



# Reflection on Student Collaboration Skills Assessment by Biology Teachers

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**Abstract:** Collaboration skill is a skill possessed by a person to work effectively in a team to achieve specific goals. Collaboration skills become essential for students to master because these skills become provisions for students to face global competition and improve social aspects. This study aims to identify how teachers measure student collaboration skills in biology at high schools in the Surakarta region. The research conducted was survey research with 76 Biology teachers in Soloraya consisting of 23 private school teachers and 53 public school teachers. The instrument used was a questionnaire in the form of a data collection form developed from collaboration skills based on NEA and P21. Analysis of questionnaire data using Rasch modeling. The analysis result shows that the item has a good reliability with a KR-20 value of 0.9. Based on the results of data analysis, biology teachers at public schools took more collaborative skill measurements of students than in private schools, especially in the aspects of responsibility and other respects.

**Keywords:** Assessment; Blended learning; Collaboration skill; Rasch model

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## Introduction

Studies conducted by Trilling and Fadel (2009) show low competence of graduates up to high school level in terms of communication, critical thinking, professionalism, collaboration, technology utilization, project management, and leadership. This fact is supported by ASEAN business outlook survey 2014 data which shows that Indonesia is one of the leading destinations for foreign investment. This fact indicates that Human Resources (HR) in Indonesia has low expertise. Therefore it is necessary to have an education program that produces graduates with high-level skills (Oganisjana, 2015). Graduates with high-level skills encourage Indonesia to create superior products (Bikard et al., 2015).

A superior product cannot be produced individually but through collaboration to create a discussion atmosphere that fosters critical thinking and gives rise to creativity (Koebele, 2020). Individuals cannot make a superior product alone because they

cannot become experts in all fields and require collaboration to produce it (Kivunja, 2014). Therefore, collaboration skills are a crucial aspect for the next generation of the nation to create superior products that boil down to the progress of Indonesia.

Collaboration is the process of interacting with multiple people through negotiations, both formally and informally, who are together, relate to each other, and share the benefits of planning for or solving a problem (Ching, 2020). A person in this interaction must have good collaboration skills so that the existing exchange can run well and achieve goals.

Collaboration skills are trained in education with a collaborative approach that aims to build their knowledge through dialogue, exchanging ideas and information to improve students' mental abilities in collaborating (Ober et al., 2017). Collaboration-based teaching can be described as learning by dividing students into small groups to achieve the same goal or solve a problem. The critical thing to note in collaboration-based learning is that students solve the

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same problem, not solve the fragmented parts of the problem. Thus, students learn to work together to understand concepts with other students in solving a problem (Fu & Hwang, 2018).

Collaboration training students need to be evaluated to know the success of education in practicing collaboration skills (Kaendler et al., 2015). According to the OECD (2003), assessments in the Program for International Student Assessment (PISA) are designed to describe students' level of ability to deal with, structure, explain, and solve problems effectively. Therefore, evaluations on collaboration skills aim to gather evidence of students' skills related to collaboration skills in problem-solving in groups.

Based on NEA (2012) and P21 (2011), indicators of collaboration skills include responsibility, respecting others, contribution, organize work, and work as whole team. Responsibility, which is the sense of responsibility that each member of the group has in carrying out their role to achieve common goals. Respecting others, i.e., mutual respect and respect for opinions, decisions, and roles that group members have carried out. Contribution, i.e., member participation in achieving group goals. Organize work, i.e., the division of member roles, and determine clear policies in teamwork. Working as a whole team, all members work together and perform their roles as part of the team, not working individually.

Based on the theory presented, the importance of assessing collaboration skills can be known so that research is carried out to determine the implementation of the assessment in school. This research aims to identify the assessment of collaboration skills that teachers have done in biology learning in high school in Surakarta.

