

The ABC of Needs Study: A Mixed-Methods Approach for Instrument Development

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Abstract

A researcher first conducts a needs study to comprehend the issues, challenges, and significance of a particular phenomenon. This is crucial especially in developing instruments to measure various phenomenon in the educational context. The feasibility of instrument development can be systematically evaluated according to the best practices through a needs study. However, to date, there are limited scholarly articles that discuss how researchers can conduct a needs study. In this paper, we present a practical approach to develop instrument using a mixed-methods needs study. A mixed-methods needs study is viable for developing a comprehensive instrument given its potential to bring depth and breadth of information of phenomenon of interest. The practical, step-by-step guidelines discussed can guide researchers, especially novices in their attempt of conducting a needs study in a more purposeful and thorough manner. Conclusively, a needs study serves as a practical and flexible approach for mixed-methods studies in various disciplines.

Keywords: Competency, Instrument Development, Mixed-Methods, Needs Study, Preliminary Study, Research Methodology

Introduction

Instrumentation is an indispensable element of an empirical study. It is particularly challenging for social science researchers to develop instruments to measure latent variables, which cannot be directly observed, for better understanding of the phenomenon of interest. Through instruments, organisational issues and appropriate solutions can be properly addressed. There are different instruments available to measure various phenomena of interest in social sciences including education, but different instruments are required when different contexts or countries with different cultures and practices are involved (Cohen & Swerdlik, 2009). Therefore, it is pertinent to come up with new instruments or extend the available instruments.

Accordingly, instrument development involves generating items or statements that measure a specific phenomenon. Questionnaires are commonly used instruments in social sciences due to their robustness when properly developed. A solid theory serves as the underlying basis of instrument development, especially for a scientific use. Based on the theory of choice, specific concepts and valid constructs are developed. A robust instrument has solid conceptualisation and consists of properly generated items in terms of words, sentence length, and sequence. In other words, a standardised measure needs a solid theory and robust measurement (Bohrnstedt, 2010). The development of such measurement heavily relies on the state of theory. However, the lack of solid theories in social sciences has resulted in the lack of properly developed instruments (Bohrnstedt, 2010).

Different disciplines involve different measurement of concepts and constructs. Therefore, it is imperative to learn how different disciplines use different terms and interpretations. However, it should be noted that different contexts and circumstances may change the concepts and interpretations that one may regard as important. The measurement of less tangible concepts, such as personal well-being, satisfaction, and social connectedness, has recently gained growing attention of social scientists. With the changing concepts and interpretations over the decades, modifications to the measurement are inevitable.

Several steps and procedures must be implemented before one can conduct research, such as research grant application, fieldwork, and most importantly, a needs study. A needs study serves as the preliminary step in conducting research, which provides valuable insights on the issues, challenges, and significance of the phenomenon of interest. Fundamentally, it is a process of identifying and evaluating relevant needs, confirming any existing gaps, and describing the issues encountered by the target population (Titcomb, 2000). There are specific purposes of conducting a needs study. Firstly, a needs study confirms the need to conduct research on a particular phenomenon of interest. Secondly, a needs study evaluates and solves the identified issues based on the perceptions of stakeholders. Thirdly, a needs study provides in-depth understanding of the issues and challenges related to the phenomenon of interest. Besides that, a needs study bridges the gap between the theory or policy and practice. A needs study strengthens the research background, research problems, research questions, and research objectives. Last but not least, a needs study refines and finalises the methodological part of the research, such as the research design, target population and respondents, data collection tools, and data analysis procedures can also be refined and finalised accordingly. This helps in fundamental research grant applications.

