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Construction of Measurement and Investigation of the Role of Classroom Climate on Students' Knowledge and Attitudes in the Learning Process

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Abstract. The learning climate in the classroom has a very important role in encouraging optimal learning processes in the classroom. The purpose of this research is to look at creating measurements of classroom climate, investigate the aspects that influence it and the role of classroom climate in citizenship education lessons in terms of students' knowledge, attitudes, and behaviour. This study was a factorial design analysis investigating the role of citizenship education classes in classroom climate, students' knowledge, skills, and dispositions. The sample was conducted on 650 junior high school students with a total of 50 classes. Data analysis used was variability correlation and hierarchical linear model analysis. Findings show that a classroom climate with open discussions has proven effective in improving student learning outcomes in citizenship education subjects, both in the aspects of students' knowledge, attitudes and behaviour. Several aspects that influence the level of reliability of measuring classroom climate are the gender composition in the class, the level of student activity, individual perceptions of learning opportunities, the socioeconomic level of students, the level of student knowledge about citizenship education, and differences in views about class material. Thus, an open classroom climate is able to increase student competence in the field of citizenship education and the reliability of the classroom climate is influenced by various factors, including student characteristics at both the individual and class levels. This research has several limitations, including the survey only focusing on students, not involving variability factors from outside the classroom, and not optimally controlling aspects of student response variability. The findings implied that teachers and stakeholders must pay attention to factors that influence the reliability of classroom climate in order to optimally improve academic competence.

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1. Introduction

The classroom climate created by teachers has a very important role in improving students' knowledge competence and attitudes. A quality classroom climate in every learning process will greatly determine student competency. One of these is the civics education learning process which facilitates students not only being able to understand civics education material, but also facilitating them to have good civic attitudes and character. Citizenship education is given to students from elementary school to university with the aim of preparing students to become effective citizens and actively involved in their roles as citizens either in the community or actively contributing to the country (Licul & Jurišević, 2022; Maurissen et al., 2018). In order to produce these student outputs, the climate of the learning process in the classroom is a very important aspect in encouraging students to develop their potential in citizenship education subjects, which includes the development of knowledge, skills and civic dispositions. Classroom climate is defined as the impressions, beliefs and desires of the learning process situation of teachers and students (Persson & Svensson, 2017; Rapa et al., 2022). Classroom climate in citizenship education means a positive classroom climate and is able to promote students to enter classroom situations and have knowledge and skills in citizenship education classes (Campbell, 2019). How then is classroom climate in the field of citizenship education assessed by relating individual involvement in community life?

The theory of classroom climate involvement is one part of the social environment that is taken into consideration in assessment. Apart from that, classroom climate also plays a role in developing students' potential. The method that can be used to assess classroom climate is to reveal each student's perception of the classroom climate they experience (Beld et al., 2021; DiCarlo et al., 2020). However, analysis of individual student perceptions has not been able to present the climate of the citizenship education classroom comprehensively. In contrast to the perception investigation method, students as a group will be better able to assess the classroom climate comprehensively (Ingemarson et al., 2020; Isac et al., 2014). Consideration of class impact using a multilevel linear model by placing students in classes will be able to reveal the role of class climate, the aspects that influence it, and the impact that class climate has on students' abilities. Therefore, creating quality classroom climate measurements at the classroom level is a very important aspect in establishing quality classroom climate indicators. Creating classroom climate measurements can be done by assessing the level of reliability and validity of scores resulting from assessing aspects of openness in classroom climate. This aspect of openness is the extent to which diversity of opinion in discussions is encouraged and respected in the classroom (Persson & Svensson, 2017; Reichert, 2022). Combining these steps can be used as a benchmark in assessing classroom climate in a more general context.

Although previous classroom climate studies have demonstrated consistency across items within the scale, they have not uncovered other potential sources of variability that may influence the strength of agreement of students' perceptions within the classroom. Aggregate perceptions will not be reliable if each student gives a different perception (Laninga-Wijnen et al., 2021; Verlie & Blom, 2022). This is different from the perception of students in the class who have similarities or agreements. The differences in perceptions that arise among students are caused by differences in individual views of the classroom climate. Therefore, consistent classroom climate measurement criteria are needed. Students who have high aspirations in class tend to have a greater interest in politics and tend to study social studies more intensively (Persson & Svensson, 2017; Shewark et al., 2018). The main aim of classroom climate analysis is to examine the impact of classroom diversity on the level of civics education knowledge by paying attention to ethnic or racial aspects as predictor variables (Glaesser et al., 2023; McLure et al., 2022). There are several aspects that influence variations in individual student perceptions of classroom climate. Examination of individual level variables using classroom experience reports is useful in finding sources of variability in improving the quality of classroom climate. Based on a conceptual basis, classroom climate is a predictor of students' level of knowledge and skills in a particular field. One of the reasons for increasing students' knowledge and skills is students' comfort in the classroom climate so that they are encouraged to express ideas in class discussions (Bayram Özdemir & Özdemir, 2020; Laninga-Wijnen et al., 2021).

