Development of a Digital Test Instrument Using the Thurstone Scale to Measure Levels of Religious Moderation

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Abstract. There is an opinion by some people that religious moderation will shallow religious understanding. In fact, religious moderation actually implements true religious values. The phenomenon shows that people with a good understanding of religion will be friendly towards other people, especially when facing differences. The higher an individual's level of religious moderation, the better their social interactions with other people. Standardized measuring instruments are needed to measure religious moderation. In general, the research aims to produce a digital test instrument using a turnstone scale to measure the level of religious moderation. The specific aim of this research is to determine the validity and practicality of a digital test instrument using the turnstone scale to measure the level of religious moderation. The research method is research and development using the ADDIE design (Analysis, Design, Develop, Implementation and Evaluation). The development procedure uses the ADDIE Model steps. The research and development instruments used are interview guidelines, validation instruments and practicality instruments. Technical data analysis is a qualitative and quantitative analysis technique (mixing method). The research results showed that the digital test instrument using the turnstone scale was categorized as valid at 88.73% and the practicality level was 87.23%. Thus, the digital test instrument using the turnstone scale is categorized as valid based on expert assessment and can be practically applied to students.

Keywords: Development of Digital Test, Thurstone Scale, Religious Moderation

1 Introduction

Moderation is an important social capital in the safe and tolerant Republic of Indonesia. It is a concept that explains how to reduce violence, radicalism, and extremism, especially in multicultural societies, to achieve peace. Moderation is referred to as a social capital because it is related to national commitment, tolerance, and acceptance of traditions. Moderation is also important in strengthening religious moderation, especially in Indonesia, which has important social capital, such as diversity and het-

erogeneity [1]. Moderation is also important in strengthening religious moderation in Indonesia, which has important social capital, such as diversity and heterogeneity. It is a creative effort to develop a religious attitude in the midst of various tensions, such as between different religions, and it is important in maintaining national unity and preventing violence [2]. Moderation is a key solution to creating a peaceful and harmonious religious life in Indonesia, which is a plural and multicultural country.

Quraish Shihab in Iffati Zamimah claims [3],], Justice, balance, and tolerance are some of the principles of religious moderation. According to the philosophy of religious moderation, religion itself is not what is regulated, but rather the manner in which it is practiced.. Lukman Hakim [4] claimed that since religion is a gift from God, it cannot be modified and must be faultless. How to comprehend religion in its restrained practice. The general population, especially the millennial age, has to be educated about religious moderation. Education is one of the practical measures that must be used to instill in the younger generation the concept of religious moderation. [5].

There are four indicators of religious moderation, namely tolerance, non-violence, acceptance of traditions, and national commitment. If these four indicators are met then the welfare of religious and national life in harmony, peace and tolerance leading to a prosperous Indonesia is no longer impossible [4][6]. The success of religious moderation can be measured by the ability to reduce violence, build social harmony, build a culture of peace, and build a culture of tolerance. Moderation in religion is important in Indonesia because it helps reduce violence, radicalism and extremism in a multicultural society, and promotes peace. It is considered social capital because of its association with national commitment, tolerance, and acceptance of traditions. The application of religious moderation is also important in strengthening religious moderation in Indonesia which has important social capital, such as diversity and heterogeneity [7]. The application of moderation in religion is a creative effort to develop religious attitudes amidst various tensions, such as between religions, and is important in maintaining national unity and preventing violence.

The phenomenon shows that people with a good understanding of religion will be friendly towards other people, especially when facing differences [8]. The higher an individual's level of religious moderation, the better their social interactions with other people. Standardized measuring instruments are needed to measure religious moderation. There are already religious moderation measurement tools developed by previous researchers. The consideration of using the Thurstone scale is because there is no standard scale for measuring religious moderation. The type of scale developed is the Thurstone scale with the Equal Appearing Interval (EAI) method. The initial number of items on this scale was prepared as 50 items involving 40 respondents. Selection of items using median and interquartile values resulted in 50 selected items with median values >6 and interquartile values ≤4. This digital instrument for measuring religious moderation is easy to use, because it can be used on Android cellphones.

1.1   Moderasi Beragama

The Latin term moderateio, which signifies moderation (neither excess nor lack), is where the word moderation originates. The phrase also refers to self-mastery (from a perspective of extreme benefits and drawbacks). Two definitions of "moderation" are offered by The Big Indonesian Dictionary (KBBI), namely: 1) Violence reduction; and 2) staying away from extremes. The phrase "the person is moderate" indicates that the subject is functioning ordinarily, mediocrely, and not in an excessive manner [9].