Taking the case of developing competency measurement instrument, conducting a needs study is pivotal before one can proceed to identifying the relevant competency elements in a high-stake study. Apart from gaining better understanding on how to identify and deal with any related competency issues, a needs study ensures the feasibility of the designed research. Moreover, so far, there is limited information on the procedures involved in conducting a needs study through mixed-methods approach as previous examples of needs study for instrument development are concentrated on quantity approach (Arifin & Jaafar, 2021). With that, this paper presents the best practices to conduct a needs study using mixed-methods approach. Apart from achieving breadth and depth of information from triangulating the qualitative and quantitative results, mixed-methods approach is feasible for instrument development especially in extending constructs that are not readily available

in existing instruments and developing instruments for topics and populations that have not been explored by previous researchers (Creswell, 1999). As such, a mixed-methods research is able to elicit new insights that may not be achieved through a single research approach (Levasseur et al., 2022). Moreover, this mixed-methods approach for a needs study is in line with Christofi et al (2021) who have called for methodological innovations in contemporary, offering an alternative approach for researchers to enhance the trustworthiness of their results.

The steps and procedures of a qualitative approach and a quantitative approach for a needs study are discussed in the subsequent sections.

Qualitative Approach

This section presents the steps and procedures of a qualitative approach for a needs study. Overall, there are six basic steps to conducting a qualitative needs study. Through this specific guideline, significant preliminary input can be acquired for a high-stake mixed-methods study.

Step 1: Development of Research Questions

For a needs study, research questions may not be as robust as of those for an actual study. Nonetheless, a well-defined set of research questions is fundamental for a researcher to capture the actual issues and challenges related to the phenomenon of interest in a more focused manner. Qualitative research questions are more of the “why” and “how” of a phenomenon under study.

Research funded by grants often involves the collaboration of researchers with the funding agency or related industry partners, which promote rich discussion of various insights on the issues or challenges related to the phenomenon of interest. Such collaboration is recommended for the development and refinement of the research questions. Meanwhile, academicians play an important role of guiding students who are novice researchers in the development of appropriate research questions given their extensive knowledge and experience in research.

In the research planning stage, researchers often start by reading and reviewing related literature and current issues highlighted in mainstream media to identify issues or gaps related to the phenomenon of interest. Identifying pertinent issues or related gaps helps researchers to address actual problems and present significant implications that benefit researchers, practitioners, and the society. Table 1 presents a list of questions that facilitate the formulation of research questions during this reading stage.

Table 1

Self-questioning to develop research questions

| Question | Purpose |
|--|--|
| <i>What do I want to know in this study?</i> | • To strengthen the research background |
| <i>Why is this study significant to be carried out?</i> | • To present theoretical, methodological, and practical significance |
| <i>What are the issues or challenges related to this phenomenon?</i> | • To solve real-life issues and challenges |
| <i>What are the possible solutions for these issues or challenges?</i> | • To present potential solutions for practitioners, stakeholders, and policymakers |

For example, three research questions were formulated for a needs study on “Instrument for Measuring Technical and Vocational Education Training (TVET) Teachers’ Competencies” based on the comprehensive review of related literature and latest issues highlighted in the mainstream media

- (1) *Research Question 1:* What are the available instruments that measure TVET teachers’ competencies at the workplace?
- (2) *Research Question 2:* How to measure TVET teachers’ competencies at the workplace?
- (3) *Research Question 3:* Why is it significant to conduct competency measurement among TVET teachers?

Step 2: Identification and Selection of Informants

Informants are the key actors in research. In order to explore the phenomenon of interest, informants with appropriate background, knowledge, and ability to offer in-depth insights of the phenomenon must be selected. In this case, purposeful sampling method is the most appropriate method for the identification and selection of informants according to specific criteria of selection.

Firstly, the inclusion criteria of informants are established. For example, if subject-matter experts are the target informants of a needs study, then specific characteristics must be considered as inclusion criteria: education background, years of experience, number of publications, and professional assurance.

Secondly, an appropriate sample size must be considered. There are no conclusive criteria on the number of informants, but a sample size of four to five informants is deemed adequate for a qualitative needs study since qualitative data are supported by quantitative data. It depends on the researchers to select informants who can offer information power (Malterud et al., 2015). There are a few criteria to consider when it comes to determining the information power for a qualitative needs study: (1) the objective of the needs study; (2) the specificity of the inclusion criteria of informants; (3) the quality of interview data (qualitative data should reflect the necessity for a needs study on the phenomenon of interest).