The most important aspects in reporting classroom climate are students' learning opportunities in participating in formal discussions in discourse and the ability to collaborate with other students. This participation and ability to work together are used as predictors of student engagement and perceptions of classroom climate. Aspects of within-class variability can explain differences in student participation in classroom activities or in variations in students' previously acquired experiences related to learning material. Each student can view a classroom as open or less open because of the experiences they gain when they discuss political or civic topics with other students or can also be influenced by the responses of other students in responding to their opinions or views (Hadianto et al., 2022; López et al., 2018). Apart from demographic factors and experiences that influence the classroom, this classroom analysis is very helpful in understanding the criteria or indicators for measuring reliable classroom climate. The aim of the current research is to examine the climate of citizenship education classrooms and the quality of classroom climate measurements as determined by internal consistency in measurement. Climate scale scores are used at the individual and classroom levels. Cronbach's alpha is used as an aspect of the reliability of measuring classroom climate. However, using Cronbach's alpha as a means for considering the reliability of perceptions in classroom climate is felt not capable of considering inter-rater reliability in regard to classroom climate (Lombas et al., 2019; Makri et al., 2020). Therefore, in this study, researchers used a multilevel linear model strategy to test the reliability of aggregate assessments precisely and accurately.

The difference between this research and previous research is that previous research focused on aspects that influence the quality of classroom climate. However, the current research not only examines variables that influence classroom climate, but also provides an overview of the construction of classroom climate measurement and investigates the role of classroom climate on knowledge and attitude competencies in citizenship education lessons. This research also provides an overview of indicators of open and less open classroom climates which can be used as a guide by teachers. The researchers formulated several research objectives in this study, namely a) formulating a measurement of the reliability of measuring classroom climate in the learning process, b) investigating students' views on the description of open and less open classrooms in the learning process, c) investigating contextual characteristics that influence the level of classroom climate reliability, d) investigating the role of classroom climate in students' knowledge competence, attitudes and behaviour regarding citizenship education.

2. Literature Review

Previous studies reviewed the role of primary and secondary level schools towards four categories of outcomes that correspond to student roles, namely civic knowledge, social attitudes, attitudes towards participation as citizens, and student participation in responding to political situations. The study also analyses two factors, namely school factors and classroom factors which have a relationship with socio-political studies (Shewark et al., 2018; Verlie & Blom, 2022). Based on theory, classroom climate is defined as the interaction between the teacher and other classroom members and what is most important is the impact of teaching, not who and what is taught to students (Khalfaoui et al., 2021; Zitzmann et al., 2022). From this study, it can be concluded that an open classroom climate will encourage students to give their opinions on controversial issues in accordance with better knowledge, beliefs and abilities so as to minimise alienation and cynicism regarding the field of citizenship education among students. Other research strengthens the study of classroom climate and also analyse classroom climate from aspects of frequency rather than quality and discussion of topics (Deemer & Smith, 2018; McLure et al., 2022). These two studies complement each other and are used as a basis for conducting a comprehensive classroom climate assessment. As current studies develop, multilevel modelling techniques emerge to analyse classroom climate as a multilevel problem by analysing the classroom impact on students. Apart from that, schools currently also have an important role in community life, especially instilling citizenship education in students from an early age to prepare students for life in society.

Another study that examines citizenship education assesses the civics knowledge, skills, and participation of elementary and middle school students in civics discussion activities in their classes. Other studies that focus on the field of citizenship education show that an open classroom climate occurs during political discussions in a way that involves all classes. The research findings showed that all students involved were responsible for their arguments and did not appear awkward (Beld et al., 2021; Venkatesh & Bagley, 2022). The experiences of students involved in this discussion reported their abilities

related to students' civic knowledge and students' feelings when participating in the classroom climate. Students who participated in this classroom climate showed better civic knowledge scores, compared to students who were not involved in this classroom climate (Bush et al., 2018; DiCarlo et al., 2020). From several of these studies, the researchers conducted a secondary analysis of the impact of an open classroom climate on students' knowledge levels and communication methods in the classroom.

The majority of current research uses multilevel modelling techniques by investigating individual perceptions of classroom climate in the learning process. This perception approach has also been widely used to test multilevel models of community participation using other data. Multilevel consideration of classroom climate demonstrated better performance of the developed model predicting students' knowledge of citizenship in a sample of students. Classroom climate is assessed using two methods, namely assessing perceptions at the individual level and student perceptions at the class or school level (Ingemarson et al., 2020; Zitzmann et al., 2022). At the student level, open classroom climate assessments are used as a benchmark for individual reporting. At the school level, average student reports were analysed and an average classroom climate scale was formed. A similar approach was also taken in another study, namely an assessment of contextual factors related to the gap in civic participation between male and female students from several countries (Laninga-Wijnen et al., 2021; Sampermans et al., 2021). Also, through this perception approach, other research can develop models of applying the principles of the community practice framework to obtain an overview of the level of community participation as citizens in several countries such as America, England and Australia. Other researchers use this approach, but adjust for individual and group classroom climate measures that display both orthogonally in regression models.

