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Developing an assessment instrument for strengthening the *Pancasila* student profile in web-based middle school mathematics teaching

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Abstract

This study aims to develop an assessment instrument for strengthening students' Pancasila profile in middle school mathematics teaching, which teachers can use. This research follows a development process using the Plomp model, consisting of three phases. The respondents involved in this study were six experts in mathematics education and information technology, 23 middle school mathematics teachers, and 1,297 students. The research results show that Aiken's V value is 0.89, which exceeds the v-table of 0.630, indicating good validity. The Cronbach Alpha reliability analysis results indicate a strong outcome, with a value of 0.751. Confirmatory factor analysis using the R program showed significant factor loadings with a p-value < 0.05. Apart from that, the achievement percentage for all dimensions is in the good category, with an average achievement of 87.06%. These results prove that the assessment instrument developed is suitable for teachers to measure the strengthening of Pancasila student profiles in mathematics teaching at school. The developed instrument can be used as an effective evaluation tool in mathematics teaching to strengthen the Pancasila Learner Profile and help identify areas that require improvement in teaching to achieve a more balanced profile across all dimensions.

Keywords: assessment instrument; middle school mathematics teaching; *Pancasila* student profiles

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Introduction

Educational innovation in the era of Society 5.0 is directed at responding to various challenges, problems, and social issues related to teachers, students, education system dynamics, and social dynamics (Carayannis & Morawska, 2023; Murniarti et al., 2023). The era of Society 5.0 is an answer to the challenges that arise due to the problems resulting from the era of Industrial Revolution 4.0 by utilizing technological innovation that integrates the virtual world and the physical world (Aziz, 2021; Masami, 2021; Sulastri, 2023). Society 5.0 is not an ideal future but a reality brought about by technological innovation (Carayannis & Morawska-Jancelewicz, 2022; Narvaez Rojas et al., 2021).

The Society 5.0 era in education emphasizes character, morals, and role-model education (Babu, 2024; Ziatdinov et al., 2024). It is because technology can replace knowledge, while the application of soft skills and hard skills possessed by each student cannot be replaced by technology (Gupta et al., 2024; Yaras & Öztürk, 2022). It is essential to consider the significant challenges in digitalization and automation (Aquilani et al., 2020). Through the era of digital transformation, all students and members of other educational units can freely access and utilize information for various purposes without being limited by time and space (Adedoyin & Soykan, 2023; Demartini et al., 2020). On the one hand, implementing education must achieve national goals that emphasize a generation with good morals. One way to implement Society 5.0 is to integrate various aspects of education.

Educational integration is vital in the current digital era because it can unite various elements in the teaching and learning process to create a more holistic and relevant educational experience (Alenezi et al., 2023; Koul & Nayar, 2021). By integrating technology, curriculum, and teaching methodology, education can address the challenges arising from rapid changes in society and the world of work (Martinez, 2022; Núñez-Canal et al., 2022). This integration enables digital tools and resources that enrich the student learning experience, make learning materials more accessible to access and understand, and increase student engagement and motivation. In addition, educational integration also supports collaboration between educational institutions, facilitates the exchange of knowledge and best practices, and prepares students to face an increasingly connected and dynamic world (Gleason & Jaramillo Cherrez, 2021; Valverde-Berrocoso et al., 2021). With an integrated approach, education can provide learning that is more focused, efficient, and in line with the needs of technological developments and social changes, thereby creating a more adaptive learning environment that is responsive to the demands of the times. One important integration is combining character education in the curriculum.

The concept of character education departs from the view that character includes universal human behavioral values that involve all human activities concerning God, oneself, fellow humans, and the environment (Husen et al., 2022; Jamaluddin et al., 2022; Saputra & Ningsih, 2023). Character education involves the integration of character values into student learning material and the application of principles such as conveying rational information, formulating policies such as codes of ethics and promises, as well as establishing shared standards of behavior (Jerome & Kisby, 2022; Satianingsih et al., 2020). This process also

includes continuous communication about the content and goals of character education and the development of models and concrete examples of consistent positive character, especially by teachers and all parts of the school environment that are adapted to national or regional culture. The implementation of character education is critical because it allows students to internalize moral and ethical values that will help them interact with God, themselves, fellow humans, and the environment (Hudiarini & Chalim, 2023; Nada et al., 2021). One way to implement character education is by developing the Pancasila Student Profile.

Pancasila Student Profile is an educational concept emphasizing six main dimensions to shape student character in Indonesia (Benawa & Sihombing, 2023; Sanur & Saripudin, 2022; Widarini & Suterji, 2023). The first dimension is faith, devotion to The One-and-Only God, and noble morals, where faith reflects belief in the forces that influence human life. In contrast, morals include good attitudes and habits in everyday life. The second dimension is global diversity, which involves maintaining local culture while being open to global cultural diversity and creating cross-cultural respect and communication. The third dimension is cooperation, which includes the ability to work together voluntarily, respect solidarity, and help each other.

Furthermore, the fourth dimension is independence, which emphasizes students' responsibility for their learning processes and outcomes and the ability to take initiative and solve problems independently. The fifth dimension is critical reasoning, which involves analyzing, evaluating, and drawing conclusions from existing information. Finally, creativity, as the sixth dimension, shows students' ability to generate new, useful, and original ideas and find innovative solutions to various problems. All of these dimensions integrate to form the character and skills that students need to face the challenges of the times and contribute effectively to society.