Following the determination of sample size, researchers may approach target informants, which can be rather intimidating, especially for novice researchers. However, with an appropriate approach, the process of approaching informants can be performed with ease.

The recommended procedures to approach informants are summarised in Figure 1.

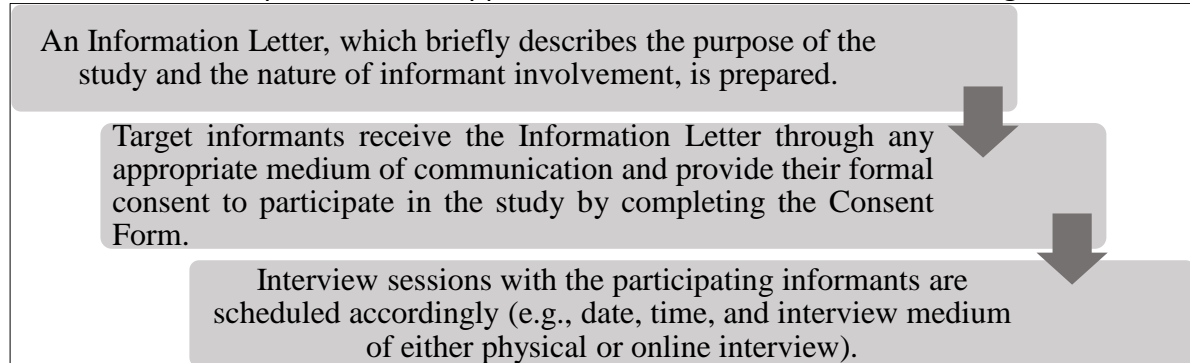


Figure 1: Suggested procedures to approach informants

As described in Figure 1, informants receive two important documents prior to their participation in the study, which are Information Letter and Consent Form. The content of these documents must be written in direct and concise manner. An example of these documents is presented in Figure 2.

| | |
|---|--|
| | <div style="border: 1px dashed black; padding: 5px; display: inline-block;"> Logo and address of your institution </div> |
| Information Letter | |
| 1. Research Title | |
| 2. Introduction of Study | |
| <i>[This section briefly describes your research (in 150 words) using layman term. It should contain details of the researcher(s), purpose of the study, research design, data collection methods, and expected output.]</i> | |
| 3. Purpose of Study | |
| <i>[This section briefly describes the purpose of research in one sentence.]</i> | |
| 4. Research Procedure | |
| <i>[This section briefly explains how data will be collected from informants.]</i> | |
| 5. Participation in Study | |
| <i>[This study presents a statement of assurance to informants that their participation in study is completely voluntary. Informants may withdraw from the study at any time without any penalty.]</i> | |
| 6. Benefits of Research | |
| <i>[This study briefly describes the output can benefit individuals, researchers, community, and/or the government.]</i> | |
| 7. Research Risk | |
| <i>[This study briefly explains the potential risks of participating in the study and how these risks are minimised.]</i> | |
| 8. Confidentiality | |
| <i>[This study informs informants on how their confidentiality will be protected.]</i> | |
| Consent Form | |
| <i>[This section contains informed consent of informants for the study]</i> | |
| I have read the Information Letter; I have understood the nature of the research and why I have been selected. | |
| <ul style="list-style-type: none"> • I agree to take part in this research. • I understand my participation is voluntary. • I understand I will be involved in individual, audio-recorded, and semi-structured interviews. • I understand I am free to withdraw from the research at any time without the need to provide any reason. • I understand that my anonymity and confidentiality will be protected. • <i>[you may add suitable statements depending on your research context]</i> | |
| Name: _____ | Date: _____ |
| Signature: _____ | |

Figure 2: Information letter and consent form

Step 3: Preparing and Conducting the Interview

Semi-structured interview method is a common qualitative data collection method due to its flexibility for both interviewer and interviewee to discuss about the phenomenon of interest. An interview protocol, which serves as an interview guide, is established based on related literature or can be adapted from the existing models on the related topic.

