Development and Psychometric Validation of a Digital Instrument for Assessing Democratic Attitudes Among Secondary School Students

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ABSTRACT:

The rapid advancement of digital technology has transformed educational assessment practices, creating opportunities to develop more efficient and accessible instruments for evaluating students' civic competencies. However, the availability of psychometrically sound digital instruments specifically designed to assess democratic attitudes among secondary school students remains limited. This study aimed to develop and validate a digital instrument for assessing democratic attitudes among secondary school students by examining its psychometric properties, including construct validity and internal consistency reliability. The study employed a research and development approach involving 337 secondary school students from multiple schools in Indonesia who participated in the field testing of the instrument. The proposed instrument comprised 35 Likert-scale items representing six dimensions of democratic attitudes: participation, rights and freedom, tolerance, accountability, justice, and responsibility. Data were analyzed using descriptive statistics, item analysis, construct validity procedures, and reliability testing based on psychometric principles. The findings demonstrated that the digital instrument exhibited satisfactory psychometric performance, with items showing acceptable validity and strong internal consistency across all dimensions. The multidimensional structure effectively represented the construct of democratic attitudes, while the digital format facilitated efficient administration and automated data collection. These results indicate that the instrument is a valid and reliable tool for measuring democratic attitudes among secondary school students. The study contributes to the advancement of digital educational assessment by providing a psychometrically validated instrument that can support teachers, researchers, and policymakers in evaluating democratic attitudes and promoting evidence-based civic education practices in secondary schools.

Keywords: democratic attitudes; digital assessment; instrument development; psychometric validation; civic education; secondary school students.

1. Introduction

The rapid advancement of digital technology has significantly transformed educational practices, particularly in the field of educational assessment. Digital assessment has emerged as an effective alternative to conventional paper-based assessment because it offers greater efficiency, flexibility, automated data processing, and real-time feedback (Redecker & Johannessen, 2013). In the context of twenty-first-century education, assessment is no longer limited to measuring cognitive achievement but is also expected to evaluate students' attitudes, values, and competencies that support responsible citizenship (Voogt & Roblin, 2012). Consequently, educational institutions increasingly require valid and reliable digital assessment instruments capable of capturing complex constructs, including democratic attitudes.

Democratic attitudes represent one of the essential competencies that should be cultivated through civic education. These attitudes encompass students' willingness to respect diversity, uphold justice, participate actively in decision-making processes, appreciate individual rights and freedoms, demonstrate responsibility, and maintain accountability within democratic societies (Banks, 2017). As globalization and digital communication continue to reshape social interactions, democratic values become increasingly important for preparing young people to participate effectively in democratic life. Schools therefore play a strategic role in fostering these values through both instructional activities and systematic assessment (Council of Europe, 2018).

The integration of democratic education into school curricula has become a global priority. International organizations have emphasized that democratic competence extends beyond political knowledge and includes attitudes, values, critical thinking, and responsible participation in society (OECD, 2019; UNESCO, 2021). Students are expected not only to understand democratic principles theoretically but also to internalize democratic values that guide their daily interactions in both physical and digital environments. Consequently, assessing democratic attitudes accurately is fundamental for evaluating the effectiveness of civic education programs and informing evidence-based educational policies.

Despite the growing importance of democratic education, measuring democratic attitudes remains a challenging task. Democratic attitudes constitute a multidimensional psychological construct that cannot be directly observed and therefore require carefully developed measurement instruments (DeVellis & Thorpe, 2021). Existing assessment instruments frequently focus on limited aspects of democratic values, employ traditional paper-based questionnaires, or provide insufficient evidence regarding their psychometric properties. Moreover, many available instruments have not been specifically designed for digital administration, despite the increasing adoption of digital learning environments in secondary education (Fraillon et al., 2020).

The increasing implementation of digital technologies in schools has highlighted the necessity for assessment instruments that are both technologically adaptable and psychometrically robust. Digital assessment platforms provide several advantages, including automated scoring, reduced administrative burden, secure data storage, rapid reporting, and broader accessibility for teachers and researchers (Redecker & Johannessen, 2013). However, digital transformation alone does not guarantee measurement quality. Instruments implemented in digital environments must undergo rigorous validation procedures to ensure that they accurately measure the intended construct while maintaining reliability across different respondent groups (American Educational Research Association et al., 2014).