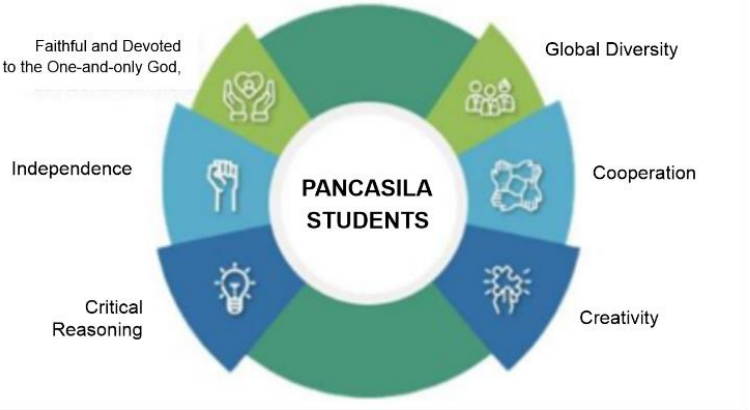


Figure 1. Six dimensions of Pancasila student profile
(Source: https://ditpsd.kemdikbud.go.id)

The *Pancasila* student profile plays a vital role in forming holistic student character and skills by emphasizing moral values and 21st-century skills (Fahri et al., 2023; Irawan et al., 2023; Qomariah & Hidayati, 2023). It makes education more integrated, focusing on academic achievement and developing students' personalities and social attitudes. Thus, student quality is measured by their academic achievements and ability to adapt, think critically, and contribute positively to society. Education that instills the Pancasila Student Profile helps shape students' characters who are challenging, creative, and responsible so that they are ready to face various

challenges and opportunities in the future (Junaidin et al., 2024; Marhenno & Ulfatun, 2024). The Pancasila Student Profile can be applied to various subjects, including mathematics.

The application of the Pancasila Student Profile in mathematics subjects can enrich the learning process by integrating character values such as honesty, responsibility, and cooperation (Kusmayanti et al., 2023; Mulya & Fantiro, 2023; Noppitasari et al., 2023). For example, in learning mathematics, students can be invited to work together to complete group assignments, discuss solutions critically, and develop creativity in finding new approaches to solving problems. In addition, by emphasizing the importance of having integrity in checking work and respecting the learning process, students not only gain mathematical skills but also internalize values that will shape their attitudes when facing everyday challenges. This integration ensures that mathematics education focuses on cognitive aspects and developing students' character (Arifin, 2023). One application of the Pancasila Student Profile that can be implemented is a web-based character development model.

The web is a very effective platform for implementing a web-based character development model in the context of the Pancasila Student Profile. Using web-based applications allows student character development to be carried out more structured and measurable (Tuluk & Yurdugül, 2020; Wahyuni et al., 2023). This platform allows teachers to access and utilize various assessment tools and character development guides quickly and easily (Pustikayasa et al., 2023; Sholeh & Efendi, 2023). Web-based applications can provide features that support real-time monitoring of student character development, provide constructive feedback, and facilitate interaction between teachers, students, and parents (Haleem et al., 2022). Apart from that, this application can be accessed anytime and anywhere, which supports the learning process in the all-digital era of Society 5.0. Thus, implementing the Pancasila Student Profile through a web-based character development model can increase the effectiveness of character education, meet the demands of the times, and advance the overall quality of education.

From the results of previous research, there are several studies on developing instruments to strengthen the Profil Pelajar Pancasila (P5) at the primary and secondary school levels. In the first study, the development of subject-specific pedagogy to strengthen the Pancasila Learner Profile in mathematics subjects at Phase C elementary schools has shown that the development is overall feasible to use in the learning process (Khoironi et al., 2024). However, this study should have gone into depth about technical implementation in diverse situations and the shortcomings that may arise in field application. Meanwhile, the second study that focused on the development of the P5 E-Module as a differentiated learning resource for mathematics in secondary schools showed that the module was highly valid and usable, but it did not explain in detail how effective it was in improving students' learning outcomes in the long term (Tyaningsih et al., 2024). Both have yet to develop assessment instruments integrated into a digital platform that is easily accessed and used by teachers and students. Therefore, this study aims to develop a web-based assessment instrument that can strengthen the Pancasila Student Profile in teaching mathematics in secondary schools, which is expected to overcome the shortcomings of previous studies and provide a more comprehensive and practical solution. Compared to previous studies, the novelty of this research lies in its focus on developing an

assessment instrument to enhance the Pancasila learner profile, with the model being problem oriented. Additionally, the instrument developed is web-based with automatically generated polytomous scoring.

The problems faced in the era of Society 5.0 include challenges, problems, and social issues related to teachers and students, the dynamics of the education system, and the social dynamics caused by the era of Industrial Revolution 4.0. The era of Society 5.0 aims to overcome this problem by utilizing technological innovations that integrate the virtual and physical worlds. This era emphasizes character, morals, and exemplary education because technology can replace knowledge while applying soft and hard skills cannot. To face the challenges of digitalization and automation, educational integration that combines technology, curriculum, and teaching methodology is essential. Character education is critical to this integration, which includes universal behavioral values in relationships with God, oneself, fellow humans, and the environment. Applying the Pancasila Student Profile concept, which emphasizes six main dimensions to shape student character in Indonesia, is one concrete effort in character education. Therefore, this research aims to develop an assessment instrument for strengthening the profile of Pancasila students in junior high school mathematics teaching that is valid, reliable, and suitable for use by mathematics teachers in schools.

Method

Research design

This research was development research using the Plomp model, which consists of 3 phases: Problem Identification and Needs Analysis, Design Development and Implementation, and Evaluation (Plomp & Nieveen, 2013). The Plomp model is combined with the instrument development stages from Mardapi, which include: 1) Determine Instrument Specifications; 2) Writing the Instrument; 3) Determining the Instrument Scale; 4) Determining the Scoring System; 5) Reviewing the Instrument; 6) Conducting the Test; 7) Analyzing Instruments; 8) Assembling Instruments; and 9) Interpreting Measurement Results (Mardapi, 2012). At each stage, revisions are made according to suggestions and input, starting from FGDs, readability trials, and expanded trials.