The term "religious moderation" refers to ways of thinking, attitudes, and religious practices that promote peaceful coexistence by understanding the core of religious teachings that uphold human dignity and build prosperity based on the ideals of justice, balance, and adherence to the constitution as a legal document [10]. Religious moderation in this context has a different meaning from religious moderation. Religion cannot be moderated because it has become a decree from God, but moderating the religious viewpoints, attitudes and practices that are adhered to according to conditions and situations can be done as long as it does not conflict with the principles of religious teachings.

Moderation in religion is a concept that refers to ideas, attitudes, and religious practices when living together, and is the essence of religious teachings that protect human dignity and promote happiness based on the principles of justice, balance, and creation of justice. It embodies. The Constitution as a national consensus.

1.2   Skala Thurstone

L. L. Thurstone was a prominent proponent of the mathematical foundations of scientific psychology in the 20th century. The influence of his work extends beyond his native United States to Europe, Canada, Latin America, Australia, and the Far East. The implications of his contributions extend beyond the boundaries of psychology and remain fundamental to both current measurement methods and future developments in mathematical modeling in the social sciences [11].

The development of the instrument for religious moderation attitudes in this research used the Thurstone scale with the Equal-Appearing Interval method. This scale was first developed by Louis Leon Thrustone in 1928 [12]. Some experts say that this method is the first method for measuring attitudes [13].

First-stone scaling is often used to express the priority of the elements being compared. The mean of the quantiles corresponding to the frequency of preference for each stimulus relative to other stimuli defines the item's position on the psychological continuum of the Thurstone scale [14].

The measurement scale theory using Thurstone pays attention to the psychological aspects of Si (I = I, 2, ... , m) as random normal variables $x_i = N(v_i, c_{r_i})$ with mean v_i and standard deviation σ_i [15]. The Thurstone scale consists of estimating the value of v_i as a stimulus' position on a psychological continuum -see Figure I.

The cumulative probability is that one stimulus is more dominant than another stimulus is

$$p_{ij} = F(v_i - v_j) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z} e^{-y^2/2} \, dy, \tag{1}$$

where z = (vi − vj)/σ̄ defines the standardized variable with the standard deviation of the difference σ̄ = (σ2 i + σ2 j − 2σiσjrij)1/2, and with rij deviation and correlation between the ith and jth stimuli. Thurstone has several versions of the model. The most commonly used model is the Case V model, which assumes a standard deviation equal to o- for all pairwise differences in stimuli. The assumption will be fulfilled if the standard deviation of all stimuli has the same value. The correlation value obtained is equal to zero. Mosteller [29] showed that the latter requirement can be relaxed for spherical stimulus distributions with the same correlation.

If the pij values on the left side of (I) are given, the quartiles, or z values are:

$$z_{ij} = F^{-1}(p_{ij}) = v_i - v_j. \tag{2}$$

There are more equations like Eq. (2) for the pairs (i > j, j = 1,..., m −1) than m values vi themselves. For estimation of the parameters vi , Mosteller [29] suggested minimizing
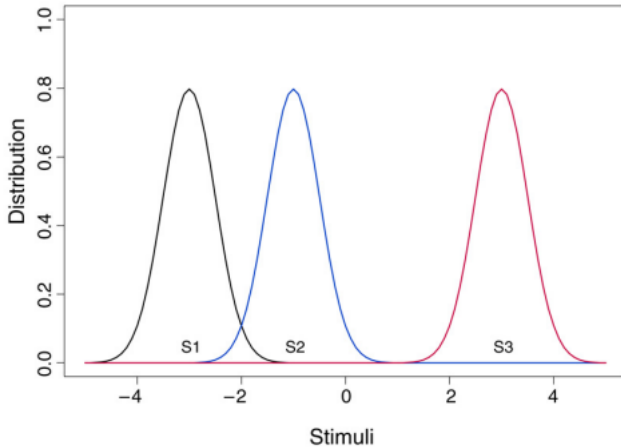

Fig. 1. Thurstone's case V pair comparison scale.

