

Validity and Reliability of the A Safety Management Questionnaire Instrument in Schools

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ABSTRACT

This study was conducted to develop and evaluate the validity and reliability of a questionnaire instrument on the safety management of co-curricular activities in schools. The study adopted a quantitative approach employing a survey research design. The instrument development process was carried out based on the instrument construction procedures proposed by Morrow et al. (1995). The questionnaire instrument was developed based on three principal constructs, namely environmental factors, equipment factors, and student factors. A pilot study was conducted in the Kota Belud district, Sabah, involving eight daily secondary schools, with a total of 150 teachers selected through simple random sampling techniques. Data were analysed using the Statistical Package for the Social Sciences (SPSS) software. To determine construct validity, Exploratory Factor Analysis (EFA) using the Principal Component Analysis (PCA) method was conducted. The results of the Kaiser-Meyer-Olkin (KMO) test indicated a value of $r=.826$, while Bartlett's Test of Sphericity demonstrated a significant value of $p=.001$. The Total Variance Explained analysis revealed that three principal constructs were successfully established, accounting for a cumulative variance of 79.285%. The questionnaire instrument consisted of 35 items comprising 13 environmental factor items, 11 equipment factor items, and 11 student factor items. The Rotated Component Matrix analysis showed that all items achieved factor loadings exceeding .50 and were therefore retained in the final instrument. Furthermore, the language validity value obtained was $r=.91$, while the content validity value was $r=.92$. The reliability findings revealed that the Cronbach's Alpha values for environmental factors, equipment factors, and student factors were $r=.97$, $r=.96$, and $r=.97$ respectively, with an overall instrument reliability value of $r=.98$. Overall, the findings indicate that the developed questionnaire instrument possesses a very high level of validity and reliability and is suitable for measuring the safety management of co-curricular activities in schools.

Keywords: validity, reliability, questionnaire instrument, safety management, co-curricular activities

INTRODUCTION

Co-curricular activities constitute an integral component of the education system implemented outside the classroom to enhance students' physical, emotional, spiritual, and intellectual development in a holistic manner. Students' participation in co-curricular activities contributes to the development of social skills, leadership qualities, discipline, and character formation. Nevertheless, involvement in such activities also exposes students to various safety risks, including injuries, accidents, and fatalities during the implementation of activities. Therefore, safety aspects must be given serious attention by school authorities and co-curricular advisory teachers to ensure that activities are conducted in a safe and controlled environment. The Ministry of Education Malaysia (MOE) has introduced various guidelines and circulars related to safety, including Professional Circular No. 9/2000, Professional Circular No. 5/2016, the Safe School Manual, and the Occupational Safety and Health Guidelines for Co-curricular Activities, to ensure that student safety is consistently safeguarded. However, accidents during co-curricular activities continue to occur due to weaknesses in safety management, environmental factors, unsafe use of equipment, and negligent student behaviour. According to Zakaria (2016), unsystematic safety management may increase the risk of injuries and accidents during the implementation of co-curricular activities.

Furthermore, safety management encompasses not only physical aspects but also includes risk management, activity monitoring, equipment maintenance, and compliance with school safety procedures. Therefore, the development of a valid and reliable questionnaire instrument is essential in assisting the systematic and consistent evaluation of the level of safety management in co-curricular activities within schools (Santhanadass, 2015). Instruments possessing high levels of validity and reliability may assist schools, researchers, and policymakers in identifying weaknesses in safety management and implementing appropriate improvement measures.

Research Problem

Although various safety circulars and guidelines have been introduced by the Ministry of Education Malaysia, accidents during co-curricular activities continue to occur in schools. Among the commonly reported incidents are injuries during sports activities, students drowning during camping activities, and accidents resulting from the use of damaged or poorly maintained equipment. This situation indicates that the safety management of co-curricular activities in schools has yet to be implemented systematically and effectively.

In addition, co-curricular advisory teachers were found to receive limited training related to safety management, risk handling, and emergency procedures. According to Kalaiselvan and Daud (2021), weaknesses in safety management often stem from uncondusive environmental factors, insufficient monitoring, and low levels of safety awareness during activities. Poorly maintained equipment and negligent student behaviour also contribute to the increased risk of accidents during co-curricular activities.

Previous studies have also demonstrated that there remains a lack of specific instruments developed to comprehensively measure the level of safety management of co-curricular activities in schools. Most existing instruments focus only on particular aspects and do not comprehensively integrate environmental factors, equipment factors, and student factors. Therefore, a questionnaire instrument with a high level of validity and reliability should be developed to facilitate a more systematic and effective evaluation of the safety management of co-curricular activities in schools.