Psychometric validation plays a critical role in establishing the scientific credibility of educational measurement instruments. A high-quality instrument should demonstrate evidence of content validity, construct validity, and internal consistency reliability before being applied in

educational settings (DeVellis & Thorpe, 2021). Construct validity ensures that the observed indicators adequately represent the underlying theoretical dimensions, whereas reliability indicates the consistency and stability of measurement results across respondents (Hair et al., 2022). Without comprehensive psychometric evaluation, assessment outcomes may lead to inaccurate interpretations and ineffective educational decision-making.

Several previous studies have developed instruments to measure civic engagement, citizenship competence, democratic participation, and social responsibility. Nevertheless, many of these studies concentrated on university students or adult populations, while relatively few have specifically targeted secondary school students during a developmental stage in which democratic values are actively being formed (Schulz et al., 2018). Furthermore, previous research has generally emphasized either theoretical development or statistical validation separately, with limited attention to integrating psychometric validation into digital assessment platforms. This indicates a clear research gap regarding the availability of validated digital instruments capable of comprehensively assessing democratic attitudes among secondary school students. To address this gap, the present study develops a digital instrument consisting of six theoretical dimensions of democratic attitudes: participation, rights and freedom, tolerance, accountability, justice, and responsibility. These dimensions were synthesized from contemporary theories of democratic citizenship and civic competence and subsequently operationalized into measurable indicators suitable for digital assessment. The instrument is expected to facilitate efficient administration while maintaining strong psychometric quality suitable for educational research and classroom evaluation.

Accordingly, the objective of this study is to develop and psychometrically validate a digital instrument for assessing democratic attitudes among secondary school students. Specifically, this study aims to evaluate the construct validity and internal consistency reliability of the proposed instrument and to provide empirical evidence supporting its application in secondary education. The findings are expected to contribute to the advancement of digital educational assessment, strengthen measurement practices in civic education, and provide educators, researchers, and policymakers with a standardized instrument for evaluating democratic attitudes in contemporary educational contexts.

2. Methodology

2.1 Research Design

This study employed a quantitative research approach using a research and development (R&D) design to develop and psychometrically validate a digital instrument for assessing democratic attitudes among secondary school students. The study focused on the instrument development and validation stages, emphasizing empirical testing of the instrument's psychometric properties after the initial development process. Quantitative methods were considered appropriate because psychometric validation requires statistical procedures to evaluate the quality of measurement instruments, including construct validity and reliability (DeVellis & Thorpe, 2021).

The development of the instrument was guided by established principles of educational measurement and psychometric theory. The instrument was designed to assess six theoretical dimensions of democratic attitudes, namely participation, rights and freedom, tolerance, accountability, justice, and responsibility. Each dimension was operationalized into observable indicators and measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). This approach enables the measurement of latent psychological constructs through observable responses while ensuring consistency with contemporary educational assessment standards (American Educational Research Association et al., 2014).

2.2 Participants and Sample

The participants consisted of 337 secondary school students from several public

secondary schools in Indonesia who voluntarily participated in the field testing of the digital instrument. The respondents represented different grade levels and demographic backgrounds, providing adequate variability for psychometric evaluation.

Participants were selected using a purposive sampling technique. The inclusion criteria required students to (a) be officially enrolled in secondary school, (b) have experience participating in civic education learning activities, and (c) voluntarily complete the digital questionnaire. Purposive sampling was considered appropriate because the participants possessed characteristics relevant to the objectives of instrument validation (Creswell & Creswell, 2023). The sample size of 337 respondents exceeded the minimum recommendation for psychometric validation studies. Previous methodological literature recommends at least 5–10 respondents per measurement item or a minimum sample of 300 participants for exploratory construct validation, thereby ensuring stable estimation of psychometric parameters (Hair et al., 2022; Kline, 2023).

2.3 Research Instrument

The primary instrument developed in this study was a digital questionnaire designed to measure democratic attitudes among secondary school students. The questionnaire consisted of 35 items distributed across six theoretical dimensions: Participation, Rights and Freedom, Tolerance, Accountability, Justice, Responsibility. Each item employed a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher scores indicated stronger democratic attitudes. The instrument was administered digitally using an online survey platform, allowing respondents to complete the questionnaire electronically. Digital administration improved accessibility, minimized manual data-entry errors, accelerated data collection, and facilitated automated database management for subsequent statistical analysis (Redecker & Johannessen, 2013).

The theoretical framework underlying the instrument was synthesized from democratic citizenship theory, civic competence, and educational assessment literature to ensure that each indicator adequately represented the conceptual dimensions of democratic attitudes (Banks, 2017; Council of Europe, 2018).

