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Research Article

Development And Validation Of An Instrument To Measure Science Teachers' Understanding Of Fink's Taxonomy

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ARTICLE INFO | **ABSTRACT**

Fink's Taxonomy, emerging as an alternative to Bloom's Taxonomy, presents a valuable framework due to its circular and interconnected nature, emphasizing affective aspects. However, there is a lack of clarity in measuring teachers' understanding levels of Fink's Taxonomy in the teaching and learning process. This study aims to develop items and measure the content validity of an instrument to assess science teachers' understanding levels of Fink's Taxonomy. The instrument development in this study involves two main phases: instrument construction phase and instrument content validation phase. The instrument construction phase in this study involves a literature review to conceptualize and operationalize the measurement instrument of Fink's Taxonomy. The instrument used in this study is a Likert scale questionnaire with 4 points. The content validation phase involves four steps: construction of expert review forms, selection of expert review panels, expert validation assessment, and analysis of content validity data. Content validity data analysis in this study uses Content Validity Ratio (CVR) with eight experts, resulting in a critical CVR value of 0.75. Fink's Taxonomy instrument comprises six constructs and 95 items. The analysis findings indicate that 88 out of 95 items are categorized as appropriate items with CVR values ranging from 0.75 to 1.00. Seven items showing values below the critical CVR require refinement and are retained in the instrument for pilot testing. The implication of this study lies in the ability to develop a Fink's Taxonomy instrument with high content validity. Further research on content validity can be conducted using CVI analysis, which can provide better item screening results and assess the validity of each domain and the entire instrument.

Keywords: Fink's Taxonomy, Content Validity Ratio, instrument development, content validity, science teacher

1. Introduction

In the rapidly evolving era of globalization, education and research have become increasingly crucial in facing the challenges of the modern world. The dynamic, creative, and innovative nature of the education system, coupled with the growing need for precise data acquisition (Wang et al., 2022), underscores the increasing importance of instrument development and validation in the field of research (Payan-Carreira, 2022).

To achieve educational aspirations in Malaysia on par with global standards, Malaysia is also adapting its education system to provide competent education (Ministry of Education Malaysia, 2013; Ministry of Education Malaysia, 2022). The educational aspiration in Malaysia is to provide equitable education that encompasses holistic and integrated aspects of intelligence, physical, emotional, and religious elements as outlined in the National Education Philosophy (NEP) to develop individuals' competencies uniquely. This effort also focuses on producing individuals balanced in cognitive, affective, and psychomotor aspects (Ministry of Education Malaysia, 2017).

Therefore, teachers, as educators, play a vital role in fulfilling the responsibility of integrating all aspects emphasized in the NEP to contribute maximally to achieving the six student aspirations as envisioned in the Malaysia Education Blueprint 2013-2025 (MEB). Teachers are also responsible for fostering significant and meaningful learning experiences that empower students to apply knowledge in real-world contexts (Abdul Khalil et al., 2021; Ballantyne et al., 2020).

Fink's Taxonomy offers a comprehensive learning model for teachers to design learning experiences that yield significant and meaningful learning experiences (DeLuca et al., 2021; Levine et al., 2008). Significant and meaningful learning experiences can be achieved in teaching and learning Science subjects that focus on fostering critical thinking. Critical thinking is defined as a process of acquiring and mastering knowledge and skills that can elevate a student's mind to an optimum level (Ministry of Education Malaysia, 2018). Teachers who understand Fink's Taxonomy can apply a combination of science teaching and learning strategies such as inquiry-based approaches, constructivism, collaborative learning, and problem-solving.

Science subjects involve a lot of cooperation or collaboration among students. Nurturing the value of cooperation or collaborative learning encourages the development of communication skills, problem-solving abilities, and self-directed learning (Ministry of Education Malaysia, 2018). Elements within Fink's Taxonomy can promote communication skills, the ability to articulate scientific ideas, and teamwork among students (Uribe Cantalejo & Pardo, 2020).

2. Problem Statement

Various types of learning taxonomies have been developed in the education systems worldwide, such as Bloom's Taxonomy, Marzano's Taxonomy, and Solo's Taxonomy. Most education systems globally, including Malaysia, predominantly employ Bloom's Taxonomy because it assists educators in curriculum management and facilitates more accurate assessments (Ullah et al., 2020), thereby influencing educational philosophy by promoting rational thinking and higher-order thinking skills (HOTS) (Abdul Rahman & Abdul Manaf, 2017).

Bloom's Taxonomy is utilized at all levels of education, from primary to tertiary education (Md Nawi, 2022). However, despite its widespread use, Bloom's Taxonomy has faced criticisms from various quarters due to several shortcomings. For instance, the pyramid-shaped structure of Bloom's Taxonomy leads some teachers to undervalue elements at the lower levels and overly focus on the higher levels (Lemov, 2017). Additionally, students must master each level starting from the bottom of the Bloom's Taxonomy hierarchy to progress to the next level (Masrom et al., 2018), resulting in learning lacking intrinsic value, instrumental value, and achievement value (Partido, Chartier & Jewell, 2020). Gueguen (2016) also noted overlapping categories and inconsistent hierarchical classification within Bloom's Taxonomy, leading to each teacher having a unique perspective and understanding, rendering Bloom's Taxonomy difficult to be consistently applied (Masrom et al., 2018). Furthermore, Bloom's Taxonomy overall places less emphasis on affective, psychomotor, and problem-solving aspects (Long & Mustapha, 2019).

Fink's Taxonomy, emerging as an alternative to Bloom's Taxonomy, presents a valuable framework for teachers due to its non-pyramidal circular structure (Fink, 2013). Fink's Taxonomy is constructed with each element interacting with one another, enabling teachers to apply the taxonomy to generate significant learning experiences (Partido, Chartier & Jewell, 2020; Uribe Cantalejo & Pardo, 2020). Moreover, Fink's Taxonomy also emphasizes affective (Billiot, 2023) and metacognitive aspects (Latifah, 2018), which are not present in any other learning taxonomies. However, there is a lack of clarity in measuring teachers' understanding levels of Fink's Taxonomy in the teaching and learning process (Yaw & Mohd Matore, 2023). To address this issue, there is a need for an instrument capable of measuring teachers' understanding levels of Fink's Taxonomy. Therefore, this study proposes to develop an instrument to measure Science teachers' understanding levels of Fink's Taxonomy, focusing on the Science subject. The validation process is conducted to ensure that the developed instrument is relevant as a valid and reliable measurement tool.

This study focuses on the following research objectives:
1. To develop measurement items for assessing Science teachers' understanding levels of Fink's Taxonomy.
2. To measure the content validity of the instrument for assessing Science teachers' understanding levels of Fink's Taxonomy.