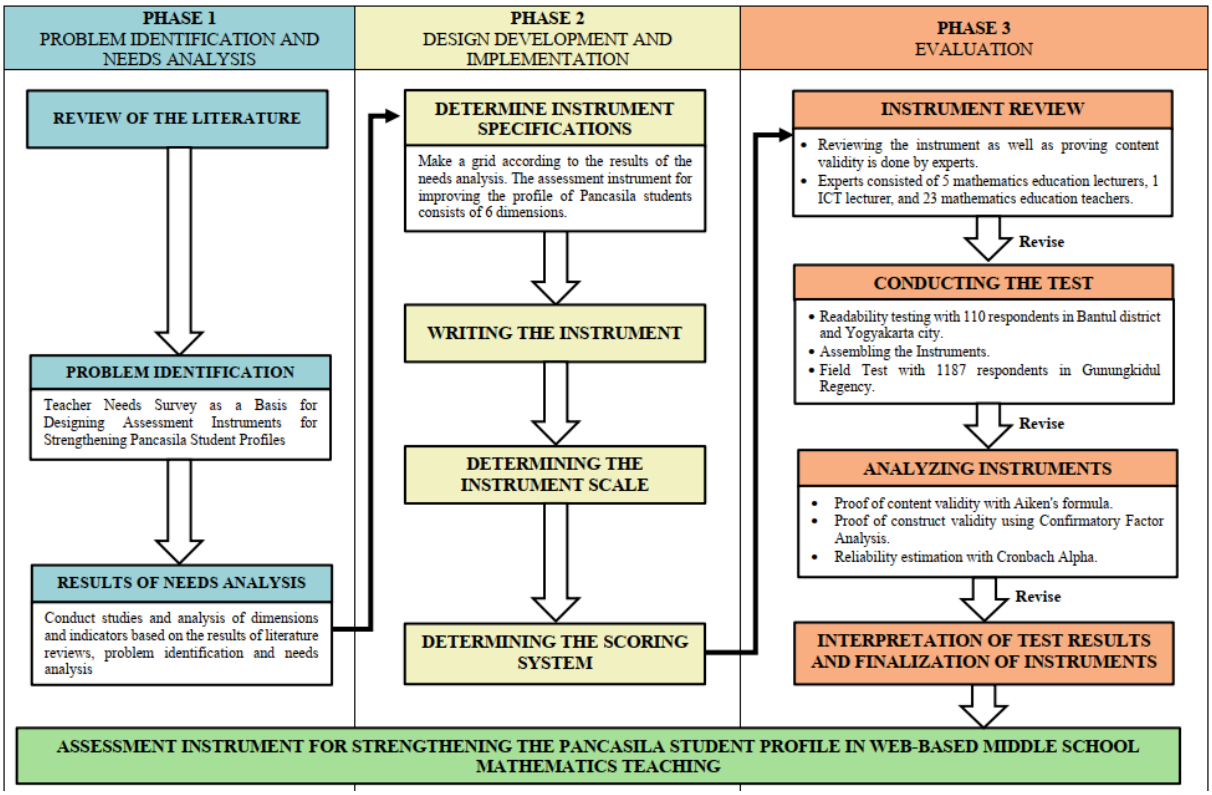


Figure 2. Development research flow using model by Plomp

Sample and data collection

Phase 3 of this research includes an instrument review and conducting the test (Readability testing and large-scale testing). The instrument review stage involved five experts in mathematics education, one expert in information technology, and 23 middle school mathematics teachers. The pilot phase involved 1,297 middle school students, consisting of 16 students from Yogyakarta city, 94 students from Bantul Regency, and 1,187 students from Gunung Kidul Regency, Yogyakarta Special Region (DIY), Indonesia, selected using Cluster Random Sampling. Data collection utilized assessment sheets completed by the experts and the Pancasila Student Profile instrument developed for this research. Details for respondents of junior high school students are presented in Table 1.

Table 1. Demographic details of respondents

	The Number of Respondents	%
Gender		
Male	508	39.17%
Female	789	60.83%
Class		
VII	767	59.14%
VIII	409	31.53%
IX	121	9.33%
Regency		
Bantul	94	7.25%
Gunung Kidul	1187	91.52%
Yogyakarta	16	1.23%

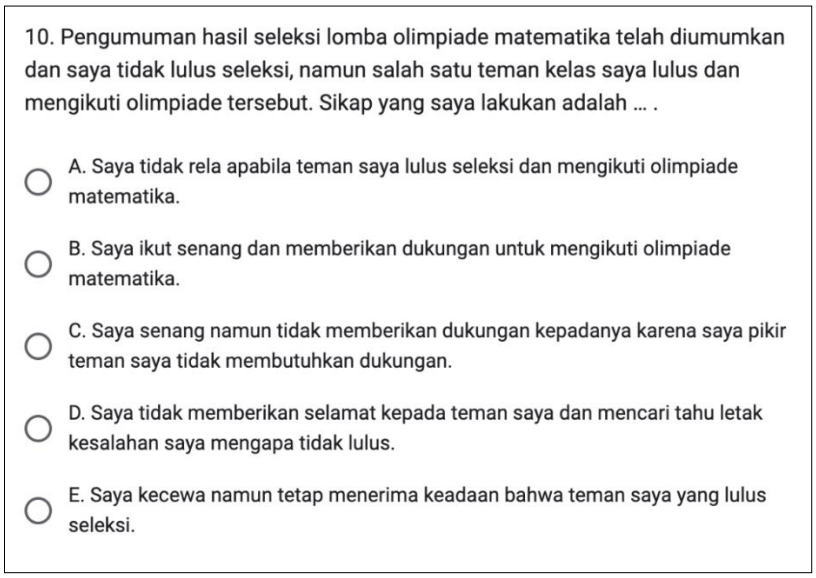
Analyzing of data

Two types of data analysis techniques were used in this research, namely, item analysis techniques and data analysis techniques. The item analysis technique was used to prove construct validity using the Confirmatory Factor Analysis technique assisted by the R Program. After analyzing construct validity, the authors then analyzed reliability with Cronbach Alpha. Meanwhile, the data analysis techniques used are the quantitative technique and the qualitative technique. The quantitative technique was used to describe the degree of implementation of character assessments currently available, the degree of agreement between experts providing input tested using the Aiken formula, and the degree of implementation of character assessments with the model being developed. Qualitative techniques are used to describe the parts that are not implemented and the obstacles that arise in the current assessment, identify and summarize expert input, and describe the parts that are not implemented and the obstacles that arise in developing the Pancasila Student Profiles assessment model for junior high school students.