**Method**

Research conducted is a survey study analyzed using quantitative descriptive analysis techniques. Survey research is conducted by taking samples from one population and using questionnaires as a primary data collection tool. At the same time, quantitative descriptive analysis is an analysis that is done by describing the size, number, or frequency. The study subjects consisted of 76 Biology teachers in the Surakarta karesidenan area, including Surakarta City, Boyolali Regency, Sragen, Ngawi, Klaten, Sukoharjo, and Wonogiri, composed of 23 private school teachers and 53 public school teachers. The selection of samples is made by random sampling.

Data collection is done by giving a questionnaire about assessment collaboration developed based on the collaboration skill indicators according to NEA (2012) and P21 (2011), which consists of responsibility, respect for others, contribute, organizing work, and work as a

whole team. Questionnaires in the form of questions related to the assessment carried out by teachers in learning activities on aspects of collaboration skills.

The characteristic aspect collected is the status of public or private schools. The scale used to measure variables is the Likert ranking scale with four answer options. The definition and measurement of these variables is the difference in ideal conditions to assess student collaboration skills with the condition of assessment of collaboration skills in the field. The data obtained were analyzed using the Rasch model. Rasch modeling is an analytical tool that can test the validity and reliability of research instruments and test the suitability of persons and items simultaneously. Rasch's model is used to analyze the response of the problem item and the relationship between the teacher's response to the questionnaire and the difficulty level of the problem item. The instrument is designed from satisfactorily defined variables, then identified the relevant constructs (Sumintono, 2014).

Rasch may also review items according to statistics, revise items if necessary, and establish validity and reliability claims for problem instruments. The results of the reliability analysis can be seen using the Winsteps program in the Summary Statistics table. The table can provide comprehensive information about the quality of teacher response patterns and the relationship between teachers and items. Reliability values between teachers and questionnaire items can be determined using Table 1.

**Table 1:** Standard of Item Reliability

Range	Category
< 0.67	Poor
0.67 - 0.80	Fair
0.80 - 0.90	Good
0.91 - 0.94	Very Good
>0.94	Excelent

The measurement data on the form is ordinal scale data, then converted into an interval scale using Rasch modeling using Winstep software. Rasch modeling addresses the problem of data intervarity by accommodating logit transformations by applying logarithms to the odds ratio of raw data obtained from respondents (Hashim et al., 2020). Univariate analysis of the study showed how much teacher assessment of collaboration skills was done in the field judging by wright's map distribution of items and persons resulting from Rasch modeling. The validity results can be known through the Outfit order table to see the suitability of items that function in standard categories to measure the level of understanding and implementation of collaboration skills assessment by teachers with due regard to the requirements in Table 2.

**Table 2.** Item Validity Criteria in Rasch Model

Standard	Limit
Outfit Mean Square (MNSQ)	0.50 < MNSQ < 1.50
Outfit Z-Standard (ZSTD)	-2.00 < ZSTD < +2.00
Point Measure Correlation (Pt Mean Corr)	0.40 < Pt Mean Corr < 0.85

**Result and Discussion**

Respondents to this study amounted to 76 people with public/private school status characteristics Table 3. According to table 3, teachers teach biology in private schools 23 people (30.30%) and public schools 53 people (69.70%).

**Table 3.** Responden Characteristic

Variable	Responden (%)
Public High School biology teacher	69.70
Private High School biology teacher	30.30
Sum	100.00

Summary of instrument analysis statistics in general (data summary statistics) using winstep software is presented in Table 4.

**Table 4.** Summary Statistic

	Information	Score
Reliability	Person Reliability	0.88
	Item Reliability	0.98
	Alpha Cronbach	0.89
Outfit MNSQ	Person	0.97
	Item	0.97
Outfit ZSTD	Person	-0.30
	Item	-0.30