3. Literature Review

3.1 Instrument Development

An instrument is defined as a tool or technique for assessing the size, quantity, or degree of a particular attribute (Miller & Lovler, 2020). Darusalam and Hussin (2021) further define an instrument as a research tool for obtaining data in a study. A good instrument is one that possesses high validity and reliability with proper and accurate construction procedures so that the developed instrument can be used repeatedly (Baco

& Ishak, 2021). Edris et al. (2019) state that high validity and reliability of instruments in the local cultural context will provide more accurate interpretations of the issues being studied.

Instrument development can be carried out through several options such as instrument adoption, instrument adaptation, and instrument development (Ganesha & Aithal, 2022). In instrument adoption, researchers are allowed to take all questions/items/inventories from an existing instrument if the instrument is suitable for measuring the study variable, and the context/environment of the research study/population is the same. However, researchers are not allowed to change any existing questions/items. In instrument adaptation, researchers take most of the questions/items from an existing questionnaire and are allowed to make changes to some existing questions to make them suitable and compatible with the context/environment of their research study/population. In contrast, instrument development involves situations where researchers cannot use or adapt existing instruments. Therefore, researchers develop a new questionnaire, ensuring that the instrument has high validity and reliability.

Instrument development is the process of designing, creating, and testing tools or devices used to collect data or information in measurement or research (Cohen, Manion & Morrison, 2018; Malone et al., 2021). Literature shows that there are many studies conducted in instrument development. The development of the PAMPDPSTEM instrument in the study by Jekri and Han (2019) aims to assess the knowledge, affective, and motivational aspects of Science teachers towards the implementation of STEM education in secondary schools. The development of the PAMPDPSTEM instrument is through literature review and analysis of existing instruments to identify constructs in the instrument. In the study by Ramli et al. (2020), the development of the STEMTIP instrument is designed by adapting the instrument development process proposed by DeVellis (2017), Nasab et al. (2015), and Miller et al. (2020). The STEMTIP instrument development process involves ten steps using social constructivist theory, the 5E teaching model, and the STEM teaching and learning approach model as the basis for instrument development.

Furthermore, the development of the HS-BCI instrument in the study by Malone et al. (2021) is designed through expert consensus by a panel of high school Biology teachers, science education researchers, and Biology experts to assess students' knowledge of key biology concepts and alternative concepts. The instrument development process on Indonesian Science teachers' perceptions of scientific literacy in the study by Suwono et al. (2022) is also developed through focus group discussions involving six experts and the analysis of past studies. Instrument development in this study applies the instrument development model by Miller and Lovler (2020). The instrument development process involves planning, development, validity testing, and reliability testing to ensure that the instrument can provide reliable and valid results.

3.2 Instrument Validity

Instrument validity is a crucial concept and procedure in any study. This is because instrument validity is essential for maintaining the accuracy of the instrument from being exposed to flaws in order to produce a good and high-quality study (Darusalam & Hussin, 2021). Validity refers to the extent to which an instrument measures the behavior or quality it intends to measure (Omar, Hamzah & Kee, 2021).

Cohen, Manion, and Morrison (2018) explain that there are various types of validity that can be used in research such as face validity, content validity, construct validity, convergent and discriminant validity, criterion validity, predictive validity, concurrent validity, cross-cultural validity, and concurrent validity. The various types of validity existing in research necessitate researchers to choose the appropriate and suitable type of validity to obtain study results that are not perfect but as best as possible to minimize invalidity and maximize validity.

Face validity is the most basic form of validity and is conducted by obtaining opinions from respondents who have similar characteristics to the actual study sample (Baco & Ishak, 2020). Face validity is conducted as an initial procedure and screening in instrument assessment, but face validity cannot be considered as a principle of validity measurement because there is no statistical data to support it. Therefore, content validity testing subsequently needs to be conducted following face validity (Cohen et al., 2018).

Content validity, on the other hand, examines the extent to which the content of the instrument aligns with the measurement scale used (Amatan et al., 2021). Content validity also validates the accuracy of questionnaire items to measure what should be measured (Kamaluddin et al., 2017; Mohamat et al., 2022; Sekaran & Bougie, 2016). Studies on validity often use content validity as empirical evidence to enhance confidence in the quality of the developed instrument. Content validity is based on the level of consideration and agreement of evaluators on items in the instrument (Zainal et al., 2020). Anizar et al. (2018) also recommend that validity and reliability should be tested and evaluated by content experts. Through expert validity, comments and suggestions provided are useful in modifying and strengthening the questionnaire (Darusalam & Hussin, 2021; Oluwatayo, 2012). Content validity testing involving several experts has advantages because it is more objective and can avoid imbalance or bias (Mohamat et al., 2022). This can prove Lawshe's (1975) study which states that uncertainty of opinions expressed by any party can be enhanced through the credibility of evaluators.

In this study, expert panel agreement on validity will determine that the developed items are sufficient to represent the six domains of Fink's Taxonomy to assess teachers' understanding levels of Fink's Taxonomy. Additionally, experts will also suggest improvements to measurement items or suggest item revocation. Experts are also given the opportunity to suggest more suitable items to replace the developed items. Only items with high agreement based on the CVR analysis conducted will be considered for item retention.

3.3 Fink's Taxonomy

Fink's Taxonomy was introduced by L. Dee Fink in 2003 and has been reviewed and updated in 2013. Fink (2003) created a taxonomy that differs from Bloom's Taxonomy. The notable difference is that Fink's Taxonomy is built without hierarchy but with elements that interact with each other. Fink's Taxonomy emphasizes more on the affective (Billiot, 2023) and metacognitive aspects (Latifah, 2008) which are not found in any other learning taxonomy. Fink (2013) also defines learning as a significant change in students (Partido, Chartier & Jewell, 2020).