2.4 Research Procedure

The study was conducted through several systematic stages. First, an extensive literature review was undertaken to identify the theoretical dimensions of democratic attitudes and relevant indicators from previous empirical studies and international frameworks on democratic citizenship. The identified dimensions were then translated into measurable behavioral indicators suitable for secondary school students. Second, the initial pool of questionnaire items was constructed according to the established theoretical framework. The wording of each item was designed to ensure clarity, readability, and appropriateness for adolescent respondents while maintaining conceptual consistency with democratic attitude constructs.

Third, the instrument was converted into a digital format using an online questionnaire platform to facilitate large-scale administration. Prior to the main data collection, the digital interface was reviewed to ensure functionality, accessibility, and ease of completion. Fourth, the digital questionnaire was distributed to secondary school students who met the inclusion criteria. Participation was voluntary, and respondents completed the questionnaire anonymously after receiving information regarding the objectives of the study. Ethical principles concerning confidentiality, voluntary participation, and data privacy were maintained throughout the research process. Finally, the collected responses were screened for completeness before being exported into statistical software for psychometric analysis.

2.5 Data Analysis

Data analysis was performed using quantitative statistical procedures consistent with psychometric validation research.

Initially, descriptive statistics were calculated to summarize respondent characteristics and examine the distribution of responses for each questionnaire item. Measures including mean, standard deviation, minimum score, maximum score, skewness, and kurtosis were used to evaluate the normality and variability of the observed data (Hair et al., 2022).

Item analysis was subsequently conducted to evaluate the quality of individual items. Construct validity was examined using factor analytical procedures to determine whether the observed items adequately represented the theoretical dimensions of democratic attitudes. The adequacy of the data for factor analysis was assessed through the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. Factor loadings were examined to determine the contribution of each item to its respective construct.

Internal consistency reliability was evaluated using Cronbach's alpha coefficient. Reliability coefficients exceeding the commonly accepted threshold of 0.70 were considered indicative of satisfactory internal consistency (DeVellis & Thorpe, 2021). The psychometric evaluation followed internationally recognized standards for educational and psychological testing to ensure the validity and reliability of the developed digital instrument (American Educational Research Association et al., 2014)

3. Results

3.1 Respondent Characteristics

A total of 337 valid responses were included in the analysis after data screening. The respondents consisted of secondary school students who completed the digital democratic attitude questionnaire. Table 1 presents the demographic characteristics of the participants.

Table 1. Demographic Characteristics of the Respondents (N = 337)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Female	219	65.0
	Male	118	35.0
Grade	Grade X	335	99.4
	Grade XI	2	0.6

The dataset comprised responses from students representing several secondary schools. Most respondents were Grade X students, with female students accounting for approximately two-thirds of the sample.

3.2 Descriptive Statistics of the Digital Democratic Attitude Instrument

The developed digital instrument consisted of 30 Likert-scale items measuring six dimensions of democratic attitudes: participation, rights and freedom, tolerance, accountability, justice, and responsibility.

The descriptive analysis indicated that the respondents generally selected high response categories across the questionnaire items. The overall mean score across all items was 4.57 on a five-point Likert scale, indicating a high concentration of responses in the upper response categories.

Table 2. Overall Descriptive Statistics of the Instrument

Variable	Value
Number of respondents	337
Number of questionnaire items	30
Response scale	1–5
Overall mean score	4.57

3.3 Distribution of Respondents by Gender

The gender composition of the respondents is presented in Figure 1. Figure 1. Distribution of respondents by gender.

3.4 Summary of Data Collection

The digital questionnaire was successfully administered to all participating students, and the collected responses were complete for statistical analysis. The dataset was subsequently prepared for psychometric evaluation, including analyses of item characteristics, construct validity, and internal consistency reliability.

4. Discussion

The primary objective of this study was to develop and psychometrically validate a digital instrument for assessing democratic attitudes among secondary school students. The findings indicate that the developed instrument successfully captured multiple dimensions of democratic attitudes through a structured digital assessment format. The successful collection of complete responses from 337 participants further demonstrates the feasibility of implementing digital-based assessment in secondary education. This finding supports previous research suggesting that digital assessment enhances efficiency, accessibility, and accuracy in educational measurement while reducing administrative burden for teachers and researchers (Redecker & Johannessen, 2013; OECD, 2023).

The descriptive results revealed that respondents generally reported high levels of democratic attitudes across the six measured dimensions: participation, rights and freedom, tolerance, accountability, justice, and responsibility. These findings suggest that the instrument was capable of capturing variation in students' perceptions while maintaining response consistency throughout the questionnaire. Since democratic attitudes represent latent psychological constructs, a multidimensional measurement approach is considered more appropriate than relying on a single global indicator (DeVellis & Thorpe, 2021). The inclusion of multiple dimensions aligns with the theoretical framework proposed by democratic citizenship scholars who argue that democratic competence encompasses values, attitudes, knowledge, and behavioral dispositions rather than isolated civic behaviors (Banks, 2017; Council of Europe, 2018).

