant interaction effect of people with SEN was found to be a strong predictor of the high level of perceived teaching-efficacy, indicating a lower degree of concern. Avramidis and Norwich (2002) have described how, in keeping with the teachers' implementation of an inclusion program for students with SEN, the teachers' attitude is more positive. Ahsan, Sharma, and Deppeler's study supported the findings of this study, stating that: as the level of experience in handling students with SEN increased, teachers' degree of concern decreased (Ahsan et al., 2012). Moreover, according to Sharma et al., interactional experience with people with SEN was found to be a strong predictor that contributed toward positive attitudes (P. Sharma et al., 2003). A significant interaction effect of SEN support forms a positive attitude among teachers regarding inclusion, while also indicating a lower degree of concern. Other studies (Forlin et al., 2009; Sharma et al., 2008) have also supported the findings that teachers with previous contact experience or teaching experience with SEN students have positive attitudes and fewer concerns regarding inclusive education (Forlin et al., 2009; U. Sharma et al., 2008).

## E. Conclusion

Based on the above discussion, the data revealed that 145 science teachers (71.8%) in the Banjarnegara Regency appeared to have moderately positive attitudes concerning the overall idea of teaching diverse student groups in general education classrooms. The results also showed that there were no statistically significant interaction effects with regard to teachers' ages, years of teaching experience, and personal experience of interacting with SEN students. Of these three factors, teachers' of interacting with SEN students was found to be the main factor that contributes to producing a significant difference in teachers' acquiring positive attitudes toward involving these students in regular classrooms. In future research, improvements based on factors pertaining to specific schools and their students are needed. In addition, comparative studies are also required among teachers who teach both science and other subjects.

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