Fink's Taxonomy consists of six elements: foundational knowledge, application, integration, human dimension, caring, and learning how to learn, which are arranged to interact and form significant learning. Figure 1: Fink's Taxonomy is as follows:

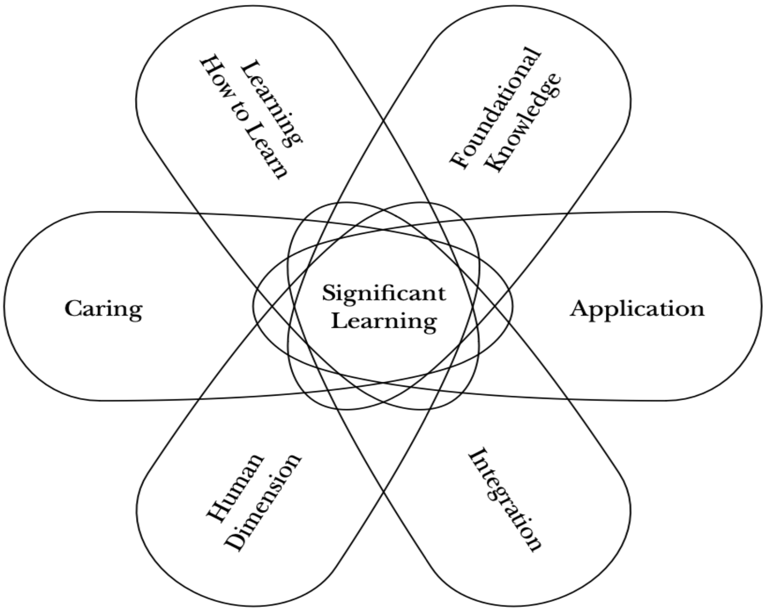

Figure 1: Fink's Taxonomy (Fink, 2013)

The description of the elements in Fink's Taxonomy (O'neill & Murphy, 2010) is as in Table 1 below.

Table 1: Elements in Fink's Taxonomy

Elements	Description
Foundational Knowledge	• Understanding and remembering
Application	• Critical, creative and practical thinking
Integration	• Connecting ideas, views, and people
Human Dimension	• Understanding and interacting with others • Learn about yourself and others
Caring	• Build feelings (motivation) and interest • Cares about the subject
Learning how to Learn	• Become a self-directed learner • Life-long learning

Studies related to Fink's Taxonomy have been conducted outside the country since it was introduced by L. Dee Fink in 2003. Among the recent studies is Su's study (2022) which uses Fink's Taxonomy as an integrated model in designing a writing course that can develop students' writing skills holistically and provide significant learning experiences. DeLuca et al.'s study (2021) examines the pedagogy of teaching 35 prospective teachers slow learning using Fink's Taxonomy. Findings reveal a trend in learning, especially slow learning, requiring significant learning experiences found in Fink's Taxonomy. In contrast, Barton et al.'s study (2020) uses Fink's Taxonomy to analyze interview data on workers' perceptions in assessment practices for new teacher education programs. Additionally, studies related to Fink's Taxonomy have also been conducted by Partido, Chartier, and Jewell (2020) in a project to create chapters in an e-book on dental education. The creation of chapters in the e-book is evaluated using Fink's Taxonomy's six elements, and the strength of the study is seen in the balance of Fink's Taxonomy elements in cognitive, affective, and metacognitive aspects.

The uniqueness of Fink's Taxonomy, which is structured in a circular manner, allows the six learning elements to be more interactive and interconnected. The synergy between the six learning elements shows that any one type of learning element can stimulate other learning elements (Fink, 2013). Furthermore, Fink's Taxonomy learning model also focuses on the development of goals that not only rely on memorizing facts but also understanding and using knowledge meaningfully (Fink, 2013). If teachers use this learning model, it is important to assess teachers' understanding of Fink's Taxonomy in their teaching and learning practices.

4. Methodology

The development of the instrument in this study involves two main phases: the first phase is the design and construction of the instrument (Cohen, Manion, & Morrison, 2018), while the second phase involves testing the instrument for validity, which is done in the expert review phase.

4.1 Phase One: Instrument Development

The development of the instrument in this study is based on the model introduced by Miller and Lovler (2020). The process of instrument development involves planning, development, validity testing, and reliability testing to ensure that the instrument can provide reliable and valid results. The design and construction phase of the instrument involve a literature review to determine the conceptualization and operationalization of the Fink's Taxonomy measurement instrument in identifying the objectives of the instrument and determining the operational definitions of the study instrument. The objective of the instrument developed in this study is to measure the level of understanding of teachers regarding Fink's Taxonomy, focusing on teachers who teach Science subjects.

This study uses a Likert scale 4-point questionnaire instrument based on the six elements of Fink's Taxonomy. The questionnaire used in this study consists of two main parts: Part A consists of demographic items, and Part B contains six constructs of Fink's Taxonomy.

4.2 Phase Two: Instrument Content Validation

This phase of instrument content validation involves four steps: (1) development of the expert review form, (2) selection of the expert review panel, (3) assessment of validity by experts, and (4) analysis of expert validation data.

4.2.1 Development of the Expert Review Form

The expert review form developed and used in this study contains the research objectives, validity assessment guidelines, criteria to be measured for validity, explanation of the measurement scale, and an explanation of the expert review form acknowledgment. The expert review form also includes instructions to the panel to assess each measurement item based on validity criteria using a 4-point Likert scale representing levels of agreement on validity content referring to Yaghmaie (2003); Scale 1 - Not Suitable at All, 2 - Not Suitable, 3 - Suitable, 4 - Very Suitable.

4.2.2 Selection of the Expert Review Panel

In the content validity assessment phase, involving a group of experts to assess and determine whether the content of the instrument developed measures what should be measured (Almanasreh, Moles & Chen, 2019; Mohamat, Sumintono & Abd Hamid, 2022) is required. In this study, the expert panel used to assess content validity focuses on a group of experts using non-probabilistic sampling techniques. The selection of the sample for non-probabilistic sampling techniques focuses on samples with certain criteria, and this technique does not require the study sample to be generalized to a broader population (Raifman et al., 2022).

The purposive sampling technique is used by the researcher to select expert samples predetermined by criteria, characteristics, and desired profile, and the selection of samples is based on specific goals desired by the researcher (Denscombe, 2003). This sampling technique has the advantage of selecting expert samples who have expertise in the field studied and have in-depth views and extensive experience in exploring content validity of the instrument (Hennick & Kaiser, 2022).

The selected expert panel refers to the expertise possessed by individuals in the field studied. Academics recommend a minimum of two experts as the minimum number to conduct content validity, but the consensus among academics is at least six experts as the most appropriate number (Polit, Beck & Owen, 2007; Almanasreh, Moles & Chen, 2019; Lynn, 1986; Alonzi-Gold & Grajo, 2021). Therefore, the expert sample in this study consists of eight lecturers and teachers selected from several universities and schools serving in the field of education. The criteria for selecting expert samples refer to aspects; (1) teachers who have served for at least 3 years in the field of education, (2) have expertise in science and measurement, (3) have at least a minimum education level of a bachelor's degree.

4.2.3 Assessment of Validity by Experts

The validity assessment stage by experts requires the panel members to assess each Fink's Taxonomy measurement item on a scale of 1 to 4 based on two content validity criteria: accuracy and suitability. The panel members were contacted in advance via email and WhatsApp to obtain their agreement and willingness to become content validity experts. Once the panel agrees, the appointment letter and expert review form are provided. The panel is also asked to sign the expert review form using a digital signature.