An approach that combines individual and school climate perceptions is able to explain variations in civic knowledge from almost 30 countries. This open classroom climate is related to a number of competencies that are appropriate to the student's age, such as the role of social attitudes, the role of students in society, and student participation in class. In addition, the classroom climate also encourages students to increase their civic knowledge (Shewark et al., 2018; Stack Hankey et al., 2019). The classroom climate is also able to open up students' views on their roles as men and women in society. Classroom climate is also related to students' views on resolving conflicts in society. An open classroom climate encourages students to provide opinions that have different points of view on the issues presented (Verlie & Blom, 2022). School, class and individual level variables have a relationship with three aspects of citizenship education, namely political interest, political efficacy, and students' political beliefs. The data were obtained from several previous studies (Persson & Svensson, 2017; Reichert, 2022). In other studies, open classroom climate was included as a school-level measurement variable. Findings indicate that this classroom climate has a positive relationship with students' beliefs in government (Lombas et al., 2019; Makri et al., 2020).

This perception analysis was carried out on the objective structure of the classroom climate. The reliability of this aggregate measure of class goals uses both item-level and individual-level reliability. Reliability at the item level is the variation in individual responses to classroom climate assessment items; individual-level reliability includes variation between individuals within a class. This approach is considered appropriate by considering the structure of the classroom climate study with items generated from each individual in the class (Campbell, 2019; Sönmez & Betül Kolaşınlı, 2021). The results of this assessment can be used to test the level of reliability more accurately than internal statistics. The aim of this research is to examine the psychometric properties of classroom climate measurement indicators in the field of citizenship education studies as reported by students. The correlation of these measures is the main result in determining the level of climate in citizenship studies. As such, this study aims to analyse student reports about classroom climate expectations and opportunities. The report is used as a reliable and valid indicator of classroom climate measurement in this research. In detail, the researchers formulated several research objectives including measuring classroom climate in citizenship education studies reliably at the class level, investigating aspects that influence the reliability of classroom characteristics, the influence of student variability from aspects of student characteristics such as student achievement and discussion experience, and the role of student variables at grade level in predicting competency in knowledge, skills, and discussion of fields of study.

3. Method

3.1 Research Design, Participants and Instrument

This research uses a factorial design analysis method to examine variables that can influence classroom climate and its role in knowledge competence, attitudes and behaviour in the field of citizenship education. To facilitate analysis, the research used a hierarchical linear model to reveal all variables that influence each other between variables that influence the quality of classroom climate and the role of classroom climate in regard to knowledge, attitudes and behaviour in citizenship education classes (Verlie & Blom, 2022). Participants in this research were junior school students with a total of 650 students consisting of 50 classes. Data collection techniques used surveys on students' knowledge and attitudes towards citizenship topics. Next, items were prepared to investigate students' level of knowledge and skills in interpreting citizenship information. The items used were adapted to the education level of elementary and middle school students. Sampling was carried out randomly in selecting the schools and classes of students in this study. Students were given a test of civic knowledge and ability to understand political information with a total of 40 items and a test for intermediate level students totalling 40 items with a higher level of difficulty. This instrument was also used to survey student attitudes and behaviour. Sample weights were used to assess student competency and additional data from civics education administrators and teachers were used to draw conclusions.

3.2 Data Collection Process

3.2.1. Data scale for the citizenship education study

Data collection and development of measurement criteria were carried out over a fairly long period of approximately one year. The development of this scale was carried out based on the assessment of knowledge and community involvement developed by Schulz and Sibberns (2004). The results of the development of the classroom climate measurement scale obtained 15 scale items for assessing students' knowledge and involvement in the classroom. The scale was developed using confirmatory factor analysis, a technique used to test hypotheses. Apart from that, item response theory techniques were also used in creating the classroom climate scale. Creating a scale using response theory techniques (IRT) will make it more likely to estimate missing responses and make it easier to compare between groups on a scale using modern reinforcement theory. Item response scale theory is widely used to measure student competencies related to an open classroom climate.