The number of interview questions depends on the complexity and scope of data the researchers intend to capture. Interview questions are constructed with respect to the

formulated research questions and purpose of the study. Open-ended questions allow informants to freely express their views and opinions on the phenomenon of interest. Meanwhile, questions on the demographic information of informants, such as their education background, work experience, and expertise, should be included in the first part of the interview protocol. This allows researchers to obtain the necessary demographic data and break the ice before prompting informants to discuss about the phenomenon of interest in detail.

The effectiveness of the overall interview protocol should be evaluated accordingly. For instance, research team members who are familiar with qualitative research can provide input and feedback on the developed interview protocol. Novice researchers can obtain constructive feedback and suggestions from their research mentors or supervisors on the quality and quantity of interview prompts.

Researchers play an important role of initiating a dialogue on the phenomenon of interest using the developed interview protocol. Besides that, it is not necessary for researchers to follow the exact order of questions in the interview protocol given the flexibility of the semi-structured interview method. Researchers must remain in control of the interview session, ensuring the dialogues do not go off-topic. Various prompts can be used to encourage informants to share their views and opinions. For examples, "Why?", "Can you provide an example?", "What do you mean?", "Really?", "How did you feel about that?", and "Can you explain further?".

Adding to that, all interview sessions must be audio-recorded for the purpose of transcription. Online conferencing platforms like Microsoft Teams, Google Meet, Skype, and Zoom have gained growing popularity, especially during the COVID-19 pandemic. These platforms are good alternative approaches to conducting interviews. There are various functions that benefit qualitative researchers. Firstly, most of these platforms are publicly available and can be accessed with no charge. Secondly, these platforms can accommodate multiple participants within a single session. Both researchers and informants can maintain appropriate distancing without compromising their safety and comfort. Thirdly, these platforms allow both researchers and informants to meet up without the need to travel to a specific location for interview. Furthermore, the invite function allows researchers to send invitation and schedule (or reschedule) interview sessions with ease. In this way, researchers can systematically organise the data collection process. Last but not least, these platforms have recording and storage functions, allowing their users to record meetings and store these recordings in the cloud storage. Moreover, researchers do not need to use other recording devices. With these functions, raw data can be stored and retrieved in a more organised and systematic manner.

Step 4: Analysis of the Interview Transcripts

This step involves identifying key themes and subthemes from the interview data. Thematic analysis (Braun & Clarke, 2012) is a common approach to qualitative data analysis. Unlike grounded theory and discourse analysis, this analytical approach involves less complicated phases of analysis (see Braun & Clarke, 2006; 2012), which are especially useful for novice qualitative researchers. Table 2 describes the six-phase thematic analysis.

Table 2

Six-phase thematic analysis for qualitative data analysis

| Phase | Description |
|--|---|
| Phase 1 Data familiarisation | <ul style="list-style-type: none"> Careful reading of the transcribed data by being critical and analytical of the informants' words Note-taking important details from the data |
| Phase 2 Generate initial codes | <ul style="list-style-type: none"> Generate relevant code(s) or phrase(s) with respect to the research question(s) |
| Phase 3 Search for themes | <ul style="list-style-type: none"> Group codes into themes according to their unifying features |
| Phase 4 Review potential themes | <ul style="list-style-type: none"> Determine whether the generated themes reflect the entirety of the data |
| Phase 5 Define and name the themes | <ul style="list-style-type: none"> Name each theme that reflects the research questions (Ideally, each theme should have a singular focus and reflects the essence of the related data in a single sentence) |
| Phase 6 Produce the report | <ul style="list-style-type: none"> Write a clear and analytical report of the findings by making arguments based on the research questions |

Taking the case of the previously discussed needs study on "Instrument for Measuring TVET Teachers' Competencies", the gathered interview data were first analysed. Focusing on developing a competency measurement instrument for TVET teachers, three themes were identified:

- (1) *Theme 1:* Absence of competency measurement approaches for the TVET teacher profession in Malaysia
- (2) *Theme 2:* The need for a comprehensive competency measurement instrument
- (3) *Theme 3:* The importance of competency assessment and measurement

Step 5: Discussion of Findings

Lastly, the discussion of findings should focus on the issues and challenges related to the phenomenon of interest. The findings reflect the significance of conducting an actual study on the phenomenon. The findings of a needs study can be used to support or strengthen different sections of the research proposal, such as the problem statement and significance of study sections. For a high-stake study, the integration of certain qualitative findings and quantitative results help researchers to obtain a comprehensive understanding of the issues, challenges, and significance of the phenomenon of interest.