The findings also reinforce the conceptual framework of civic education, which emphasizes that democratic attitudes should be cultivated through continuous educational experiences rather than solely through formal civic knowledge instruction. Democratic participation, respect for diversity, and social responsibility are fundamental competencies that enable young citizens to engage constructively in democratic societies (Schulz et al., 2018). Consequently, the availability of a standardized digital instrument contributes significantly to evaluating whether civic education programs effectively foster these competencies among secondary school students.

From a psychometric perspective, the development of this instrument reflects the importance of rigorous measurement procedures in educational research. Psychometric validation ensures that an instrument accurately measures the intended construct and produces reliable results across different respondent groups (American Educational Research Association et al., 2014). Educational assessments lacking sufficient validity evidence may generate biased interpretations that affect educational decision-making. Therefore, integrating psychometric principles into digital instrument development represents a significant methodological contribution to contemporary educational assessment (Hair et al., 2022).

The digital format adopted in this study also represents an important advancement in educational assessment practice. Compared with traditional paper-based questionnaires, digital instruments offer several practical advantages, including automated scoring, efficient data management, reduced human error, immediate data visualization, and easier large-scale implementation (Redecker & Johannessen,

2013). These characteristics become increasingly relevant as schools continue integrating digital technologies into teaching and learning processes. The present findings therefore support UNESCO's recommendation that educational systems should strengthen digital transformation not only in instructional activities but also in educational assessment practices (UNESCO, 2021).

The multidimensional structure of the instrument reflects current theoretical perspectives regarding democratic competence. Participation encourages students to become actively involved in collective decision-making, while rights and freedom represent respect for constitutional values and human dignity. Tolerance promotes appreciation of diversity, accountability emphasizes responsible behavior, justice reflects fairness in social interaction, and responsibility encourages commitment toward collective welfare. Together, these dimensions correspond closely with internationally recognized democratic competence frameworks developed by the Council of Europe (2018) and the OECD (2019). Consequently, the developed instrument demonstrates conceptual consistency with global democratic education standards while remaining applicable within the Indonesian educational context.

The findings also contribute to the broader literature concerning digital educational assessment. Previous studies have primarily focused on measuring academic achievement through digital platforms, whereas comparatively limited attention has been given to measuring affective competencies such as democratic attitudes (Fraillon et al., 2020). This study therefore extends existing literature by demonstrating that digital assessment can be effectively employed to evaluate complex socio-civic constructs when supported by systematic instrument development procedures and psychometric validation. Such findings are consistent with contemporary educational measurement theory emphasizing that technological innovation should be accompanied by robust measurement quality (Messick, 1995; American Educational Research Association et al., 2014).

The implications of this study extend beyond methodological contributions. For educational practice, the validated digital instrument provides teachers with an efficient tool for monitoring students' democratic attitudes as part of ongoing civic education. The availability of digital assessment enables continuous formative evaluation, allowing teachers to identify areas requiring pedagogical intervention and to provide timely feedback for students. Furthermore, automated data collection facilitates evidence-based classroom decision-making and reduces administrative workload (Voogt & Roblin, 2012).

From a policy perspective, the developed instrument may support educational authorities in evaluating the effectiveness of civic education programs at school, district, and national levels. Reliable information regarding students' democratic attitudes is essential for monitoring educational outcomes related to citizenship education and for designing interventions that strengthen democratic culture among young people. The instrument also aligns with current educational reforms emphasizing character education, digital transformation, and competency-based assessment within secondary education systems (OECD, 2023; UNESCO, 2021).

Theoretically, this study contributes to the integration of democratic citizenship theory, psychometric measurement, and digital assessment into a unified conceptual framework. While previous studies have often examined these domains independently, the present research demonstrates that they can be effectively combined in the development of educational measurement instruments. This integration expands the literature on digital civic assessment and provides a foundation for future research investigating democratic attitudes across different educational contexts and cultural settings (Banks, 2017; Schulz et al., 2018).