3.2.2 Measuring classroom climate

The main assessment in this research is an assessment of students' perceptions of the classroom climate they experience (Beld et al., 2021). Surveys of civic education studies also provide items assessing student attitudes and behaviour. A 5-point Likert scale was used. Examples of items in the attitude scale are "students have the freedom to openly express opinions that disagree with social and political issues" and "teachers require students to memorise concepts and definitions". Fifteen items reveal students' perceptions of class activities. Confirmatory factor analysis was used to analyse two aspects of classroom activities in the scale creation process. First, an open classroom climate in discussion activities consisted of seven items. The main focus was on measuring classroom climate using citizenship education learning process data. The scale for measuring classroom climate in learning activities contained items similar to observing students' activeness in participating in all class activities and events. Identification of the two dimensions of classroom activities was carried out separately based on student responses. This identification provided a picture of discriminant validity that was able to explain perceptions of classroom climate and the intensity of teacher- and student-centred activities. This analysis focused on the openness of the class climate in discussion activities. The focus on this scale is based on conceptual points of view and methodological aspects. The perspective aspect is a scale measuring activities that are considered important and represent activities that can create a classroom climate in the civics education learning process. The methodological aspect is that the scale on classroom activities uses internal consistency with a = 0.675.

3.3 Data analysis

3.3.1 Secondary analysis of the results of the citizenship education competency survey

Secondary analysis was carried out on data on the value of citizenship education that had been carried out and used to analyse more specific competencies. The benefit of this analysis is to support the accuracy of assessing citizenship education competencies. Survey items to assess competency were also conducted to obtain broad information. The thoroughness of procedures and scale creation in civic competency studies is able to provide comprehensive and

high-quality data about the nature of students' civic and political involvement (Barksdale et al., 2021). Collecting the data s requires a lot of time, but studies of competencies in previous fields of study are often used as analysis material in many studies. Although civic education study data were conducted, classroom climate measurements were conducted to more comprehensively reveal students' experiences in the classroom.

3.3.2 Primary data analysis

The primary data analysis was carried out in accordance with the problem formulation proposed in this research. The following is the data analysis used in each problem formulation in this research. To answer the first problem formulation, researchers used the reliability of classroom climate measures. The researchers used an unconditional three-level hierarchical linear model by placing scale items (level 1) at the individual student level (level 2) calculated at the class level (level 3). The analysis model to answer the first uses: Y ¼ c000 þ u00 þ r0 þ e ð1Þ. Y is the student's score on the class climate item, c000 is the overall average score of all students at grade level and all scales, u is the error that cannot be explained by grade level, r is the error that cannot be explained by a particular student, and e is errors on certain scale items. This model and the multilevel model in this study were analysed using HLM 6 software. This hierarchical linear model application provides a statistical level of reliability for each measurement. Reliability measurements are also used to answer the first problem formulation. Consideration of variability at three levels of analysis and the average number of each student and at class level is used to answer the first problem formulation. Considering students' perceptions in the classroom for assessing reliability and calculating reliability coefficients and item variability can make the lambda coefficient a more precise and accurate measurement criterion for internal consistency compared to calculating Cronbach's alpha coefficient. This analysis uses perception data at the student level and is given grades according to the age level of students at the primary and secondary levels to be able to represent the population.

To answer the second problem formulation, researchers conducted covariate analysis at the student level with the aim of getting an alternative picture of why students consider classrooms less open or more open when discussing citizenship. This analysis is based on previous studies which explain that students with different backgrounds can provide different views of the classroom. This problem formulation can expand the findings by testing variables at the student level because it can provide an overview of differences in students' views on classroom climate. This analysis includes measuring students' participation behaviour in class activities and the intensity of discussion activities they carry out with their friends, teachers, parents, and the intensity of other activities such as watching and reading related to citizenship education material. In addition, analysis was also carried out on students' perceptions of learning opportunities obtained from the way they respect differences of opinion in the classroom as well as on students' beliefs about their views being valued or heard in the classroom and school context. In addition, aspects of civic education knowledge level and demographic aspects (race and gender) were also analysed. This variable is also included in the second level

and third level models involved to answer the first problem formulation. The equation to answer the second problem formulation is: Y ¼ c000 þ Rb0j_VARIABLEj_ þ u00 þ r0 þ e ð2Þ. The additional variable Rb0j describes the additional effect of each student-level predictor j on the outcome at the item level y. Each variable was considered as a group average so that the variables could explain individual-level variance in their perceptions of classroom climate. Researchers included all predictor variables with fixed effects because variations in predictor coefficients between classes were not considered in the study. The aim of this model analysis is to minimise the variability in classroom climate perceptions at the individual level, so as to increase the reliability of classroom climate measurements.

To answer the third problem formulation, researchers revealed contextual characteristics related to the level of reliability. A one-level analysis was conducted with the aim of finding correlations with classroom variability and other contextual factors. In hierarchical linear models, variability at the class level analysis is considered unable to explain aspects of variability at the individual level. Thus, researchers must create measures of variability across grade-level groups to account for differences in variability that correlate with classroom characteristics themselves. The creation of a class climate measure was carried out by calculating the average class discussion climate from the average class perception reporting items. Using the average value is better than using the theoretical response item scale regarding perceptions of open classroom climate. This occurs because the average value is more in line with the hierarchical linear model analysis used in the previous stage with all items counted equally. Next, the standard deviation of students' perceptions within the classroom was collected and analysed at the classroom level.