Quantitative Approach

This section presents the steps and procedures of a quantitative approach for a needs study. Likewise, the needs study on "Instrument for Measuring TVET Teachers' Competencies" was used to demonstrate the quantitative approach of developing and validating the measurement instrument for TVET teachers. There are several basic steps to conducting a quantitative needs study, which are discussed in the following subsections.

Step 1: Identification of Panel Experts

Panel experts are first identified according to the needs of the study. In most cases, a questionnaire survey is employed to identify a panel of experts who agree to be part of the

study. Based on literature, about 12 to 15 panel experts are deemed sufficient to form a panel of experts for a study—for instance, Nornazira et al. (2015) recommended 12 experts, whereas Arifin and Wan Jaafar (2021) suggested 15 experts. An example of a list of panel experts is presented in Figure 3.

| DEVELOPMENT AND VALIDATION OF AN INSTRUMENT TO MEASURE TVET TEACHERS' COMPETENCIES: A NEEDS STUDY | | | |
|--|-------------|------------|---------------------------------|
| LIST OF PANEL EXPERTS | | | |
| PANEL EXPERT | INSTITUTION | EXPERIENCE | AGREE / DISAGREE TO PARTICIPATE |
| Dr A | | | |
| Prof B | | | |
| Mr C | | | |
| Ms D | | | |

Figure 3: An example of a list of panel experts

Step 2: Preparation of an Expert Assessment Form

Besides that, an expert assessment form is prepared. This form consists of two key sections. Figure 4 presents an example of the instruction and rating scale used in the form. The first section (Part A) gathers demographic information of the panel experts (Figure 5), while the second section (Part B) includes questions on the panel experts' perceptions on the instrument for competency measurement (Figure 6).

| DEVELOPMENT AND VALIDATION OF AN INSTRUMENT TO MEASURE TVET TEACHERS' COMPETENCIES: A NEEDS STUDY |
|--|
| <p>Dear Panel Experts,</p> <p>This instrument contains 12 items related to the need to develop and validate an instrument to measure TVET teachers' competencies. The evaluation of the instrument should be based on your knowledge and experience of competency measurement in TVET field. The evaluation should be as objective as possible. Please use the following rating scale in your evaluation:</p> <p>1: Strongly Agree 2: Agree 3: Moderate 4: Disagree 5: Strongly Disagree</p> |

Figure 4: An example of instruction and rating scale in the needs form for the panel experts

| PART A: Demographic Information |
|--|
| 1. Gender: |
| 2. Age: |
| 3. Experience: |
| 4. Job Position: |
| 5. Institution: |

Figure 5: An example of demographic information of panel experts

| PART B: Perceptions on the Instrument for Competency Measurement | | | | | | |
|---|---|-----------------|---|---|---|---|
| Statement | | Response | | | | |
| 1 | Currently, there is no comprehensive competency modelling framework for TVET teachers. | 1 | 2 | 3 | 4 | 5 |
| 2 | There is a need to develop a competency modelling framework for TVET teachers. | 1 | 2 | 3 | 4 | 5 |
| 3 | Currently, there is no comprehensive instrument to measure TVET teachers' competencies in Malaysia. | 1 | 2 | 3 | 4 | 5 |
| 4 | Having an instrument to measure TVET teachers' competencies can help TVET teachers to identify competencies in terms of individual job performance in the teaching profession. | 1 | 2 | 3 | 4 | 5 |
| 5 | Having an instrument to measure TVET teachers' competencies can guide TVET teachers in delivering effective job performance in the teaching profession. | 1 | 2 | 3 | 4 | 5 |
| 6 | Having an instrument to measure TVET teachers' competencies can help TVET teachers to be aware of their essential competencies in order to fulfil new requirements of the teaching profession. | 1 | 2 | 3 | 4 | 5 |
| 7 | An instrument to measure TVET teachers' competencies is important for TVET teachers' self-assessment. | 1 | 2 | 3 | 4 | 5 |
| 8 | Having an instrument to measure TVET teachers' competencies can help vocational education institutions to produce skilled TVET students to meet industry demands. | 1 | 2 | 3 | 4 | 5 |
| 9 | Having an instrument to measure TVET teachers' competencies can help training and education institutions to identify which areas in the curriculum need to be developed or improved in order to meet industry demands. | 1 | 2 | 3 | 4 | 5 |
| 10 | Having an instrument to measure TVET teachers' competencies can help the human resource department to shape the initial and in-service vocational teacher education and training, especially in professional courses, in order to support their career development. | 1 | 2 | 3 | 4 | 5 |
| 11 | Both job and personal competencies are necessary for TVET teachers to become competent teachers. | 1 | 2 | 3 | 4 | 5 |
| 12 | Having a comprehensive instrument comprising teaching, professional, communication, and personal competencies is vital for the current TVET teaching profession. | 1 | 2 | 3 | 4 | 5 |