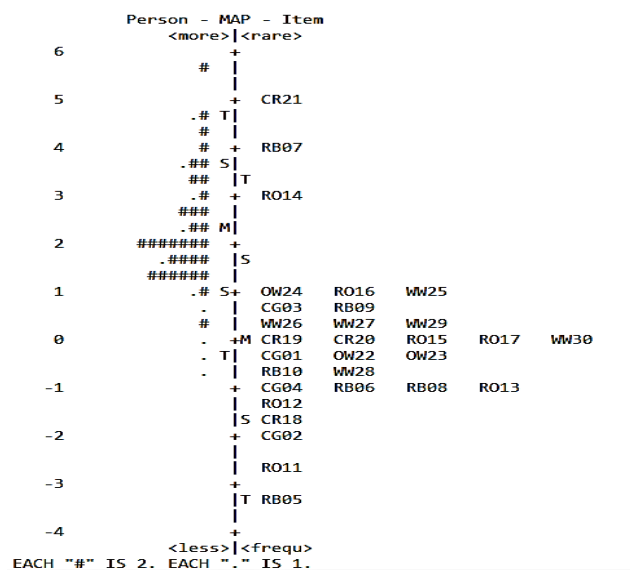
The table shows the person reliability value (person reliability) in the entire trial is worth 0.88, which means the reliability of respondents on trial is relatively high. The reliability of the item in the table shows a value of 0.98 which means the quality of the instrument used in data retrieval has good reliability. Cronbach's Alpha score in the trial was 0.89, which means the interaction between the respondent and the assessment instrument as a whole is quite good. Another magnitude shown in the table is the Outfit Mean Squared (Outfit MNSQ) value of 0.97 in both the person and item columns. The value of 0.97 is included in the fit criteria, located between intervals of 0.50<MNSQ<1.50. The instrument used follows the model to measure teacher understanding in a collaboration skills assessment.

The ideal ZSTD Outfit value is close to 0 or is between an interval of -2.00 <ZSTD< 2.00, which can be interpreted as data having a possible rational value. The test results in the table showed the ZSTD outfit values -0.3 in the person column and -0.3 in the item column. Based on these values, it can be interpreted that the overall instrument has been following the Rasch model and can measure the teacher's understanding in the assessment of collaboration skills.

Based on the results of the data analysis, it shows that the instrument construct is valid to obtain a level of conformity between the teacher's response and the instrument. The requirement to know whether the item is accepted or not by looking at the MNSQ scale with a range of 0.50 < MNSQ < 1.50. The results showed that 27 items were received. In comparison, the other three items were not eligible, so it can be concluded that there was a teacher's misconception in understanding the question on the questionnaire given. Therefore, a reduction is made on the response against the invalid item to keep the data valid.

The teacher's response to the item can be seen in figure 2, which shows most respondents are above the average logit item (+0.00 logit) of 74 people (97.30%) respondents. That means that 74 respondents have done and understood the importance of assessment of collaboration skills to be done by teachers in 21st-century learning. It becomes important because 'building knowledge,' according to Bereiter (2002), is a leading model in developing 21st-century skills (Scardamalia et al., 2012). In the building knowledge community, the concept of 'embedded and transformative assessment' has been proposed by Y. Matsuzawa et al. to assess knowledge-building activities, one of which is assessing collaboration skills.

Figure 1 shows the left column is the person column, and the right column is the item column. Items above the average logit value of an item (+0.00 logits) mean that the item is relatively difficult to approve by the respondent. An item below the average value of the item logit implies that the respondent easily approves the item. Items that are difficult to agree by respondents indicate that most respondents rarely make statements on such items. Teachers who do not answer correctly on certain category items do not conduct assessments on aspects designated by the item.



**Figure 1.** Wright Map

Based on Figure 1, problematic statements are CR21, RB07, and RO14 items. The following items that fall into the category are difficult to approve by respondents presented in Table 4.