This analysis provided a picture of the variability of classroom climate responses within classrooms. The researcher then used multiple regression analysis to analyse classroom variables, which were able to provide predictions of variability between perceptions of classroom climate as assessed by standard deviations of the average student responses. The analysis is modelled with the equation: Y ¼ a þ Rbj_VARIABLEj_ þ e ð3Þ. Y is the variability of students' perceptions of classroom climate, a is the average level of variability across all classrooms and b is the additional effect of each variable j on the report of classroom climate. There are several predictor aspects that are taken into account, namely school demographics which include race or ethnicity, public or private school status, school area, average class size, socioeconomic status of students in the class, average classroom climate, and students' level of knowledge about citizenship education in the classroom. This analysis aims to address the analysis carried out to answer the second problem formulation, but the analysis to answer the third problem formulation is that the researchers examine aspects of context characteristics compared to individual characteristics. Comparison of these characteristics is to explain aspects that cause disagreement at the student level.

To answer the fourth problem formulation, researchers analysed the role of classroom climate measurements in providing predictions of students'

knowledge, attitudes and behaviour competencies regarding citizenship education. Researchers conducted a multilevel analysis using criteria measuring open discussion in the classroom climate to investigate student competencies (students' knowledge, attitudes, and behaviour regarding citizenship education). Based on theoretical studies in the field of citizenship education, an analysis of student competency results was carried out and correlated with an open and supportive classroom climate. These student competencies include knowledge aspects (mastery of content and skills in interpreting material), behavioural aspects (students' expectations of information regarding elections and public protests), motivational aspects (students' activeness in political discussions), and attitude aspects (confidence in institutions and students' willingness to exercise their political rights). The predictor aspect considered in the classroom is the average perception of classroom climate. In addition, student perception variables at the individual level are also involved as predictors at level one to account for the variability that provides effects within the classroom. All predictor variables were entered at the student group average so that class variance could be accounted for. Researchers considered the openness of classroom climate with adjusted aggregates.

4. Results

All research participants took part in a series of studies and responded to an open classroom climate with discussions, so that this research met the criteria for generalisation. From the research results, several differences were found in several variables considered in this research, such as gender, race, and student competency variables in the field of citizenship education. The difference is quite significant with SD 0.60 in the knowledge aspect between students who carry out the learning process with an open classroom climate and those who do not. The weight value is used to investigate the inequality of sample determination probabilities following a series of studies. Sampling was carried out based on random school stratification and based on elementary and middle school levels. Data from students who did not participate in the research series were not involved in the analysis to answer the first problem formulation because the scale of classroom climate openness is very important. The missing data were used to answer the second, third and fourth problem formulations so that the total number of students was still taken into account in the analysis. As a guide in presenting the results, the objectives of this research included measuring the level of reliability of classroom climate in classroom level, investigating aspects that influence the reliability of classroom characteristics, investigating the influence of individual perception variability on classroom discussion climate, and investigating the role of student variables on grade level in predicting competency in knowledge, skills, and discussion of fields of study.

4.1 Measuring the Reliability of Classroom Climate in the Study of Civics Education at the Classroom Level

Researchers analysed the level of reliability of open classroom climate in three ways. First, calculations using traditional Cronbach's alpha internal consistency coefficients, second, calculations of nested effects within classes, and calculations using hierarchical linear models. The Cronbach's alpha internal consistency coefficient assessment is considered reliable using the value a = 0.854. Next, the

level of reliability was calculated using a hierarchical linear model with a value of k = 0.735. Below are presented the results of the analysis of open classroom climate perceptions using a hierarchical linear model.

Table 1. Analysis of perceptions of open classroom climate with hierarchical linear models

Variable		Coefficient (SE)
Interception (c000)		4.05 (0.03)
Ability to understand differences of opinion (b01)		0.10** (0.03)
Ability to work together with others (b02)		0.05* (0.03)
Problem solving ability (b03)		0.08** (0.03)
Total Knowledge of Citizenship Education (b04)		$3.89\ 9\ 10^{-3}$ ** ($5.89\ 8\ 10^{-4}$)
Participation confidence (b05)		0.04** (0.01)
Gender (b06)		0.07** (0.03)
Intensity of newspaper reading activities (b07)		0.10** (0.03)
Political discussion activities with teachers (b08)		0.14** (0.01)
	Before predictors	**After predictors (% reduction)**
Grade Level Variance	0.04	0.03 (70)
Individual Level Variance	0.32	0.13 (65)
Survey Item Level Variance	0.50	0.60 (0)
Class Level HLM Reliability After Student Level is Controlled	0.61	0.70