Results

The results of this study are divided into three parts based on the 3 phases of the Plomp model: problem identification and needs analysis, design development and implementation, and evaluation. At the problem identification and needs analysis stage, the research part of R&D, a literature review is conducted, identifying problems directly to mathematics teachers and principals at the junior high school level. Based on the literature review, six dimensions of the Pancasila learner profile are having faith and devotion to the one-and-only God and possessing noble morals, cooperation, creativity, critical thinking, global diversity, and independence. In addition, based on the results of the needs analysis questionnaire, mathematics teachers and principals need an instrument that can be automatically assessed so that the assessment results are immediately obtained after taking the test, and the instrument developed adjusts the mathematical context.

At the design development and implementation stage, four steps are carried out: determining the instrument specification, writing the instrument, determining the instrument scale, and determining the scoring system. At this stage, the instrument grids and web design used are produced. This instrument uses a Likert scale that is designed to be problem oriented. This instrument provides a problem, and the answer is not only to agree and disagree but also to adjust to the existing problems. In addition, the scoring is made automatically so that math teachers or principals can see the score directly after the assessment using the developed instrument. The following Figure 3 is an example of a web-based instrument based on development results.


10. Pengumuman hasil seleksi lomba olimpiade matematika telah diumumkan dan saya tidak lulus seleksi, namun salah satu teman kelas saya lulus dan mengikuti olimpiade tersebut. Sikap yang saya lakukan adalah … .

A. Saya tidak rela apabila teman saya lulus seleksi dan mengikuti olimpiade matematika.

B. Saya ikut senang dan memberikan dukungan untuk mengikuti olimpiade matematika.

C. Saya senang namun tidak memberikan dukungan kepadanya karena saya pikir teman saya tidak membutuhkan dukungan.

D. Saya tidak memberikan selamat kepada teman saya dan mencari tahu letak kesalahan saya mengapa tidak lulus.

E. Saya kecewa namun tetap menerima keadaan bahwa teman saya yang lulus seleksi.

Figure 3. An example of a complete instrument item with options

Translation:

10. The results of the selection for the Mathematics Olympiad competition have been announced and I did not pass the selection, but one of my classmates passed and took part in the Olympiad. My attitude is...
    A. I do not want my friend to pass the selection and take part in the mathematics olympiad.
    B. I am happy and provide support to take part in the mathematics olympiad.
    C. I was happy but did not provide support to him because I thought he did not need support.
    D. I did not congratulate my friend and find out where I went wrong as to why I did not pass.
    E. I am disappointed but still accept the situation that my friend passed the selection.

The third part, the Evaluation Phase, consists of reviewing the instrument, conducting a pilot test, analyzing the instrument, and interpreting the results and finalizing the instrument. The results of this validation assessment were then analyzed using V-Aiken analysis. The results of the validation of the Pancasila Student Profiles research instrument obtained a V-Aiken value of 0.89 > V-table of 0.630. These results indicate that the research instrument used is valid and suitable for use in research to measure how the implementation of strengthening the Pancasila Student Profiles is implemented. The validity results also show that the developed instrument is valid and suitable for use in data collection.

Table 2. Instrument items and Aiken validity results per item and overall items

No	Items	V-Aiken Result	Category
1	The mathematics teacher was explaining the material in front of the class, and then in the middle of the lesson, it was the time for worship, the attitude I had to adopt was...	0.85	Valid
2	SMP Negeri 1 Gunung Kidul holds a flag ceremony every Monday. The students line up according to their respective classes, the grade VIII student line is led by Dimas, and it turns out that Dimas is not wearing a hat. My attitude is...	0.82	Valid

No	Items	V-Aiken Result	Category
3	Andi is an outstanding student who always takes part in the National Mathematics Science Olympiad, even though he is a transfer student from Maluku. However, his friends feel that Andi is different because he has black skin and curly hair, so Andi is often bullied by his friends. My attitude is...	0.92	Valid
4	While studying mathematics, Hana and Heni asked permission to carry out worship. Before carrying out their worship, they played in the water and did not turn off the water tap until the water reservoir ran out. The attitude I took when I saw Hana and Hani was...	0.84	Valid
5	The teacher divided the mathematics study groups according to the roll number, during the presentation some friends gave their opinions but their opinions were not correct and they still did not want to be blamed. The attitude I have to take is...	0.88	Valid
6	The teacher gave practice questions during mathematics teaching which was done in groups. During the discussion, I did not understand the material being discussed. The attitude I have to take is...	0.91	Valid
7	When doing math assignments, we divided each material for each member. One of my friends still seemed confused about the material he had obtained. My attitude is...	0.91	Valid
8	Before class started, several of my classmates and I carried out class picket duty. However, one of my friends did not complete his picket duty because he felt sick. My attitude is...	0.91	Valid
9	During a discussion, other group members expressed opinions that were very different from the opinions I conveyed. My attitude is...	0.88	Valid
10	The announcement of the selection results for the Mathematics Olympiad competition had been announced and I did not pass the selection, but one of my classmates passed and took part in the Olympiad. My attitude is...	0.89	Valid
11	The mathematics teacher asked students to pay attention to example questions and steps for solving problems in the textbook. Then he asked students to work on the existing practice questions, but the solution steps were too long and difficult to understand. My attitude is...	0.91	Valid
12	This is currently the first SPLDV learning meeting. The teacher is explaining the SPLDV material in front of the class.	0.91	Valid