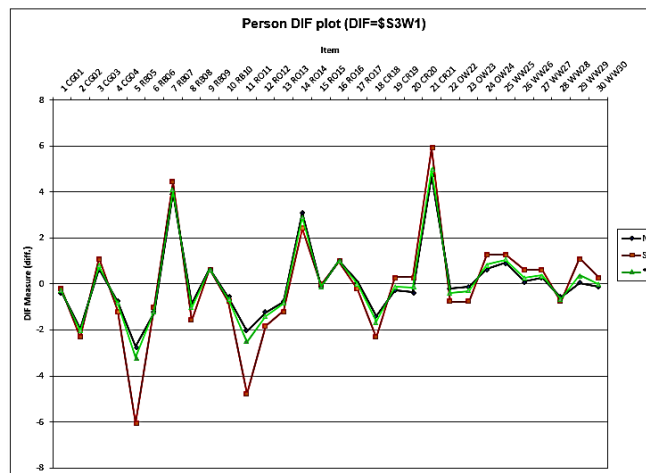
**Table 5.** Hard Categorized Item

Item Code	Collaboration Skill Aspect	Descriptor
CR21	Contributes	In my opinion, passive students in group activities are child characters that cannot be changed.
RB07	Responsibility	The problem for me is if there are students who are late in completing their assignments in a group
RO14	Respect Other	I think mutual respect in-group members will not grow based on students' character if not trained.

Based on Table 4, it can be known that: first, most respondents consider that passive students in group activities are an irreversible character. Second, the respondent less discipline, even though discipline is a form of responsibility that must be trained to students and is one form of student responsibility. Third, the majority of respondents consider that mutual respect between group members can be trained.

evenly. There are no aspects that are measured thoroughly or aspects that are not measured at all.

The assessment of collaboration skills conducted by all respondents with the characteristics of public and private schools did not produce a significant difference. The difference in assessments made can be seen based on Figure 3.

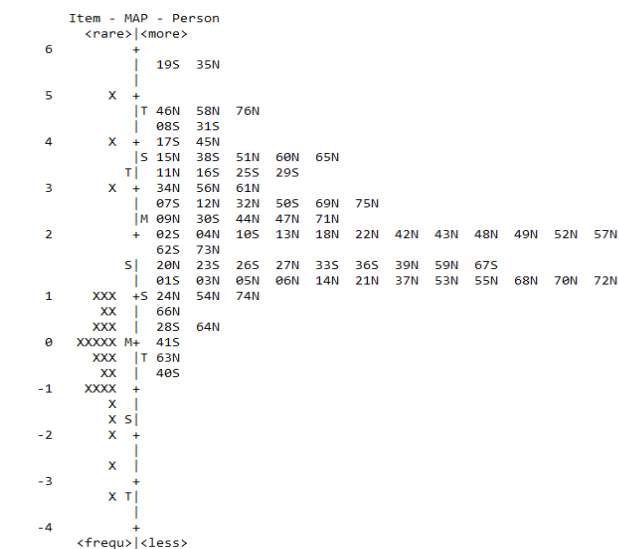


**Figure 3.** Person Differentiation Graph

Based on Figure 3, it can be known that questions on items that can be answered by teacher respondents who teach in public and private schools have similar results, and there is no significant difference. Slight differences are found in RB05, RO11, and WW29 items, namely in aspects of responsibility, respect others, and working as a whole team, but in the same element on other items are almost the same, so there is no significant difference. This equation means that items are easily answered by private and state teachers with the same difficulty level. The same difficulty level showed that the teachers' assessment of collaboration skills conducted by private and state teachers was almost the same.

**Conclusion**

The study concluded that middle and high school teachers in Solo and surrounding areas had conducted assessments of learners' collaboration skills in every aspect. The assessment of collaboration skills taught by middle and high school teachers is not much different. Respondents have also understood the importance of assessment of collaboration skills in this global competition of the 21st century. To support the assessment of student collaboration skills, development needs to be developed tools to measure student collaboration skills and the improvement of teacher competence in assessment and collaboration skills improvement.



**Figure 2.** Item Distribution

Based on Figure 2, it can be seen that the distribution of public and private teacher respondents is evenly distributed. There is no advantage among public or private schools in assessing student collaboration skills conducted. In general, the understanding and strengthening of student collaboration skills that teachers have done in every aspect have been done



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