* p\0.05; ** p\0.01

4.2 Factors that Influence the Reliability of Classroom Characteristics

To answer this problem, factors at the student level are involved with the low level of reliability of class science aggregates. The involvement of this factor can explain the cause of the decrease in reliability. The combination of several factors in Table 1 provides an illustration of the variability in individual perceptions of the classroom discussion climate. These factors include gender, level of student participation, individual student perceptions of learning opportunities, level of civics knowledge, and the belief that differences of opinion can give rise to differences within the classroom community. From the results of the analysis, the majority of female students feel that the classroom discussion climate is more open than male students. These factors at the individual student level can minimise the level of individual variability in classroom climate perceptions and can increase the reliability of classroom discussion climate perceptions to k = 0.874. These findings indicate that differences between individuals on dimensions are able to explain variability in perceptions of classroom climate.

Classes with mixed gender composition, superior and less superior students, student activity, and student openness in accepting differences of opinion will be better able to create an open classroom climate. The role of teachers and school stakeholders is very vital in determining class composition to be able to facilitate students to obtain optimal academic competence. Classes that meet this

level of reliability tend to be better able to create an open classroom climate compared to classes that do not meet the reliability aspect. Apart from that, it was found that female students were considered more effective in creating an open classroom climate than male students because the gender composition of students in the class was still not proportional. In addition, factors related to individual student characteristics can also minimise the level of individual variability in classroom climate perceptions and can increase the reliability of classroom discussion climate perceptions. The better and more qualified the students' characteristics are, both in terms of academic aspects and the level of activity in the classroom, the better quality the classroom climate that is created will be, so that it can produce quality students.

4.3 The Influence of Individual Perception Variability on Classroom Discussion Climate

Based on the results of the analysis, it was found that classrooms that have certain characteristics show more variability than other aspects. The answer to this third problem formulation focuses on classroom characteristics that are related to the level of reliability of classroom climate measurements. From the results of the analysis in Table 2, there are two predictor variables that show statistical significance in the level of variability in perceptions of classroom climate, namely the average use of books in students' homes, and open discussions in class. It was found that there was more variability in classroom climate perceptions when the average classroom climate perception showed a low value. From these data it can be concluded that the majority of students agree that the classroom will present an open classroom climate when all students are open to discussions with various opinions. When the classroom climate is not open, students will experience different feelings when carrying out the learning process. Furthermore, more variability was found in perceptions of classroom climate in classrooms with students from low socioeconomic backgrounds. These variables can cause a reduction in the standard deviation score variance between classes.

From the research results, it was found that what influences the variability of students' perceptions of classroom climate is the average use of books in students' homes, and open discussions in class. The frequency with which students read books really helps students to actively participate in open discussions. Students who read more often also have opinions on discussion activities, so their perception of the classroom climate is positive. In contrast, students who rarely read books will be less likely to be involved in discussions, creating a less favourable perception of the classroom climate. Furthermore, open class discussions were found to be a factor that influenced students' perceptions of classroom climate. Open class discussion activities are able to open up opportunities for students to express opinions without fear and tension because this open discussion encourages students to respect each other's differences of opinion. The majority of students who took part in the learning process with open class discussions gave good perceptions on each survey item to measure the reliability of the classroom climate. Apart from that, based on the results of the analysis, students' socioeconomic background is also considered to influence the quality of class discussions, which results in a quality classroom

climate. From the research findings, classes with students dominated by students from low socioeconomic backgrounds were able to show more open and more active class discussions.

4.4 The Role of Classroom Climate on Knowledge, Skills and Discussion Competencies in the Field of Citizenship Studies

To answer the fourth problem formulation, the correlation between the level of perception of classroom climate and the level of student competence in the field of citizenship education was tested. Researchers used the average score of open classroom climate perceptions and correlated it with student competence. The results of this analysis provide evidence of the simultaneous validity of the aggregate score. From the results of the analysis using a two-level model, it was found that the average perception of class climate has a significant correlation with students' academic competence in the field of citizenship education (student knowledge, attitudes and behaviour) as presented in Table 3. Students who carry out the learning process with an open classroom climate tend to have better civic knowledge, ability to understand political material, motivation to learn, positive attitudes towards students' political rights, and student participation in class compared to students who do not carry out the learning process in an open classroom climate. This is in accordance with previous research which confirms that students with an open classroom climate and respect for each other's opinions are more effective in understanding learning material compared to a closed classroom climate.