No	Items	V-Aiken Result	Category
	After finishing explaining, the teacher asks students to understand it by themselves. My attitude is...		
13	The mathematics teacher asked questions related to the number pattern material presented on the blackboard. The teacher allowed students to provide answers. Deni and Anton gave the same answer. My attitude is...	0.88	Valid
14	The mathematics teacher invited Angga to present the results of his work in front of the class. The teacher gave other students the opportunity to add other answers. My attitude is...	0.92	Valid
15	The teacher gave an explanation about building space. Then he asked students to draw each geometric figure in their respective books. I just remembered that I forgot to bring a ruler. My attitude is...	0.86	Valid
16	The class leader informed that the mathematics teacher was unable to teach. Then he said that there was a practice question assignment that had to be done and it would be discussed at the next meeting. My attitude is...	0.91	Valid
17	The mathematics teacher will teach new material that has never been studied before by providing story problems. My attitude is...	0.88	Valid
18	The teacher gives a math problem in the form of a story problem and students are asked to find a solution to the story problem through several alternative solutions. My attitude is...	0.95	Valid
19	When I was working on the test questions given by the teacher, I still had quite a lot of time left. My attitude is...	0.84	Valid
20	During group discussions, the teacher gave tasks to find solutions, make decisions, and draw conclusions from the results of individual problem solving. My attitude is...	0.75	Valid
21	I was chosen to be the school's representative at an overseas event. After completing the activity, I was invited by friends from other countries to attend a farewell party in a foreign cultural style that was not in accordance with Indonesian culture. My attitude is...	0.88	Valid
22	During a discussion, one of my friends from abroad expressed his opinion in Indonesian but was not very fluent and most of the friends in the class laughed when he heard it. My attitude is...	0.94	Valid
23	At the end of a class, several of my classmates from eastern Indonesia invited me to see a cultural exhibition of the	0.84	Valid

No	Items	V-Aiken Result	Category
	Pangkur Sago Dance in one of the city centers. My attitude is...		
24	The teacher gave a group assignment that related mathematics to culture (ethnomathematics), namely making mathematics questions in the context of Indonesian culture, but I have not learned much about culture, so the action I took was...	0.85	Valid
25	Mathematics teachers often hold impromptu quizzes. This quiz is carried out after the teacher has finished explaining several sub-materials in class. My attitude is...	0.95	Valid
26	At the end of each lesson, the mathematics teacher always gives assignments to measure students' understanding. This task is used for affective and cognitive assessment of students. My attitude is...	0.97	Valid
27	Whenever I encounter difficulties in doing mathematics assignments then the action I take is...	0.94	Valid
28	After school, I re-studied the material about flat shapes taught by the mathematics teacher at school. My attitude after studying is...	0.95	Valid

After validating, the researcher then carried out limited trials of the instrument. From the results of the limited trial, the percentage of achievement of each dimension of the Pancasila Student Profiles was obtained, as shown in Table 3 below.

Table 3. Percentage of achievement of *Pancasila* student profiles dimensions

No	Dimension Name	Average Score	Ideal Maximum	Percentage of Achievement
1	Having faith and devotion to the one-and-only God and possessing noble morals	22.71	25	90.86%
2	Cooperation	23.33	25	93.33%
3	Creativity	26.24	30	87.46%
4	Critical Thinking	16.62	20	83.10%
5	Global Diversity	17.24	20	86.19%
6	Independent	17.05	20	85.24%
	Ideal Score Average	**20.53**		**87.99%**

Besides, there are also average values for each dimension of the *Pancasila* student profiles in the three schools as shown in Table 4.

Table 4. Average values in the 3 educational units

Schools	Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Dimension 6
SMP_A	22.71	23.33	26.24	16.62	17.24	17.04
SMP_B	15.00	13.00	10.00	7.00	15.00	11.00
SMP_C	14.75	15.42	19.33	11.83	12.92	11.08

The indicators for each dimension of the Pancasila Student Profiles are as follows: Having faith and devotion to the one-and-only God and possessing noble morals is a way to get closer to God that is interconnected and can be manifested through religious morals, personal/individual morals, morals towards fellow humans, morals towards nature/the environment, and state morals. An indicator of global diversity is the ability to maintain a noble culture and interact interculturally, both regionally and nationally, to foster a sense of mutual respect, reflection, and responsibility for diversity. Global diversity indicators include maintaining culture, intercultural interaction, respecting culture, and reflection and responsibility.

The indicator of cooperation is the ability to carry out activities voluntarily, help each other, respect each other, and have solidarity so that work can be completed more efficiently and lightly. The indicators of cooperation include working together, being voluntary, helping each other, appreciation, and solidarity. Meanwhile, independence indicates a person's effort in learning activities to foster initiative, responsibility, independence from others, and self-control to achieve specific goals. The indicators of learning independence include initiative, responsibility, not depending on other people, and self-control.

An indicator of critical reasoning is a reflective thinking process that helps find solutions through processing information, analyzing, explaining, evaluating, and making decisions or conclusions. The indicators of critical thinking abilities include understanding the problem, analyzing, explaining, evaluating, and concluding. Indicators regarding creativity are an ability that reflects fluency, flexibility, originality, and elaboration, as well as the ability to modify and produce ideas, works, and actions that are original, meaningful, useful, and impactful for both humans and the environment to be able to solve problems in everyday life. The indicators of creativity include fluency, flexibility, originality, elaboration, generating original ideas, and producing original work and actions.

In addition, based on construct validity estimates carried out using the R Program, the Kaiser-Mayer-Olkin Measure of Sampling Adequacy obtained good results on the overall MSA and MSA for each item, where the value obtained was > 0.5, meaning that the sample analyzed was sufficient to carry out further factor analysis.