4.2.4 Analysis of Content Validity Data

Several popular methods that have existed can be used in determining the content validity of an instrument. One method that is often chosen by many researchers is using the content validity ratio (CVR) method. This method, also known as Content Validity Ratio (CVR), created by Charles Lawshe in 1975, is a method for measuring the consensus among experts to assess the appropriateness of each item in the instrument (Chong et al., 2021). The CVR method also helps identify irrelevant items and remove those items to improve the overall quality of the instrument (Creswell & Guetterman, 2019).

The CVR calculation uses the formula as in the equation below:

$$CVR = \frac{(ne - \frac{N}{2})}{\frac{N}{2}}$$

Guidance:
ne = the number of panels that answered 3 and 4
N = total number of panels

To assess content validity, expert reviewers will provide individual assessments for each item using a 4-point Likert scale; 1 - not suitable at all, 2 - not suitable, 3 - suitable, and 4 - very suitable. In the equation created by Lawshe (1975), CVR refers to the content validity ratio of the item, ne refers to the number of experts who agree to rate the item on a scale of 3 and 4 for both aspects of validity, while N is the total number of expert reviewers involved in content validity.

The range of CVR scores obtained for each item in the instrument will be between -1 and +1. This CVR value will indicate that a value close to +1 indicates that the majority of experts agree that the item is appropriate and should be retained in the instrument. Conversely, if the CVR value is less than zero, it indicates that less than half of the expert panel agrees that the measurement item is appropriate. The obtained CVR value for each item will be compared with the critical CVR value to determine whether the item should be retained or dropped from the instrument (Almanasreh, Moles & Chen, 2019; Lawshe, 1975; Zainal et al., 2020).

The number of experts conducting content validity in a study will determine the critical CVR value (Lawshe, 1975). The number of content validity experts in this study is eight, making the critical CVR value to be adhered to is 0.75. Therefore, items that obtain a CVR value of less than 0.75 need to be reconsidered as they indicate that the item is problematic before deciding whether the item needs refinement or consideration for removal from the instrument (Lawshe, 1975; Rodrigues et al., 2017).

5.0 Research Findings

5.1 Instrument Development

Objective 1: Developing measurement items to gauge Science teachers' understanding of Fink's Taxonomy

Table 2 shows the number of constructs, study dimensions, and instrument items developed to measure Science teachers' understanding of Fink's Taxonomy.

Table 2: Number of Constructs and Items of Fink's Taxonomy Instrument

Construct	Definition	Number of Item
Foundational Knowledge	About knowing and the ability to remember and understanding information	15
Application	Transfering knowledge to the real world and learning how to engage in new actions, the application of critical, creative thinking and KBAT as well as the development of communication skills	18
Integration	Making connections between ideas and concept obtained with other disciplines and building new relationships	15
Human Dimension	The ability to learn about oneself, interact and understand others, and be able to influence interpersonal relationships among students	15
Caring	Build feelings, motivation, and interest, appreciate values and care about things, cultivate empathy and compassion values and have professional judgement	15
Learning how to learn	Develop the ability to learn and become a self-directed learner, practice lifelong learning and engage in reflection	17
The total number of items in the instrument		95

The Basic Knowledge construct identifies three study dimensions: (1) basic knowledge required for other types of learning, (2) remembering information, and (3) understanding information. This construct comprises 15 items, with five items measuring basic knowledge required for other types of learning, five items for remembering information, and five items for understanding information.

The Application construct contains four identified dimensions: (1) transferring knowledge to the real world, (2) engaging in action, (3) critical, creative, and higher-order thinking, and (4) developing communication skills. A total of 18 items are developed in the Application construct, with four items measuring the transfer of knowledge to the real world, three items measuring engagement in action, five items measuring critical, creative, and higher-order thinking, and four items measuring the development of communication skills.

Furthermore, the Integration construct identifies two study dimensions: (1) making connections between ideas and concepts and (2) building new relationships. The number of items in this construct is 15, with seven items measuring making connections between ideas and concepts and eight items measuring building new relationships.

The Human Dimension construct contains three identified study dimensions: (1) learning about oneself, (2) interacting and understanding others, and (3) influencing interpersonal relationships. A total of 15 items are included in the Human Dimension construct, with five items measuring the ability to learn about oneself, five items measuring the dimension of interacting with others, and five items measuring interpersonal relationships.

The Caring construct identifies four study dimensions: (1) building feelings and interests, (2) appreciating values and concerns, (3) fostering empathy, and (4) professional consideration. This construct contains 15 items, with three items measuring the dimension of building feelings and interests, four items measuring appreciating values and concerns, four items measuring empathy, and four items measuring professional consideration.

The final construct is Learning How to Learn and contains four identified study dimensions: (1) developing learning abilities, (2) becoming a self-directed learner, (3) lifelong learning, and (4) reflection. A total of 17 items are contained in the Learning How to Learn construct, with five items measuring the development of learning abilities, four items measuring self-directed learning, five items measuring lifelong learning, and three items measuring engagement in reflection.

5.2 Determining Content Validity Ratio (CVR)

Objective 2: Measuring the content validity of the instrument measuring Science teachers' understanding of Fink's Taxonomy

To measure content validity, a descriptive analysis of the expert review study was conducted using the Content Validity Ratio (CVR) analysis and calculation method. Content validity in this study involved eight professional and field experts who met the criteria for expert sample selection. Each expert would provide assessments involving two different aspects of validity: accuracy and relevance. CVR findings for each item were calculated for both accuracy and relevance aspects to obtain the overall CVR value.

The establishment of the critical CVR reading = 0.75, as suggested by Lawshe (1975), refers to the number of experts, N = 8. Items with CVR values below the critical CVR value of 0.75 are considered unimportant and will be removed from the instrument.

Based on the CVR findings for each item for Construct 1: Basic Knowledge in Table 3, it was found that the items with CVR values below the critical CVR value of 0.75 are item (A5accuracy) = 0.5 and item (A5relevance) = 0.5. Table 3.1 shows the results for accuracy CVR, relevance CVR, and overall CVR values for the Basic Knowledge construct involving 15 items, namely A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, and A15. Based on the overall CVR value, 14 out of 15 items for Construct 1 were accepted for further study, while item A5 will be removed.