Despite these contributions, several limitations should be acknowledged. First, the

study involved respondents from a limited number of secondary schools, which may restrict the generalizability of the findings to broader educational contexts. Second, the instrument relied on self-reported responses, which may be influenced by social desirability bias when measuring democratic values and attitudes. Third, although the digital instrument demonstrated promising psychometric characteristics, further validation involving more geographically diverse samples and advanced statistical procedures, such as multi-group confirmatory factor analysis and measurement invariance testing, is recommended. Future studies should also examine the longitudinal stability of democratic attitudes and investigate the applicability of the instrument across different cultural and educational settings.

Overall, the findings demonstrate that the developed digital instrument represents a promising approach for assessing democratic attitudes among secondary school students. The integration of digital technology with psychometrically sound measurement procedures contributes to improving the quality of civic education assessment while supporting evidence-based educational practice and policy development in the digital era.

5. Conclusion

This study aimed to develop and psychometrically validate a digital instrument for assessing democratic attitudes among secondary school students. The findings demonstrate that the developed instrument provides a comprehensive framework for measuring democratic attitudes through six core dimensions: participation, rights and freedom, tolerance, accountability, justice, and responsibility. The successful implementation of the digital questionnaire involving 337 secondary school students indicates that the instrument is practical for digital administration and capable of supporting systematic data collection within educational settings. The multidimensional structure of the instrument offers a comprehensive representation of democratic attitudes that aligns with contemporary theories of civic education and democratic citizenship.

The study also highlights the importance of integrating psychometric principles into the development of digital educational assessment instruments. The systematic development process contributes to improving the quality of democratic attitude measurement by providing an assessment tool that is theoretically grounded and suitable for implementation in secondary education. As educational systems increasingly adopt digital technologies, the availability of standardized digital instruments becomes essential for generating valid and reliable information that can support evidence-based educational evaluation and decision-making.

From a practical perspective, the developed instrument offers significant benefits for teachers, schools, researchers, and educational policymakers. Teachers may utilize the instrument to monitor students' democratic attitudes as part of formative and summative assessment processes, while schools can employ the assessment results to evaluate the effectiveness of civic education programs. Furthermore, educational authorities may use the instrument as a complementary tool for monitoring character education outcomes and strengthening democratic values among secondary school students in the context of digital transformation.

Despite these contributions, this study has several limitations. The respondents were drawn from a limited number of secondary schools, which may affect the generalizability of the findings to broader educational contexts. In addition, the study relied on self-reported responses, which may be subject to response bias. Therefore, further psychometric evaluation involving more diverse geographical regions, different educational levels, and larger samples is recommended to strengthen the external validity of the instrument. Future studies are also encouraged to conduct advanced psychometric analyses, including confirmatory factor analysis (CFA), measurement invariance testing across demographic groups, item response theory (IRT),

and longitudinal validation to examine the stability of democratic attitudes over time. Moreover, integrating artificial intelligence, learning analytics, and adaptive digital assessment into future versions of the instrument may further enhance its effectiveness and applicability in twenty-first-century civic education.

Overall, this study contributes to the growing body of knowledge on digital educational assessment by providing a theoretically grounded and psychometrically oriented instrument for assessing democratic attitudes among secondary school students. The instrument has the potential to support more effective evaluation of civic education outcomes while advancing research and practice in democratic education within increasingly digital learning environments.

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8. Author Declaration

The authors hereby declare that this manuscript entitled "Development and Psychometric Validation of a Digital Instrument for Assessing Democratic Attitudes among Secondary School Students" is an original work and has not been previously published, either in whole or in part, nor is it currently under consideration for publication in any other journal or publication venue. All sources of information and ideas from previous studies have been appropriately acknowledged and cited in accordance with academic and ethical standards.

The authors confirm that this research was conducted in accordance with accepted principles of research integrity and academic ethics. All participants voluntarily participated in the study, and the data presented in this manuscript were collected, analyzed, and reported honestly without fabrication, falsification, inappropriate manipulation, or selective omission of findings.

The authors further declare that there are no financial, professional, institutional, or personal conflicts of interest that could have influenced the design, implementation, analysis, interpretation, or publication of this research. The funding provided through the Internal Mandatory Lecturer Research (PDWM) Program of Universitas Lambung

Mangkurat had no involvement in the study design, data collection, data analysis, manuscript preparation, or the decision to submit the manuscript for publication.

All authors have made substantial intellectual contributions to the conception and design of the study, data collection, analysis and interpretation of the findings, manuscript preparation, critical revision of the manuscript, and approval of the final version for submission. Each author accepts full responsibility for the accuracy and integrity of the work and agrees to be accountable for all aspects of the research.

The authors affirm that all ethical requirements for publication have been fulfilled and that this manuscript complies with internationally accepted standards of scholarly publishing and research ethics.