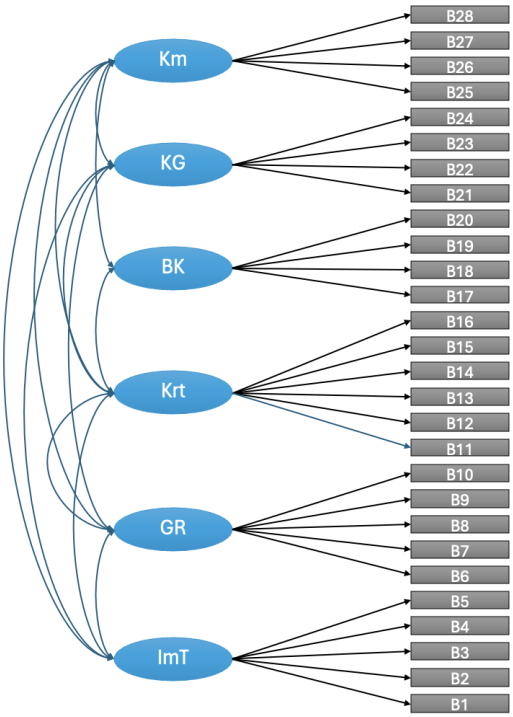


Figure 4. Conceptual model for measuring *Pancasila* student profiles

Based on the results of factor analysis, it is known that components 1 to component 8 have an eigenvalue < 1, so based on this analysis, it is recommended to use eight factors. However, although in PCA analysis, it is recommended to use eight factors, this study used six factors for CFA. The conceptual model tested is shown in Figure 2. A wide-scale trial was carried out to prove the instrument's construct validity using Confirmatory Factor Analysis (CFA). A total of 1,297 students from the Special Region of Yogyakarta Province were the trial sample. CFA was performed using the lavaan package in R Studio. CFA was carried out to prove six factors that became the basis for the instrument's development: faith and devotion to The One-and-Only God and noble character, global diversity, cooperation, independence, critical reasoning, and creativity.

Table 5. CFA model testing results

Type	Index	Actual value	Preferred value	Conclusion
Absolute	χ^2/df	$\frac{541.386}{335} = 1.62$	< 2.0	Fit
	RMSEA	0.023	< 0.05	Fit
	SRMR	0.035	< 0.05	Fit
Relative	CFI	0.910	> 0.9	Fit

Note: RMSEA = Root Mean Square Error; SRMR = Standardized Root Mean Square Residual; CFI = Comparative Fit Index

The results of the analysis show that the model fits, with the results as shown in Table 3. In Table 4, it can be seen that χ^2/df, RMSEA, and SRMR show values that are following the criteria of the absolute fit index (Thakkar, 2020). Likewise, CFI also shows a value that is above the expected standard or cut-off, namely 0.9. Thus, the conceptual model for measuring the

Pancasila student profiles has confirmed its construct validity based on the results of wide-scale trials.

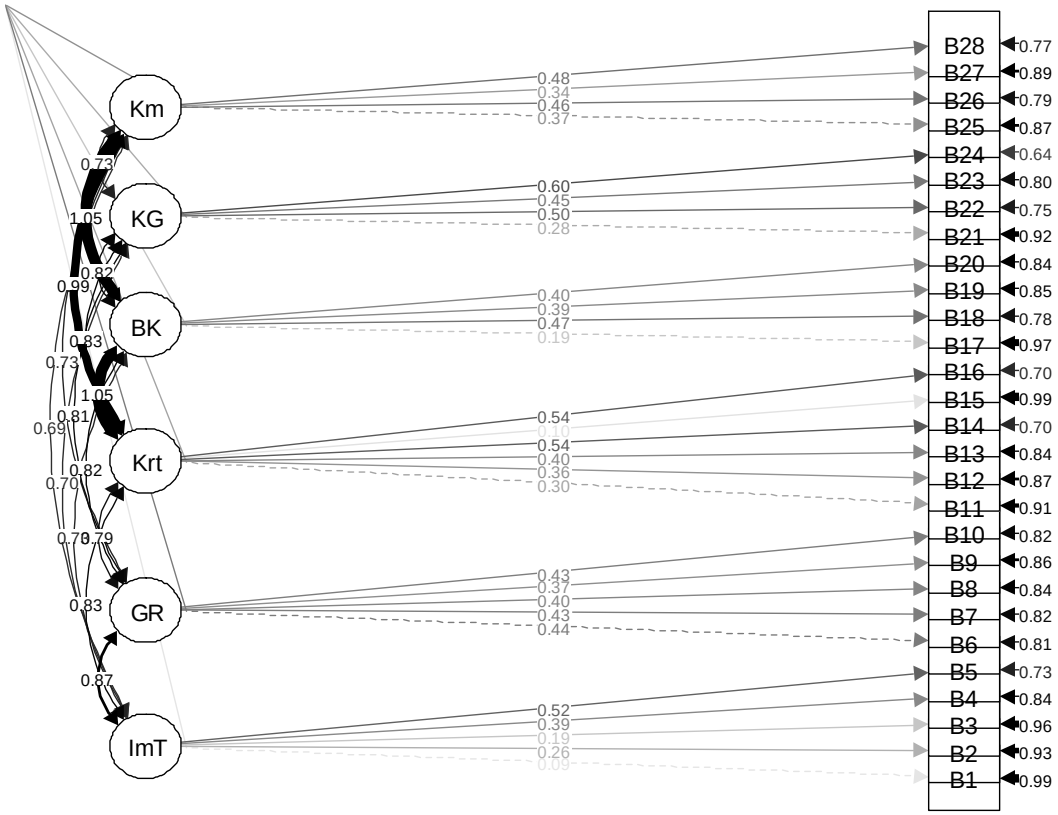


Figure 5. Standardized solution model for measuring *Pancasila* student profiles

Apart from that, from the CFA analysis, the estimate (loading factor) values for both standard and non-standard question items were obtained. From these calculations, the Z value was > 1.96 with a p-value < 0.05 except for the ImT factor dimension in items 2, 3, and 5, while for the other items, significant results were obtained. Thus, it can be said that each loading factor is significant.