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the least squares (LS) objective of the deviations εij from the model zij = vi − vj + εij :

$$LS(v) = \sum_{i \neq j}^{m} (z_{ij} - (v_i - v_j))^2. \tag{3}$$

The objective (3) corresponds to a linear regression by dummy variables with the coefficients vi . These coefficients need a shift identifiability constraint, for instance,

$$\sum_{i=1}^{m} v_i = 0. \tag{4}$$

Then the first-order condition dLS/dvi = 0 for minimizing (3) yields the estimate

$$v_i = \frac{1}{m}\sum_{j=1}^{m} z_{ij} + \frac{1}{m}\sum_{j=1}^{m} v_j = \frac{1}{m}\sum_{j=1}^{m} z_{ij}. \tag{5}$$

The position on the psychological scale for each ith item is equal to the average value of the z-score for comparison with the other items. The practical application of TMD scaling is to apply the sample proportion of preferences for each item compared to other items. These frequencies are presented in a matrix where each element fij corresponds to a preference for item j over item i. Then the frequency is transformed into quantiles with a normal distribution (2), so that zij = F-1 (fij). The average z value (5) was used as the item position on the Thurstone preference scale. The preference scale is reduced to a standard zero-one preference scale through transformation

$$\tilde{v}_j = \frac{v_j - \min(v)}{\max(v) - \min(v)}, \tag{6}$$

where min and max are the minimum and maximum of all the vj values. This approach is the standard Case V Thurstone scale estimation procedure.

Product Specifications and Novelty

The product that will be produced is in the form of a digital test instrument containing assessment aspects and indicators using the Thurstone scale to measure the level of religious moderation

Digital test instruments using the Thurstone scale can make it easier to assess the level of religious moderation in schools, because they are presented in clear and easy to understand steps.

A digital test instrument using the Thurstone scale to measure the level of religious moderation in schools is used offline and online and can be used on Android devices

A digital test instrument using the Thurstone scale to measure the level of religious moderation in schools is presented in text form created using the Kahoot application

The product of research and development is a digital application for measuring students' level of religious moderation using the Thurstone scale. The novelty lies in the development stage based on the combination of using the Tustone scale with Kahoot as a tool for measuring the level of religious moderation. Easier and simpler use, which is not yet available in other research products.

2   Methods

This research aims to develop a digital testing instrument that uses the Thurston scale to measure different levels of moderation. Based on the research objectives, the type of development research or research and development (R and D) was selected. Borg and Garu [16] It states that research and development (R and D) is the process of

developing and validating educational products. "Products" include textbooks, educational films, computer software, etc., as well as methods such as educational methods and programs such as drug education programs and workforce development programs. Meanwhile, Richie [17] In this research, called development research, development research, as opposed to simple learning development, is defined as "a study that involves the design, development, and evaluation of learning programs, processes, and products that must meet criteria of requirements, internal consistency, and effectiveness." It states that it is defined as ``systematic research''.".

The procedures carried out in the digital tes instrument for students of Madrasah Aliyah Negeri 2 Tanah Datar follow the steps for developing the ADDIE model, including the stages; 1) Analysis, 2) Design, 3) Development, 4) Implementation, and 5) Evaluation. The ADDIE model development procedure is described as below [18].
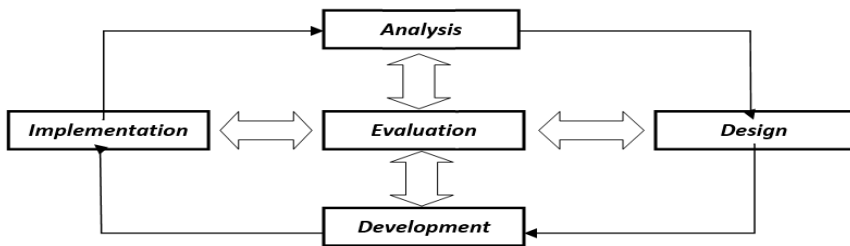

Fig. 2. The ADDIE Development Analysis

3 Results and Discussion

3.1 Analysis

Needs analysis was carried out through interviews with the Principal and teachers who taught Madrasah Aliyah Negeri 2 Tanah Datar. Based on the interview results, it is known that there is no valid and practical test instrument to measure students' level of religious moderation (Sabrimen, Personal Interview: 17 July 2023). This was also conveyed by Azwir as deputy principal, saying that the level of religious moderation in students also needs to be measured using valid and practical measuring instruments. A valid test instrument is needed, so that students can know the level of religious moderation in students (Personal Interview: 18 July 2023). Thus, appropriate test instruments are needed to measure the level of religious moderation in students. This is the reason why it is important to develop test instruments to measure the level of religious moderation in students. The test instrument was developed digitally and can be used using Android electronic devices and computers. The test instrument was developed using the Thurstone scale with the aim of obtaining more diverse results, because the Thurstone scale has a counting scale of 1-11.