Table 3: Construct 1 Foundational Knowledge

No of item	ne	(CVR) Accuracy	ne	(CVR) Relevance	Σ: (CVR)
A1	8	1.00	8	1.00	1.00
A2	7	0.75	7	0.75	0.75
A3	7	0.75	7	0.75	0.75
A4	8	1.00	8	1.00	1.00
A5	6	0.50	6	0.50	0.50
A6	8	1.00	8	1.00	1.00
A7	7	0.75	7	0.75	0.75
A8	7	0.75	7	0.75	0.75
A9	7	0.75	7	0.75	0.75
A10	8	1.00	8	1.00	1.00
A11	8	1.00	8	1.00	1.00
A12	8	1.00	8	1.00	1.00
A13	8	1.00	8	1.00	1.00
A14	7	0.75	7	0.75	0.75
A15	7	0.75	7	0.75	0.75

For Construct 2, which is Application, the CVR findings for each item are shown in Table 4. A total of 18 items underwent expert review, and the analysis findings showed that items with CVR values below the critical CVR value of 0.75 are item B23accuracy&relevance = 0.50, B27accuracy&relevance = 0.635, and B28accuracy&relevance = 0.50. Table 4 shows the results for accuracy CVR, relevance CVR, and overall CVR values for the Application construct involving 18 items, namely B16, B17, B18, B19, B20, B21, B22, B23, B24, B25, B26, B27, B28, B29, B30, B31, B32, and B33. Based on the overall CVR value, 14 out of 15 items for Construct 2 were accepted for further study, while items B8, B12, and B13 will be removed.

Table 4: Construct 2 Application

No of item	ne	(CVR) Accuracy	ne	(CVR) Relevance	Σ: (CVR)
B16	8	1.00	8	1.00	1.00
B17	7	0.75	7	0.75	0.75
B18	8	1.00	8	1.00	1.00
B19	8	1.00	8	1.00	1.00
B20	8	1.00	7	0.75	0.875
B21	8	1.00	8	1.00	1.00
B22	8	1.00	8	1.00	1.00
B23	6	0.50	6	0.50	0.50
B24	8	1.00	8	1.00	1.00
B25	8	1.00	8	1.00	1.00
B26	7	0.75	7	0.75	0.75
B27	6	0.50	7	0.75	0.625
B28	6	0.50	7	0.50	0.50
B29	7	0.75	7	0.75	0.75
B30	8	1.00	8	1.00	1.00
B31	8	1.00	8	1.00	1.00
B32	7	0.75	7	0.75	0.75
B33	7	0.75	7	0.75	0.75

Furthermore, there were 15 items undergoing expert review in Construct 3: Integration. Table 5 shows only one item with a CVR value below the critical CVR value of 0.75, which is item C34accuracy&relevance = 0.625, and will be removed. This results in 14 items in Construct 3: Integration being retained in this instrument.

Table 5: Construct 3 Integration

No item	ne	(CVR) Accuracy	ne	(CVR) Relevance	Σ: (CVR)
C34	6	0.50	7	0.75	0.625
C35	8	1.00	8	1.00	1.00
C36	8	1.00	8	1.00	1.00
C37	8	1.00	8	1.00	1.00
C38	8	1.00	8	1.00	1.00
C39	8	1.00	8	1.00	1.00
C40	8	1.00	8	1.00	1.00
C41	8	1.00	8	1.00	1.00
C42	8	1.00	8	1.00	1.00
C43	7	0.75	7	0.75	0.75
C44	7	0.75	7	0.75	0.75
C45	8	1.00	7	0.75	0.875
C46	8	1.00	8	1.00	1.00
C47	7	0.75	7	0.75	0.75
C48	7	0.75	8	1.00	0.875

Table 6 shows the CVR findings for each item in the fourth construct, Human Dimension. Content validity analysis for 15 items (D49 to D63) in the Human Dimension construct shows that all items exceed the critical CVR value of 0.75 for both accuracy and relevance aspects. This indicates that all items in the fourth construct are retained in the instrument for further study.

Table 6: Construct 4 Human Dimension

No of item	ne	(CVR) Accuracy	ne	(CVR) Relevance	Σ: (CVR)
D49	7	0.75	7	0.75	0.75
D50	8	1.00	8	1.00	1.00
D51	8	1.00	8	1.00	1.00
D52	8	1.00	8	1.00	1.00
D53	8	1.00	8	1.00	1.00
D54	8	1.00	8	1.00	1.00
D55	7	0.75	7	0.75	0.75
D56	8	1.00	8	1.00	1.00
D57	7	0.75	7	0.75	0.75
D58	7	0.75	7	0.75	0.75
D59	8	1.00	8	1.00	1.00
D60	8	1.00	8	1.00	1.00
D61	7	0.75	7	0.75	0.75
D62	7	0.75	7	0.75	0.75
D63	7	0.75	7	0.75	0.75

Content validity analysis for 15 items (E64 to E78) in the Caring construct also shows that all items exceed the critical CVR value of 0.75 for both validity aspects. Table 7 shows the results for accuracy CVR, relevance CVR, and overall CVR values for the Caring construct. Based on the overall CVR value, no items are removed, and all items are accepted for further study.

Table 7: Construct 5 Caring

No of item	ne	(CVR) Accuracy	ne	(CVR) Relevance	Σ: (CVR)
E64	7	0.75	7	0.75	0.75
E65	7	0.75	7	0.75	0.75
E66	8	1.00	8	1.00	1.00
E67	8	1.00	8	1.00	1.00
E68	8	1.00	8	1.00	1.00

E69	7	0.75	7	0.75	0.75
E70	8	1.00	8	1.00	1.00
E71	8	1.00	8	1.00	1.00
E72	8	1.00	8	1.00	1.00
E73	8	1.00	8	1.00	1.00
E74	8	1.00	8	1.00	1.00
E75	8	1.00	8	1.00	1.00
E76	7	0.75	7	0.75	0.75
E77	7	0.75	7	0.75	0.75
E78	7	0.75	7	0.75	0.75

For the last construct, Learning How to Learn, analysis found two items that did not exceed the critical CVR value of 0.75. Table 8 shows the results for accuracy CVR, relevance CVR, and overall CVR values for items F79 to F95. Based on the overall CVR analysis, items F87 and F90 will be removed as they only have a CVRaccuracy&relevance = 0.50. Only 15 items will be used for further study.