In addition, based on the results of the analysis using a two-level model, it was found that the average perception of an open classroom climate had a significant relationship with student learning outcomes in the aspects of student confidence in government and student interest in participating in civic activities in the future. A significant correlation was also found in the correlation between an open classroom discussion climate and the benefits of student participation in student political discussions when no covariate adjustments were made, but the opposite result occurred when the classroom climate was adjusted with a decrease in the significance level ($p = 0.108$). From the results of the analysis, the statistical significance pattern of the adjusted and unadjusted class climate scores has a similar pattern and this score is considered to be able to reduce the amount of variance in perceptions at the class level. The unadjusted aggregate class climate score is assessed to cause reduced variability by 14% (efficacy aspect) to 50% (voting expectations aspect) at the class level. Furthermore, the adjusted score variance also experienced a reduction in variance between 0.7% (efficacy aspect) to 20% (illegal form of protest aspect).

Table 2. Quadratic regression analysis of variability correlation in open class climate

Coefficient	B (SE)	Beta
Constant	3.24 (0.26)	
Average intensity of book use at home	-0.06** (0.03)	0.28
Average Open Classroom Climate	-0.46** (0.10)	0.50
Adjusted R2		32.42 %

* p\0.05; ** p\0.10

Table 3. Results of hierarchical linear model analysis of the role of open classroom climate on student learning outcomes

Outcome variable Level of knowledge of citizenship education material	Unadjusted c001 Coefficient (SE)	% Reduction in Tau	Adjusted c001 Coefficient (SE)	% Reduction in Tau
Ability to understand citizenship education material	28.81** (6.57)	22.50	19.42** (7.40)	5.72
The wishes and selection of the government are expressed	31.89** (6.41)	24.80	(8.20)	5.70
		21.00**		
Expect illegal protests during discussions	0.80** (0.15)	52.23	1.51*	(0.53) 8.42
Student support for women's rights	-1.52** (0.26)	39.49	-	(0.42) 19.30
		1.48**		
Students' positive attitudes towards immigrant communities	3.13** (0.36)	35.12	1.72**	(0.60) 10.89
Students' trust in government agencies	1.35** (0.30)	24.35	1.04*	(0.52) 7.20
Internal political discussions	1.40** (0.30)	45.14	1.21**	(0.40) 14.72
Efficacy	0.80** (0.26)	13.90	0.60	(0.38) 0.62

* p\0.05; ** p\0.01

5. Discussion

From the research results, student perceptions were used as data to measure open classroom climate at the class level. Although civics education studies can be relied upon as a measure in open classroom climate assessments, these assessments need to be supported by psychometric aspects of classroom climate so that the data can be reliable and valid at grade levels and other fields of study. The use of hierarchical linear model reliability coefficients at class level aggregates is considered better and more reliable by considering response variability at the item and individual levels. Furthermore, analysis of classroom climate predictors provides an overview of what aspects can contribute to the quality of classroom climate and student learning outcomes (Fraser et al., 2021; Hadianto et al., 2022). Analysis of classroom climate perceptions is able to show that students with individual experiences and attitudes can shape students' perceptions of the classrooms they participate in during the learning process. Each student in the same class shows different results in several aspects, including the level of student participation in learning process activities, students' experiences in social life related to citizenship, students' attitudes towards other students' opinions, and students' knowledge about citizenship matters (Isac et al., 2014; Meyer & Eklund, 2020). All of these student outcomes or competencies are closely related to student perceptions of classroom climate. Consideration of student response variability may also serve as a characteristic of other classes. Specifically, the consistency of students' responses to classroom climate is more often found in classes occupied by students with a conducive home environment and who have supportive resources in their education. Consistency was also found in the average measurement of classroom climate

perceptions that used open discussion in the learning process (López et al., 2018; Persson & Svensson, 2017). This analysis as a whole shows that systematic, aggregate climate measurements can be accounted for in terms of reliability in class-level measures.

Aggregate measurements of open classroom climate have been proven to provide predictions of student learning outcomes in various aspects in the field of citizenship education. The increase in student competence with an open classroom climate can be seen in several aspects, namely increased knowledge of citizenship, better expectations regarding the election process in Indonesia, increased student confidence in the government, and student desire to be more involved in following social and political matters (Campbell, 2019; Licul & Jurišević, 2022). Researchers also found that an open classroom climate was able to minimise the opinions of students who protested illegally or prohibited other students from having different opinions with them. It can be said that this class climate really supports the openness of students' views on a problem. The findings of this research are in line with the theory that open classroom climate strongly supports open discussions in the learning process (Hadianto et al., 2021; Lombas et al., 2019). The results of this study also offer evidence that strengthen the simultaneous validity of measuring aggregate openness and classroom climate measurement. Factors that can influence the reliability of measuring classroom climate included the gender composition in the class, the level of student activity, individual perceptions of their learning opportunities, the level of student knowledge about citizenship education, and differences in views about class material. In addition, most female students felt that the class discussion climate was more open than male students. This is because female students have a more open character than male students in conducting discussions and tend to be more active in participating in each stage of the learning process activities. This character makes the class climate better in classes dominated by female students compared to other classes. This finding is in line with several previous studies which state that classroom climate is very dependent on students' level of knowledge, activeness and views on classroom climate (Fraser et al., 2021; Makri et al., 2020).