3.2   Design

The resulting product design is the Kahoot application as a digital test instrument to measure students' level of religious moderation. Kahoot is a website application that has many features, one of which is the feature of creating quiz-based test instruments that connect to students' smartphones in a way that is fun and easy to use [19]. Kahoot is a technology product for conducting quizzes, discussions, and surveys. The system used is a game-based class response format that can be used by the entire class in real time. Contains multiple-choice questions or statements that are projected onto the screen. Students can use their smartphones, tablets, or computers to answer questions. By using this application, teachers can collaborate more effectively with students while ultimately saving time and paper [20].

The use of the Kahoot application begins with the design of a test instrument which is developed from the religious moderation value of 50 valid question items based on expert tests. In the next stage, the test instrument questions are input into the Kahoot application. The Kahoot application can be accessed on the website www.kahoot.it or on smartphones via Play Store. In applications that can be accessed, students can answer questions via smartphone directly. The students' answers will be entered into the Kahoot application that the teacher has created. The use of Kahoot application can be a creative effort to develop a religious attitude in the midst of various tensions, such as between different religions, and it is important in maintaining national unity and preventing violence. The success of religious moderation can be measured by four main indicators, namely the ability to reduce violence, the ability to build social harmony, the ability to build a culture of peace, and the ability to build a culture of tolerance. The Kahoot application can be a useful tool to help meet these indicators by promoting interactive learning and increasing student engagement.

Steps to design the Kahoot application by entering your email and password.
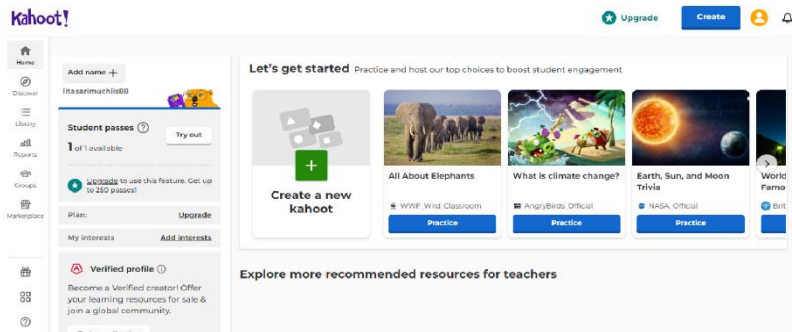

Fig. 3. How to Login to Digital Test Instruments

The next step in the process is to engage with the religious moderation score test. Here, you can create a series of questions to evaluate an individual's religious moderation. The interface allows you to include pictures, diagrams, and multiple answer

choices to enhance the test experience. Time limits can be set for fair evaluation. The questions cover different formats such as multiple-choice, puzzles, polls, and descriptive answers. These formats assess knowledge, critical thinking, opinions, and understanding. By utilizing a diverse range of question formats, this evaluation aims to deeply assess an individual's level of religious moderation.
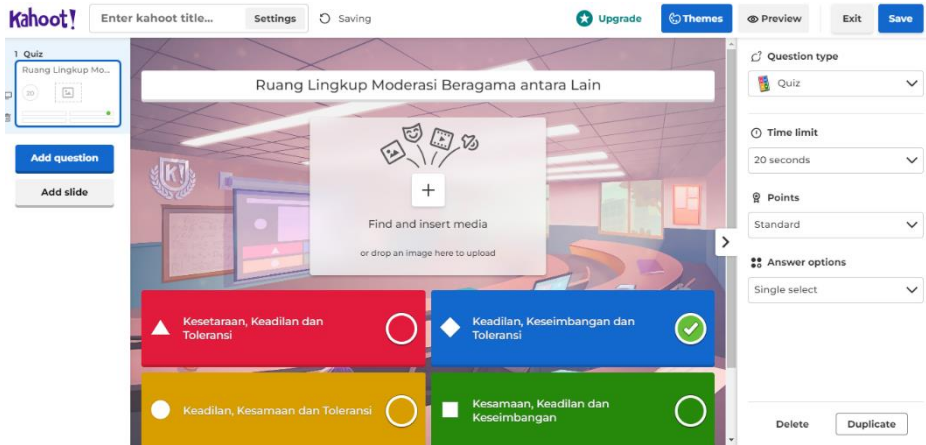
Fig. 4. Sample Digital Test Questions

Using the Kahoot application to administer the religious moderation test offers numerous benefits for both teachers and students. This interactive tool brings a fun and engaging approach to the traditional test-taking process, spurring students' excitement and eagerness to participate. The Kahoot application allows teachers to create quizzes tailored to test the religious moderation of their students. The quizzes can involve different question formats such as multiple-choice, image-based questions, and puzzles. All these options offer a variety of levels of engagement, keeping students interested throughout the test.