Table 8: Construct 6 Learning how to learn

No of item	ne	(CVR) Accuracy	ne	(CVR) Relevance	Σ: (CVR)
F79	7	0.75	7	0.75	0.75
F80	8	1.00	8	1.00	1.00
F81	7	0.75	7	0.75	0.75
F82	7	0.75	7	0.75	0.75
F83	7	0.75	7	0.75	0.75
F84	8	1.00	8	1.00	1.00
F85	8	1.00	8	1.00	1.00
F86	8	1.00	8	1.00	1.00
F87	6	0.50	6	0.50	0.50
F88	8	1.00	8	1.00	1.00
F89	7	0.75	7	0.75	0.75
F90	6	0.50	6	0.50	0.50
F91	8	1.00	8	1.00	1.00
F92	8	1.00	8	1.00	1.00
F93	8	1.00	8	1.00	1.00
F94	8	1.00	8	1.00	1.00
F95	8	1.00	8	1.00	1.00

Overall, Tables 3 to 8 show the assessment of eight expert reviewers (professional and field) on 95 instrument items. Based on the CVR calculation, seven items are removed from the instrument after undergoing expert content validity assessment. Therefore, 88 items will be used in the instrument measuring Science teachers' understanding of Fink's Taxonomy for pilot study purposes.

6. Discussion

This study aimed to develop a reliable and valid instrument to measure Science teachers' understanding of Fink's Taxonomy. Based on the CVR results, 88 out of 95 items were categorized as items suitable with CVR values ranging from 0.75 to 1.00. These values reflect a high percentage of expert panel consensus in assessing items as "important" for the instrument (Ayre & Scally, 2014). A total of seven items, namely A5, B23, B27, B28, C34, F87, and F90, with CVR values below the critical CVR = 0.75, require refinement based on consideration by professional and field experts. Thus, the researcher conducted refinement on these seven items; however, item changes were not limited to these seven items alone but also involved other items considered inappropriate and requiring refinement based on experts' comments and suggestions (Mohd Matore et al., 2017).

Expert panels provided comments on the repetition of similar question items, such as items A14 and A15, D53 and D62, C48 and D55, C48, and E68. Experts suggested either eliminating one of the items or refining them to avoid repetition. Item repetition can affect the quality of the instrument developed and may also distract respondents' focus when answering the questionnaire (Boynton & Greenhalgh, 2004). Additionally, experts noted that some items had overly long sentences (items C45, C46, C47, and C48), and they suggested that the researcher should simplify these items. Constructing long sentences in items consumes time and requires more effort (Taherdoost, 2022), which can affect respondents' focus and consistency when answering the questionnaire.

7. Conclusion

This study successfully obtained consensus from professional and field experts for all 95 constructed items. Only seven items required refinement, indicating that the items for the instrument were well conceptualized and operationalized. The strengths and weaknesses of each item were clearly demonstrated through expert consensus and CVR analysis findings. Therefore, the 95 constructed items can be used for pilot study purposes. The findings of this study have the potential to develop a Fink's Taxonomy instrument with high content validity. However, there are limitations to content validity using CVR analysis. CVR analysis can assess content validity at the item level but cannot confirm the domain and overall instrument validity, as well as the consistency of respondents in evaluating the instrument. However, CVR analysis also has its advantages, as the number of respondents (experts) will affect the critical CVR value. The more experts involved in content validity, the lower the critical CVR value, which increases the potential for retaining and salvaging items from elimination.

Nevertheless, some past studies have questioned the strength of using CVR analysis alone to measure content validity. Therefore, it is suggested that the content validity process be conducted a second time using different samples or respondents and employing different validity analyses. CVI analysis, referring to I-CVI and S-CVI, is a content validity analysis that can provide better item screening results. CVI analysis can also assess the validity of each domain and the validity of the overall instrument.

8. Reference

1. Abdul Khalil, A., Mohamed, S. S. B. P., Hassan, H., & Ibrahim, A. (2021). Pelaksanaan Community Based Learning (CBL) dalam Pengajaran dan Pembelajaran bagi Kursus Khidmat Masyarakat di Institusi Pengajian Tinggi. *International Jurnal of Education, Psychology and Counselling, 6(40)*, 145-159
2. Abdul Rahman, S., & Abdul Manaf, N. F. (2017). A Critical Analysis of Bloom’s Taxonomy in Teaching Creative and Critical Thinking Skills in Malaysia through English Literature. *English Language Teaching, 10(9)*, 245-256. https://doi.org/10.5539/elt.v10n9p245
3. Agarwal, P. K. (2019). Retrieval Practice & Bloom’s Taxonomy: Do Students Need fact Knowledge Before Higher Order Learning? *Journal of Educational Psychology, 111(2)*, 189-209. http://dx.doi.org/10.1037/edu0000282.supp
4. Almanasreh, E., Moles, R., & Chen, T. F. (2019). Evaluation of Methods used for Estimating Content Validity. *Research in Social and Administrative Pharmacy, 15(2),* 214-221.
5. Alonzi-Gold, D., & Grajo, L. C. (2021). The Content Validity and Clinical Utility of the Kindergarten Readiness Inventory (K-READI): A Screening Tool of School Readiness for Children on the Autism Spectrum. *Journal of Occuoational Theraphy, Schools, and Early Intervention, 14(1),* 75-89.
6. Amatan, M. A., Han, C. G. K., & Pang, V. (2021). Kesahan Kandungan Soal Selidik Faktor Konteks, Input dan Proses Terhadap Penerimaan Pelaksanaan Elemen Pendidikan STEM dalam Pengajaran dan Pembelajaran Guru Menggunakan Nisbah Kesahan Kandungan (CVR). *International Journal of Advanced Research in Future Ready Learning and Education, 23(1)*, 10-22. https://akademiabaru.com/submit/index.php/frle/article/view/3923
7. Anizar, Gani, A., Khaldun, I., & Bahi, M. (2018). The Development of a Module with Microsoft Excel-Based Interactive Media on the Topic of Buffer Solution. *Journal of Physics: Conference Series, 1088*, 1-6. https://doi.org/10.1088/1742-6596/1088/1/012119
8. Ayre, C., & Scally, A. J. (2014). Critical Values for Lawshe’s Content Validity Ratio: Revisiting the Original Methods of Calculation. *Measurement and Evaluation in Counseling and Development, 47,* 79-86. https://doi.org/10.1177/0748175613513808
9. Baco, S. & Ishak, M. Z. (2021). Kesahan dan Kebolehpercayaan Instrumen Penilaian Kendiri Pembelajaran Ungkapan Algebra Tingkatan Dua. *Malaysian Journal of Social Sciences and Humanities (MJSSH), 6(11)*, 127-137. https://doi.org/10.47405/mjssh.v6i11.1136
10. Ballantyne, J., Flynn, L., & Olm-Madden, T. (2020). Problem-Seeking in Teacher Education: Empowering Students to Grapple with The Complexities of The Profession. *Australian Journal of Teacher Education*, *45(5),* 38-61. https://doi.org/10.14221/ajte.2020v45n5.3
11. Barton, G. M., Baguley, M., Kerby, M., & MacDonald, A. (2020). Investigating the Assessment Practices within an Initial Teacher Education Program in an Australian University: Staff Perceptions and Practices. *Australian Journal of Teacher Education, 45(3),* 34-47. http://dx.doi.org/10.14221/ajte.2020v45n3.3
12. Billiot, T. (2023). Continuous Learning and Advancing Technologies: A Framework for professional Development and Training in Artificial Intelligence. *Development and Learning in Organizations: An International Journal, 37(3)*, 29-31.
13. Boynton, P. M., & Greenhalgh, T. (2004). Selecting, designing, and developing your questionnaire. *Education and debate, 328,* 1312-1315.
14. Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education (8th ed.)*. Routledge