The research results also show that perceptions of classroom climate have a significant correlation with student learning competency outcomes in citizenship education material. Improvements were seen in aspects of students' knowledge, attitudes and behaviour towards citizenship education. Students who carry out the citizenship education learning process with an open classroom climate produce better student learning outcome competencies compared to students who do not take part in open classes in their learning process (Knowles, 2020; Walker & Graham, 2021). The increase in learning outcomes can be seen in the level of knowledge of civic education, understanding of political material, the level of motivation in participating in the learning process, students' positive attitudes towards political rights and the level of student activity in participating in the learning process. The findings of this research are in accordance with previous research which confirms that an open classroom climate can increase student competence in aspects of knowledge, attitudes and behaviour related to teaching material (Isac et al., 2014; Lombas et al., 2019; López et al., 2018). This

increase occurred because the open classroom climate meant students did not feel afraid to express their opinions, thus making their minds more open and able to understand the material comprehensively. The research results also show that the perception of an open classroom climate has a significant correlation with students' trust in government and students' interest in participating in the civics education learning process (Persson & Svensson, 2017).

A classroom climate with open discussions has proven to be effective in improving student learning outcomes in citizenship education subjects, both in aspects of students' knowledge, attitudes and behaviour related to their role in the field of citizenship. Open discussions are considered effective in increasing student competence because they can improve a positive classroom climate (Barksdale et al., 2021; Hoang et al., 2019). All students have the opportunity to express their views to better understand the concept of citizenship education. Apart from that, the discussion process is open, there are no opinions that bring down other opinions, thereby making students feel valued in the learning process. Several aspects that influence the level of reliability of measuring classroom climate are the gender composition in the class, the level of student activity, individual perceptions of learning opportunities, the socioeconomic level of students, the level of student knowledge about citizenship education, and differences in views about class material (Ingemarson et al., 2020; Zitzmann et al., 2022). Teachers must pay attention to this aspect in creating an open classroom climate and encouraging students to be active. This finding is in accordance with the theory which states that increasing competence is very dependent on classroom climate and the creation of this classroom climate does not only come from teacher competence but is also influenced by aspects of gender, knowledge and student abilities (Bayram Özdemir & Özdemir, 2020; Kuzle, 2023; McLure et al., 2022). Thus, the quality of the classroom climate depends greatly on the composition of students in the class and individual characteristics.

6. Conclusion and Implications

An open classroom climate is influenced by the gender composition in the class, the level of student activity, individual perceptions of their learning opportunities, students' socioeconomic level, their level of knowledge about citizenship education, and differences in views about class material. A classroom climate with open discussions has proven to be effective in improving student learning outcomes in citizenship education subjects, both in aspects of students' knowledge, attitudes and behaviour related to their role in the field of citizenship. The increase in learning outcomes can be seen in the level of knowledge of civic education, understanding of political material, the level of motivation in participating in the learning process, students' positive attitudes towards political rights and the level of student activity in participating in the learning process. The implication of this research is that teachers and stakeholders must pay attention to factors that influence the reliability of classroom climate in order to optimally improve academic competence. The theoretical benefit of this research is the development of theory regarding the construction of measuring classroom climate, while the practical benefit is that it provides indicators of how to measure the quality of classroom climate and

provides an idea of how to improve the quality of classroom climate, which greatly contributes to student competence. This research has several limitations, including the survey only focuses on students, variability factors from outside the classroom that can influence perceptions of classroom climate have not been investigated, it is not optimal in controlling aspects of student response variability, and the need for additional samples, especially the addition of a control group with a proportional gender composition in class.

7. Recommendation

Based on the research results, the researchers recommend several aspects for further study, including the development of classroom climate criteria and to include survey items for teachers and school principals to validate the general aggregate with student surveys. Surveying other teachers about perceptions and practices of the learning process with open discussions will obtain their perspective as validation material for student responses to the same survey questions. The next recommendation is to add items with the consideration of the teacher or school principal when empirical testing is carried out. In previous research conducted in America, additional surveys were conducted on other teachers to reveal the teaching methods used as preparatory material in the civics education learning process as well as the design of learning activities that will be carried out in class. However, if convergent validity between perceptions and instructors can be investigated during pilot testing, questions about method and activity perception do not need to be used. Furthermore, when aggregate class climate measures are used, control for response variability must be considered. This perception of class climate is influenced by factors inside and outside the classroom, especially during class discussions on political themes. Future research should control characteristics at the individual level to reduce the variability of controlling characteristics at the individual and class levels, which will make it easier for researchers to investigate interclass influences. the researchers also recommend adding other relevant control groups so as to explain aspects of variability within the class, for example, the variable female gender which has more influence on the level of open classroom climate compared to male gender.

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