During the test, the Kahoot application incorporates gamification elements such as live scoreboards and timers, creating a competitive atmosphere that motivates students to perform better. The real-time feedback and active participation also increase students' confidence and excitement in learning about religious moderation principles.

Overall, utilizing the Kahoot application as an instrument to carry out religious moderation tests has proven to be more interesting than traditional test methods. The combination of interactive and competitive elements helps teachers to achieve more accurate and comprehensive assessments of their students' understanding of religious moderation. The Kahoot application has transformed the testing process into an enjoyable and engaging experience, increasing students' levels of participation and knowledge retention.

3.3   Development

The development stages for the digital Thurstone scale test instrument involved various steps to ensure its validity and practicality [21]. The initial phase included the creation of a test instrument using a valid Thurstone scale, with expert validation being conducted to ensure its accuracy. The instrument initially consisted of 75 items. However, through thorough item analysis and expert validation, a total of 50 valid Thurstone scale items were finalized.

Once the Thurstone scale question items were obtained, they were incorporated into the Kahoot application, allowing for a digital implementation of the test instrument on Android devices and computers. This digital adaptation enhances the accessibility and convenience for students to complete the test.

The research results demonstrated the effectiveness of the Thurston scale-based digital test instrument. Expert assessment highlighted the instrument's validity with a rating of 88.73%. Additionally, the practicality level of 87.23% indicated the instrument's usability and ease of administration. In conclusion, the digital test instrument developed using the Thurstone scale underwent a rigorous validation process and attained a high level of validity and practicality. Hence, it can be confidently applied to students, providing an effective means of assessing their understanding of religious moderation.

3.4   Implementation

The practicality of the digital test instrument product using the Thurstone scale was put to the test by conducting a trial on 50 students from Madrasah Aliyah Negeri 2 Tanah Datar. The practicality level obtained was an impressive 87.23%, meaning the instrument was easy to use and administer. The trial produced valuable insights into the effectiveness of the Thurstone scale-based digital test instrument, as students' feedback on the test experience proved crucial in establishing the tool's practicality. The feedback was positive, with students highlighting the user-friendly nature of the tool, alongside ease of access and accurate representation of their understanding of religious moderation.

The study also showed that the digital test instrument made the process of testing more efficient, saving time and resources that were once required for manual assessments. The test could be easily administered, with results produced immediately, providing instant feedback to both teachers and students.

In conclusion, the trial results proved that the digital test instrument using the Thurstone scale was not only effective but practical, enhancing the process of evaluating student's knowledge of religious moderation. Its digital implementation streamlined the testing process, making it more efficient and convenient while allowing for immediate assessment of students' understanding and promoting self-improvement through actionable feedback.

3.5   Evaluation

Following the completion of the implementation stage, the digital test instrument utilizing the Thurstone scale underwent an evaluation based on the data acquired during this phase. The assessment provided valuable insights into the effectiveness and suitability of the instrument for developing test instruments on religious moderation for students.

The validation and testing of the developed product yielded positive results, indicating that the digital test instrument using the Thurstone scale, in conjunction with the Kahoot application, is well-suited for evaluating students' understanding of religious moderation.

The evaluation process involved verifying the instrument's accuracy, reliability, and the extent to which it accurately measured students' comprehension of religious moderation. The findings from this evaluation confirmed that the digital test instrument effectively fulfilled these criteria. Furthermore, the integration of the Thurstone scale with the Kahoot application added an interactive and engaging dimension to the assessment process, further enhancing its suitability for student evaluation in the context of religious moderation.

Therefore, based on the validation and testing of the digital test instrument, it can be concluded that it is a reliable and appropriate tool to assess students' knowledge of religious moderation. Researchers can confidently utilize this instrument for future test development and assessment purposes, knowing that it aligns with the objectives of measuring students' understanding in this particular area.

4   Conclusion

The research results showed that the digital test instrument using the turnstone scale was catego rized as valid at 88.73% and the practicality level was 87.23%. Thus the digital test instrument using the turnstone scale is categorized as valid based on expert assessment and can be practically applied to students.

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