15. Creswell, J. W., & Guetterman, T. C. (2019). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research (6th ed.).* Pearson.
16. Darusalam, G. & Hussin, S. (2021). *Metodologi Penyelidikan dalam Pendidikan: Amalan dan Analisis Kajian*. Penerbit Universiti Malaya
17. DeLuca, C., Searle, M., Carbone, K., Ge, J., & LaPointe-McEwan, D. (2021). Toward a Pedagogy for Slow and Significant Learning about Assessment in Teacher Education. *Teaching and Teacher Education, 101*, 1-12. https://doi.org/10.1016/j.tate.2021.103316
18. Denscombe, M. (2010). *The Good Research Guide for Small-scale Social Research Projects (4th ed.).* McGraw-Hill Education.
19. DeVellis, R. F. (2017). *Scale Development Theory and Applications (4th ed.).* SAGE Publication Inc.
20. Edris, A., Amat S., Mahmud, M. I., Abu Bakar, A. Y., Ghazali, N. M., Anuar, A. (2019). Split-Half Analysis: Measurement of Validity and Reliability of the Career Counselling Self-Efficacy Scale (CCSES) in Malaysian Public Universities. *International Journal of Innovation, Creativity and Change, 7(7),* 1-15. http://ir.unimas.my/id/eprint/27924
21. Fink, L. D. (2013). *Creating Significant Learning Experiences, Revised and Updated: An Integrated Approach to Designing College Courses*. Jossey-Bass A Wiley Brand
22. Ganesha, H. R, & Aithal, P. S. (2022). How to Choose an Appropriate Research Data Collection Method and Method Choices during Ph.D. Program in India?. *International Journal of Management, Technology, and Social Sciences (IJMTS), 7(2),* 455-489. http://dx.doi.org/10.2319/ssrn.4275696
23. Hennick, M., & Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine, 292,* 1-10. https://doi.org/10.1016/j.socscimed.2021.114523
24. Jekri, A., & Han, C. G. K. (2019). Pembinaan dan Pengesahan Instrumen Pengetahuan, Afektif, dan Motivasi Guru Sains terhadap Pengajaran dan Pembelajaran STEM (PAMPDPSTEM). *International Journal of Education, Psychology and Counseling, 4(32)*, 79-89.
25. Kamaluddin, M. R., Nasir, R., Wan Sulaiman, W. S., Khairudin, R., & Zamani, Z. A. (2017). Validity and Psychometric Properties of Malay Translated Religious Orientation Scale-Revised among Malaysian Adult Samples. *Akademika, 87(2)*, 133-144
26. Kementerian Pendidikan Malaysia. (2013). *Pelan Pembangunan Pendidikan Malaysia 2013-2025 (Pendidikan Prasekolah hingga Lepas Menengah).* Kementerian Pendidikan Malaysia
27. Kementerian Pendidikan Malaysia. (2017). *Dasar Pendidikan Kebangsaan (Edisi Keempat)*. Bahagian Perancangan dan Penyelidikan Dasar Pendidikan.
28. Kementerian Pendidikan Malaysia. (2018). *Dokumen Standard Kurikulum dan Pentaksiran: Sains Tingkatan 4 dan 5*. Kementerian Pendidikan Malaysia
29. Kementerian Pendidikan Malaysia. (2022). *Unit Pelaksanaan dan Prestasi Pendidikan (PADU) Pelan Pembangunan Pendidikan Malaysia 2013-2025: Laporan Tahunan 2022*. Kementerian Pendidikan Malaysia
30. Latifah, I. U. (2018). Pengembangan Instrumen Penilaian Hasil Belajar Matematika Berbasis Taksonomi Fink. Universitas Islam Negeri Sunan Ampel Surabaya, Surabaya.
31. Lawshe, C. H. (1975). A Quantitative Approach to Content Validity. *Personnel Psychology, 28(4),* 563-575.
32. Lemov, D. (2017, Mar 4). *Bloom's Taxonomy – That Pyramid is a Problem*. https://teachlikeachampion.org/blog/blooms-taxonomy-pyramid-problem/
33. Levine, L. E., Fallahi, C. R., Nicoll-Senft, J. M., Tessier, J. T., Watson, C. L., & Wood, R. M. (2008). Creating Significant Learning Experiences Across Disciplines. *College Teaching*, *56(4)*, 247-254. https://doi.org/10.3200/CTCH.56.4.247-254
34. Long, N. L., & Mustapha, R. (2019). Analisis Taksonomi Bloom dalam Penilaian Vokasional: Pembangunan suatu Taksonomi Baharu Menggunakan Teknik Delphi. *Jurnal Pengukuran Kualiti dan Analisis, 15(1),* 65-75.
35. Lynn, M. R. (1986). Determination and Quantification of Content Validity. *Nursing Research, 35(6),* 382-386.
36. Malone, K. L., Boone, W.J., Stammen, A., Schuchardt, A., Ding, L. & Sabree, Z. (2021). Construction and Evaluation of an Instrument to Measure High School Students Biological Content Knowledge. *EURASIA Journal of Mathematics, Science and Technology Education*, *17(12)*, 1-15. https://doi.org/10.29333/ejmste/11376
37. Masrom, N. W., Hashim, M., Hashim, N., & Behak, F. P. (2018). Kedudukan Taksonomi Bloom Menurut Perspektif Islam. *Journal of Quran Sunnah Education and Special Needs*, *1(1),* 18-26. https://doi.org/10.33102/jqss.vol2no1.8
38. Md Nawi, N. H. (2021). Pembinaan Taksonomi Kerohanian; Inisiatif Awalan. *Tinta Artikulasi Membina Ummah*, *7(2),* 12-23. http://www.journaltamu.com/wp-content/uploads/2021/12/TAMU-Vol-72-December-2021-12-23.pdf
39. Miller, L. A. & Lovler, R. L. (2020). *Foundations of Psychological Testing: A Practical Approach (6th ed.).* SAGE Publications, Inc.