Figure 6: An example of statements for a quantitative needs study

Step 3: Finalising the Needs Study Statements

At this stage, the researcher needs to finalise the statements based on a specific research context. The statements should reflect the overall research objectives in order to capture a generalisation of the importance to conduct the study. The finalised statements are then ready to be included in the needs study form for the purpose of data collection.

Step 4: Data Analysis

Frequency and percentage calculations are applied for the analysis of demographic information. Table 3 presents an example of a summary of demographic information of panel experts. Meanwhile, as shown in Table 4, panel experts can be further classified as of those who are from university, TVET institution, or industry. Overall, the obtained data of demographic information can be used to support or strengthen the study's findings.

Table 3

A summary of demographic information of panel experts

| Demographic Characteristics | Categories | Frequency (f) | Percentage (%) |
|-----------------------------|-------------------|---------------|----------------|
| Gender | Male | 22 18 | 55.0 |
| | Female | Xx | xx.0 |
| Age | 31–40 years old | Xx 21 | xx.0 |
| | 41–50 years old | 21 | 52.5 |
| | Over 50 years old | Xx | 37.5 |
| Experience | 5–10 years | 15 22 3 | 37.5 55.0 |
| | | 11–15 years | 22 |
| | Over 15 years | 3 | 7.5 |
| Institution | University | 20 | xx.0 |
| | TVET Institutions | 10 1 | xx.0 |
| | Industry | Xx | xx.0 |

Note: n = xx (number of panel experts)

xx.0 = percentage of panel experts

Table 4

Classification of panel experts according to institutions

| Sectors | Criteria | F | % | Total % |
|--------------|------------------|----|------|---------|
| 1. Education | University | 20 | xx.0 | 75.0 |
| | TVET institution | Xx | 25.0 | |
| 2. Industry | Industry | 10 | xx.0 | 25.0 |

The responses of panel experts for each statement are also subjected to analysis. The values of mean and standard deviation are calculated. Table 5 shows the relevance ratings on the item scale by panel experts.