After the researcher conducts a validity analysis to ensure that the instrument used can measure what should be measured, the next step is to conduct a reliability analysis using the Cronbach Alpha method. The final result of this reliability analysis shows a value of 0.751, which indicates that the instrument used has a fairly good level of internal consistency. A Cronbach Alpha value above 0.7 is generally considered an adequate indicator of reliability, so it can be concluded that the Pancasila learner profile instrument used in this study has good reliability (Cho & Kim, 2015; Daud et al., 2018). It means that the instrument can produce consistent results when used on different occasions, so it can be trusted to measure the profile of Pancasila students accurately and repeatedly.

Based on the results of data analysis per class from 1,297 students, the average score for each dimension of the Pancasila Student Profiles for each class is almost the same. This means that students in classes VII, VIII, and IX have *Pancasila* student profiles that are not very different in each dimension. For example, the Pancasila Student Profiles at the first dimension (having faith and devotion to The One-and-Only God and having noble morals) show an

average score for each class for classes VII, VIII, and IX of 22.60, 22.60, and 22.20, respectively. Other dimensions, such as cooperation, also show an average score similar for each class, where the average score for class VII is 22.59, class VIII is 22.69, and class IX is 22.78.

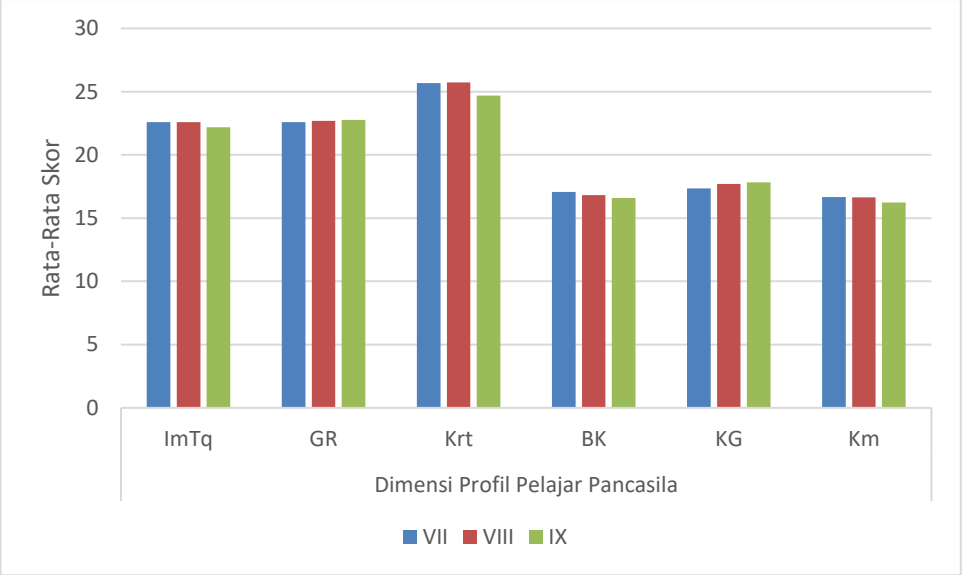


Figure 6. Average score of *Pancasila* student profiles dimensions for each class

Besides, research data also show that the achievement for all dimensions of strengthening the Pancasila Student Profiles obtained an average score of 121.88, with an ideal maximum score of 140. So, the implementation of strengthening the Pancasila Student Profiles at the middle school level in Yogyakarta Special Region Province is included in the good category with an achievement percentage of 87.06%. The percentage of achievement in each dimension can be seen in Figure 7.

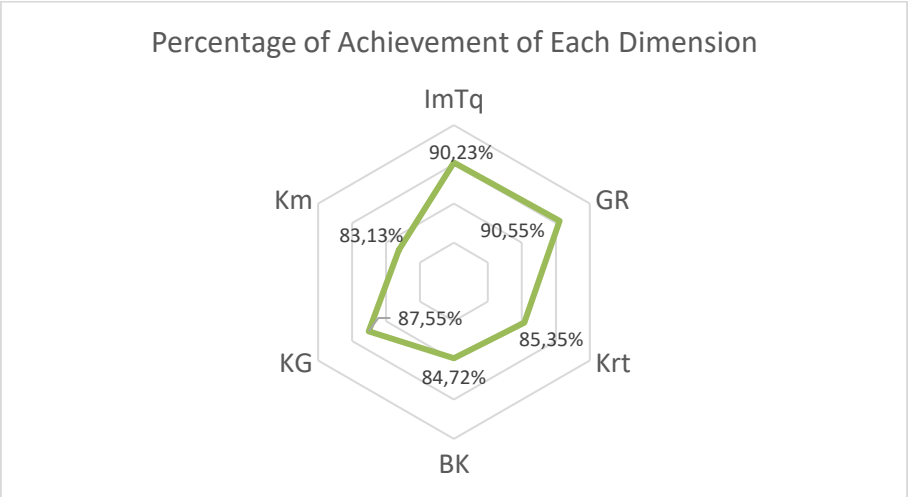


Figure 7. The Percentage of Achievement in Each Dimension

Based on Figure 7, it can be explained that the percentage of achievement of the dimension of having faith and devotion to The One-and-Only God and having noble morals is 90.23%, the percentage of achievement of the cooperation dimension is 90.55%, the percentage of achievement of the creativity dimension is 85.35%, the percentage of achievement dimension

of critical reasoning is 84.72%, the percentage achievement of the global diversity dimension is 87.55%, and the percentage achievement of the independence dimension is 83.13%. Of the six dimensions, the highest percentage of achievement is in the cooperation dimension, with an achievement percentage of 90.55%, and the lowest percentage of achievement is in the independence dimension, with an achievement percentage of 83.13%. In line with these results, based on data analysis from each school, the highest average achievement for each school was obtained by SMP_A, and the lowest was SMP_B. Thus, these results indicate a need to increase the implementation of the Pancasila Student Profiles in the teaching activities carried out in schools.