40. Mohamat, R., Sumintono, B., & Abd Hamid, H. S. (2022). Analisis Kesahan Kandungan Instrumen Kompetensi Guru untuk Melaksanakan Pentaksiran Bilik Darjah menggunakan Model Rasch pelbagai Faset. *Jurnal Pendidikan Malaysia, 47(1)*, 1-14. http://dx.doi.org/10.17576/JPEN-2022-47.01-01
41. Mohd Matore, M. E. E., & Khairani, A. Z. (2015). Assesing the Content Validity of IKBAR using Content Validiy Ratio. *Australian Journal of Basic and Applied Sciences, 9(7),* 255-257.
42. Mohd Matore, M. E. E., Idris, H., Abdul Rahman, N., & Khairani, A. Z. (2017). Kesahan Kandungan Pakar Instrumen IKBAR bagi Pengukuran AQ Menggunakan Nisbah Kesahan Kandungan. *Proceeding of International Conference on Global Education V (ICGE V), (May)*, 979-997.
43. Nasab, M. F., Abdul Kadir, R., Hassan, S. A., & Mohd Noah, S. (2015). Psychometric Evaluation of the Career Decision Scale with Iranian Undergraduate Students. *Journal of Counselling & Development, 93(3),* 344-351.
44. Oluwatayo, J. A. (2012). Validity and Reliability Issues in Educational Research. *Journal of Educational and Social Research, 2(2)*, 391-400. https://doi.org/10.5901/jesr.2012.v2n2.391
45. Omar, A., Hamzah, S. A., & Kee, C. P. (2021). Kesahan dan Kebolehpercayaan Instrumen Batas Etnik di Sekolah Kebangsaan Zon Utara Semenanjung Malaysia, *Jurnal Sains Sosial dan Kemanusiaan, 18(3)*, 253-269
46. Partido, B. B., Chartier, E., & Jewell, J. (2020). Evaluation of an e-Book Assignment using Fink's Taxonomy of Significant Learning Among Undergraduate Dental Hygiene Students. *Journal of Dental EducationI, 84(10)*, 1074-1083. https://doi.org/10.1002/jdd.12247
47. Payan-Carreira, R., Sacau-Fontenia, A., Rebelo, H., Sebastiao, L., & Pnevmatikos, D. (2022). Development and Validation of a Critical Thinking Assessment-Scale Short Form. *Education Science, 12,* 1-19. https://doi.org/10.3390/educsci12120938
48. Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Focus on Research Methods: Is the CVI an Acceptable Indicator of Content Validity? Appraisal and Recommendations. *Research in Nursing & Health, 30(4),* 459-467. https://doi.org/10.1002/nur.20199
49. Raifman, S., DeVost, M. A., Digitale, J. C., Chen, Y. H., & Morris, M. D. (2022). Respondent-Driven Sampling: A Sampling Method for Hard-to-Reach Populations and Beyond. *Current Epidemiology Reports, (9),* 38-47. https://doi.org/10.1007/s40471-022-00287-8
50. Ramli, N. F., Talib, O., Hassan, S. A., & Abdul Manaf, U. K. (2020). Development and Validation of an Instrument to Measure STEM Teachers' Instructional Preparedness. *Asian Journal of University Education, 16(3),* 193-206. https://doi.org/10.24191/ajue.v16i3.11084
51. Rodrigues, I. B., Adachi, J. D, Beattie, K. A., & MacDermid, J. C. (2017). Development and Validation of a New Tool to Measure the Facilitators, Barriers and Preferences to Exercise in People with Osteoporosis. *BMC Musculoskeletal Disorders, 28(3),* 1-9. https://doi.org/10.1186/s12891-017-1914-5
52. Sekaran, U. & Bougie, R. (2016). *Research Method for Bussiness: A Skill Building Approach (7th ed.).* John Wiley & Sons.
53. Su, C. (2022). Incorporating Fink's Integrated Model to Developing Writing Courses in College. *International Journal of English Language Teaching , 10(6),* 8-18.
54. Suwono, H., Maulidia, L., Saefi, M., Kusairi, S., & Yuenyong, C. (2022). The Development and Validation of an Instrument of Prospective Science Teachers' Perceptions of Scientific Literacy. *Journal of Mathematics, Science and Technology Education, 18(1),* 1-16.
55. Taherdoost, H. (2022). Designing a Questionnaire for a Research Paper: A Comprehensive Guide to Design and Develop an Effective Questionnaire. *Asian Journal of Managerial Science, 11(1),* 8-16. https://doi.org/10.51983/ajms-2022.11.1.3087
56. Ullah, Z., Lajis, A., Jamjoom, M., Altalhi, A., & Saleem, F. (2020). Bloom's taxonomy: A beneficial tool for learning and assessing students' competency levels in computer programming using empirical analysis. *Computer Application in Engineering Education, 28(6),* 1-13.
57. Uribe Cantalejo, J. C., & Pardo, M. I. (2020). Fink's Integrated Course Design and Taxonomy: The Impact of their Use in a "Basics of Dental Anatomy" Course. *Journal of Dental Education, 84(9)*, 964-973. https://doi.org/10.1002/jdd.12183
58. Viterbo, L. M. F., Dinis, M. A. P., Costa, A. S., & Vidal, D. G. (2019). Development and Validation of an Interdisciplinary Worker's Health Approach Instrument (IWHAI). *International Journal of Environment Research and Public Health*, *16,* 1-17. https://doi.org/10.3390/ijerph16152803
59. Wang, J. Liu, Y., Li, P., Lin, Z., Sindakis, S., & Aggarwal, S. (2022). Overview of Data Quality: Examining the Dimensions, Antecedents, and Impacts of Data Quality. *Journal of the Knowledge Economy*, *1,* 1-20.
60. Yaghmaie, F. (2003). Content validity and its estimation. *Journal of Medical Education*, *3(1),* 25-27.
61. Yaw, P. W., & Mohd Matore, M. E. E. (2023). How to Create Amazing Teacher Competency in Fink's Taxonomy in Science Subjects? International Journal of Academic Research in Business and Social Sciences, *13(3),* 1320-1333. http://dx.doi.org/10.6007/IJARBSS/v13-i3/16556
62. Zainal, M. A., Mohd Matore, M. E. E., Musa, W. N. W., & Hashim, N. H. (2020). Kesahan Kandungan Instrumen Pengukuran Tingkah Laku Inovatif Guru Menggunakan Kaedah Nisbah Kesahan Kandungan (CVR). *Akademika, 90*, 43-54. https://doi.org/10.17576/akad-2020-90IK3-04