Table 5

The relevance ratings on the item scale by 40 panel experts

| Statement | SD | D | SWA | A | SA | M | Sd |
|--|--------|--------|------------|--------------|--------------|------|-------|
| Currently, there is no comprehensive competency modelling framework for TVET teachers. | 0 0 | 0 0 | 7 17.5 | 8 20.0 | 25 62.5 | 4.45 | 0.783 |
| There is a need to develop a competency modelling framework for TVET teachers. | 0 | 0 | 5 12.5 | 9 22.5 | 26 65.0 | 4.53 | 0.716 |
| Currently, there is no comprehensive instrument to measure TVET teachers' competencies in Malaysia. | 0 | 0 | 4 10.0 | 20 50.0 | 16 40.0 | 4.30 | 0.649 |
| Having an instrument to measure TVET teachers' competencies can help TVET teachers to identify competencies in terms of individual job performance in the teaching profession. | 0 0 | 0 0 | 10 25.0 | 28 70.0 | 2 5.0 | 3.80 | 0.516 |
| Having an instrument to measure TVET teachers' competencies can guide TVET teachers in delivering effective job performance in the teaching profession. | 0 0 | 0 0 | 8 20.0 | 26 65.0 | 6 15.0 | 3.95 | 0.597 |
| Having an instrument to measure TVET teachers' competencies can help TVET teachers to be aware of their essential competencies in order to fulfil new requirements of the teaching profession. | 0 0 | 0 0 | 7 17.5 | 29 72.5 | 4 10.0 | 3.93 | 0.526 |
| An instrument to measure TVET Teachers' competencies is important for TVET teachers' self-assessment. | 0 0 | 0 0 | 7 17.5 | 28 70.0 | 5 12.5 | 3.95 | 0.552 |
| Having an instrument to measure TVET teachers' competencies can help vocational education institutions to produce skilled TVET students to meet industry demands. | 0 0 | 0 0 | 0 0 | 32 80.0 | 8 20.0 | 4.20 | 0.405 |
| Having an instrument to measure TVET teachers' competencies can help training and education institutions to identify which areas in the curriculum need to be developed or improved in order to meet industry demands. | 0 0 | 0 0 | 1 2.5 | 27.0 67.5 | 12.0 30.0 | 4.28 | 0.506 |
| Having an instrument to measure TVET teachers' competencies can help the human resource department to shape the initial and in-service vocational teacher education and training, | 0 0 | 0 0 | 1 2.5 | 28 70.0 | 11 27.5 | 4.25 | 0.494 |

| Statement | SD | D | SWA | A | SA | M | Sd |
|--|--------|--------|--------|-----------|------------|------|-------|
| especially in professional courses, in order to support their career development. | | | | | | | |
| Both job and personal competencies are necessary for TVET teachers to become competent teachers. | 0 0 | 0 0 | 0 0 | 6 15.0 | 34 85.0 | 4.85 | 0.361 |
| Having a comprehensive instrument comprising teaching, professional, communication, and personal competencies is vital for the current TVET teaching profession. | 0 0 | 0 0 | 0 0 | 6 15.0 | 34 85.0 | 4.85 | 0.361 |
| | | | | | | 4.28 | 0.485 |

Note: SD = Strongly Disagree, D = Disagree, SMA = Somewhat Agree, A = Agree, SA = Strongly Agree, M = Mean, Sd = Standard Deviation

The definitions of formula of the needs analysis are as follows:

(1) Percentage (for Likert scale): Divide the total number of responses for a specific category by the total number of respondents and multiple by 100

(2) Mean: $m = \frac{\text{sum of the terms}}{\text{number of terms}}$

(3) Standard deviation: $\sigma = \sqrt{\frac{\sum(x_i - \mu)^2}{N}}$

where σ denotes population standard deviation; N denotes population size; x_i denotes each value from the population; μ denotes population mean.

Step 5: Discussion of Results

It is important to achieve the purpose of a needs study within the quantitative context. The quantitative results are used to support and strengthen the qualitative findings. At this point, comprehensive information that supports the significance of an actual study is acquired. Figure 7 outlines the steps required for a mixed-methods needs study.