Discussion

The *Pancasila* student profile is a relevant approach that can be applied to various subjects, including mathematics (Hapsari et al., 2023; Tyaningsih et al., 2024). By instilling values such as faith and devotion to The One-and-Only God, cooperation, creativity, and critical thinking in mathematics teaching, students learn mathematical concepts and build strong character. The integration of the Pancasila Student Profile in mathematics lessons not only enriches the learning experience but also ensures that education focuses not only on mastering technical skills but also on developing critical moral attitudes and values. Therefore, implementing the Pancasila Student Profile in mathematics is crucial to creating holistic and comprehensive learning (Istiqomah & Haryanto, 2023).

The instrument validation and V-Aiken analysis results show that the instrument used in this research is declared valid and suitable for measuring the implementation of the Pancasila Student Profile. Twenty-three junior high school teachers carried out validation, and the results were analyzed using the V-Aiken method, with a V-Aiken value of 0.89, which far exceeds the v-table value of 0.630. This figure confirms that the developed instrument meets the required validity standards and is reliable for measuring the implementation of the Pancasila Student Profile in the context of this research because good validity ensures measurement accuracy and relevance (Matthews et al., 2022; Sürücü & Maslakci, 2020). Thus, the results of this validation confirm that the instruments used are appropriate and suitable for application in further research.

The results of the limited trial showed significant achievement in the dimensions of the Pancasila Student Profile at the junior high school level, with the percentage achievement of each dimension measured. The dimension "Having faith and devotion to The One-and-Only God and having noble morals" recorded an achievement of 90.86%, while the dimension "Cooperation" reached 93.33%. The dimension "Creativity" obtained a result of 87.46%, "Critical Thinking" 83.10%, "Global Diversity" 86.19%, and "Independence" 85.24%. This achievement percentage indicates that implementing the Pancasila Student Profile has been done well, although several areas can still be improved. Implementation of the Pancasila Student Profile will be successful if all dimensions are interconnected and strengthened holistically (Marhamah et al., 2024; Suryaningsih et al., 2023). This data shows that although

overall achievement is in a suitable category, further attention is needed to improve specific dimensions.

The analysis results of the average scores in the three schools show variations in the achievement of the dimensions of the Pancasila Student Profile in each school. School A showed the highest average scores in almost all dimensions, with values approaching or exceeding the overall average for the dimensions "Having faith and devotion to The One-and-Only God in and having noble character" and "Cooperation." In contrast, Schools B and C recorded lower average scores, especially in the "Creativity" and "Critical Thinking" dimensions. These results indicate variations in the implementation and understanding of the Pancasila Student Profile in each school. This analysis highlights the need for a more focused approach and improvement strategies in lower-achieving schools to ensure consistent and effective implementation of the Pancasila Learner Profile across schools.

The results of construct validity analysis using Confirmatory Factor Analysis (CFA) show that the measurement model used for the Pancasila Student Profile is a perfect fit. The fit index values such as χ^2/df, RMSEA, and SRMR, respectively, show results that follow the absolute fit criteria, namely 1.62, 0.023, and 0.035. In contrast, the Comparative Fit Index (CFI) value reaches 0.910, exceeding the expected threshold. These results confirm that the developed measurement model effectively measures the six dimensions of the Pancasila Student Profile, namely faith and piety, global diversity, cooperation, creativity, critical thinking, and independence, and supports the instrument's construct validity. Thus, this model is considered valid and suitable for further research and can be relied on in evaluating the implementation of the Pancasila Student Profile.

Overall, this research shows that the instruments developed to measure the implementation of the Pancasila Learner Profile in mathematics learning at the secondary school level are valid and reliable through validity analysis using the V-Aiken method and construct validity testing with Confirmatory Factor Analysis (CFA). The results show that implementing the Pancasila Learner Profile in secondary schools is quite good. However, there are variations in the achievement of dimensions in each school, especially in the dimensions of Creativity and Critical Thinking. Measurement theory emphasizes the importance of validity and reliability in instruments to ensure the accuracy and relevance of research results (Mellinger & Hanson, 2020; Sureshchandar, 2023; Sürücü & Maslakci, 2020). With a valid instrument, this research reinforces the importance of holistic and consistent application of the Pancasila Learner Profile in learning, ensuring that education focuses on technical skills and comprehensive development of character and moral values.

Conclusion

The developed instrument model effectively assesses the strengthening of the *Pancasila* student profiles in mathematics teaching. This is proven by the validation results by experts consisting of 23 teachers who were analyzed using the Aiken formula and obtained a V-Aiken value of 0.89 > v table of 0.630, which was included in the valid and appropriate-for-use category. The Cronbach Alpha reliability analysis results indicate a decisive outcome, with a value of 0.751.

Confirmatory factor analysis using the R program showed significant factor loadings with a p-value < 0.05. Based on the results of the data analysis, the percentage of achievement of the implementation of the Pancasila Student Profiles was 87.06%, which is included in the good category. The average score per class in each dimension shows that students in classes VII, VIII, and IX have Pancasila Student Profiles that are not much different. The developed instrument can be used as an effective evaluation tool in mathematics teaching to strengthen the Pancasila Learner Profile and help identify areas that require improvement in teaching to achieve a more balanced profile across all dimensions.

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Conflicts of Interest

The authors declare no conflict of interest regarding the publication of this manuscript. In addition, the authors have completed the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies.

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Author Contributions

Syukrul Hamdi: Coordinating activities, preparing research reports and writing article; **Nila Mareta Murdiyani:** Developing instruments and coordinating data collection; **Muhammad Fauzan:** Developing instruments and coordinating data analysis; **Hasan Djidu:** Creating applications and data analysis; **Endar Chrisdiyanto & Zafrullah:** data analysis and writing article.

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