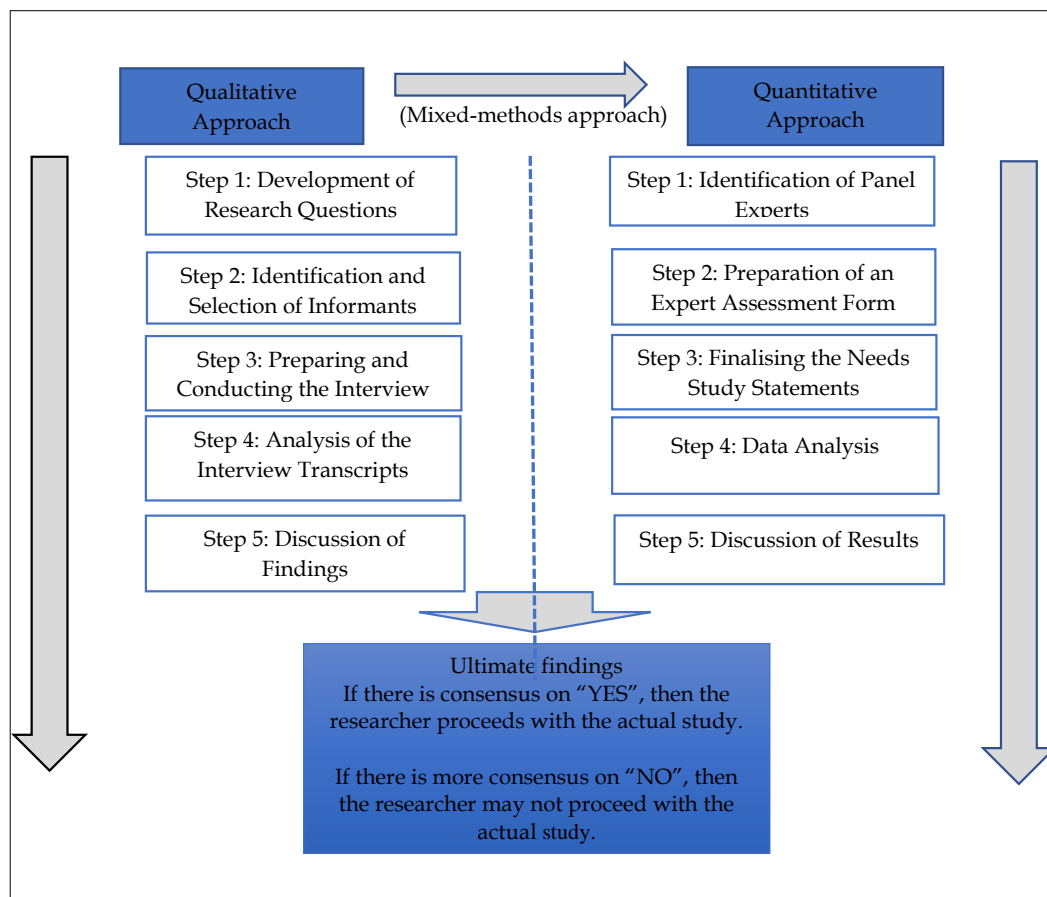


Figure 7: Flowchart of a mixed-methods needs study

It is important to note that the researcher needs to reflect and review each step outlined in the mixed-methods needs study. This will ensure the data collected are robust, able to capture the phenomenon under study and, finally, achieve the research objectives before proceeding with the actual study. The researcher may discuss the findings with their team members or research supervisors for feedback. For instance, if the findings in the needs study are not able to fit the objectives of the study, the researcher might need to review the interview questions to make sure they fit the context of the study. As argued by Ediyanto et al (2022), instrument development is an iterative process. This means, the steps, procedures, results and findings in the needs study also involve reviewing and improvement by the researcher. These steps will ensure the development of a feasible instrument in the actual study be realised.

Conclusion

This paper aimed to present the easy-to-follow steps and procedures of a mixed-methods needs study taking the case of developing competency measurement instrument. Through instruments, educational researchers to collect data accurately. Furthermore, data collected through good instruments are able to illuminate findings that can help policymakers and top management to understand a phenomenon in the educational context in an in-depth manner. Given the current research trends in educational research, it is pivotal that researchers apply robust and comprehensive process to achieve the aim and objectives of a proposed study. A mixed-methods approach ensures the feasibility of instrument development, especially when a high-stake study is involved. The discussed steps and

procedures in this paper on instrument development are applicable in high-stake studies of different disciplines, such as design and development research (DDR), measurement model development, measurement instruments, profiling, modules, and index. The discussion in this paper benefits researchers, including novice researchers in designing high-stake studies in terms of research methodologies and approaches especially in the field of education. This paper contributes to the methodological knowledge in contemporary research methodology by discussing the different sources, methods and triangulation to perform a mixed-methods needs study. In addition, this paper offers a comprehensive guideline to strengthen the research outcomes of high-stake studies through a well-developed preliminary research phase.

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