Research Objectives

This study was conducted to achieve the following objectives:

1. To identify the validity of the questionnaire instrument on the safety management of co-curricular activities in schools.
2. To determine the reliability of the questionnaire instrument on the safety management of co-curricular activities in schools.
3. To identify environmental factors, equipment factors, and student factors in the safety management of co-curricular activities in schools.

LITERATURE REVIEW

School safety refers to a condition that is free from the risks of injuries, accidents, and hazards during the implementation of activities in schools. According to Zakaria, Safial, and Ismail (2014), school safety encompasses aspects such as the environment, equipment, activity management, and teacher supervision of students. Effective safety management can help ensure that co-curricular activities are conducted smoothly while reducing the risk of accidents among students. The Ministry of Education Malaysia (2002) also emphasised that school safety should be given comprehensive attention to ensure students' well-being throughout their time in school and during the implementation of co-curricular activities. Safety theories and models such as Heinrich's Domino Theory (1941), the Firenzie Model (19787), and the Swiss Cheese Model (2000) are utilised as foundational frameworks for understanding accident factors and safety management. Heinrich's Domino Theory explains that accidents occur due to several interrelated factors and may be prevented if one of these factors is effectively controlled. Within the school context, weaknesses in safety

management may contribute to an increased risk of accidents during co-curricular activities (Zakaria, 2016). In this thesis, safety risk aspects are identified through three principal factors, namely equipment factors, human factors, and environmental factors. These three factors demonstrate a significant relationship with the level of student safety during participation in co-curricular activities in schools.

Equipment Risk

Equipment risk refers to the use of damaged, poorly maintained, obsolete, or non-compliant equipment that does not adhere to established safety specifications. Jaffry Zakaria, Mohd Harun, and Norlena Salamuddin (2018) explained that weaknesses in equipment management constitute one of the primary causes of accidents during co-curricular activities. Poorly maintained equipment may increase the risk of injuries among students during sports activities, camping programmes, and outdoor activities.

Furthermore, a study conducted by Santhanadass (2015) found that unsystematic equipment storage and the failure to conduct periodic inspections also contribute to safety risks in schools. According to the Occupational Safety and Health Guidelines for Co-curricular Activities (2018), all equipment utilised during co-curricular activities must be regularly inspected and maintained to ensure that student safety is consistently safeguarded. Therefore, aspects related to equipment maintenance, storage, and usage in accordance with safety procedures should be given serious attention in order to minimise the risk of accidents during co-curricular activities.

Human Risk

Human factors refer to individuals' behaviour, attitudes, discipline, and level of safety awareness during the implementation of co-curricular activities. Awang and Suyanto (2017) found that careless attitudes, lack of focus, and failure to comply with safety instructions are among the principal factors contributing to accidents among students. In addition to students, co-curricular advisory teachers also play an important role in ensuring that activity safety remains well controlled.

According to Zakaria (2016), inadequate training related to safety management and emergency handling among teachers may increase the risk of accidents during activities. This indicates that human factors involve not only students but also the competency level of teachers in managing the safety of co-curricular activities effectively. Furthermore, the MOE Safe School Manual (2002) emphasises that teachers must ensure close supervision of students throughout the implementation of activities in order to reduce the risk of accidents and injuries.

Environmental Risk

Environmental risk involves the condition of activity areas, weather conditions, activity implementation spaces, and the level of safety of the locations utilised. A study conducted by Kalaiselvan and Daud (2021) demonstrated that unconducive environmental factors, such as hot weather, confined areas, damaged field surfaces, and unsafe locations, may increase the risk of injuries among students during the implementation of co-curricular activities.

Furthermore, school environments that lack adequate safety facilities, such as emergency exits, fire extinguishers, and safe activity areas, also contribute to the risk of accidents. According to the Ministry of Education Malaysia (2002), schools are responsible for ensuring that co-curricular activity areas are maintained in a safe condition and free from elements that may threaten student safety. Therefore, schools must ensure that environmental aspects are given comprehensive attention in order to safeguard students' safety throughout the implementation of co-curricular activities.

The Ministry of Education Malaysia (MOE) has also introduced the Safe School Manual and the Occupational Safety and Health Guidelines for Co-curricular Activities as the principal references for ensuring that student safety is consistently maintained during school activities. These guidelines emphasise aspects such as risk management, activity monitoring, and compliance with safety procedures as preventive measures against accidents among students (Ministry of Education Malaysia, 2018).

RESEARCH METHODOLOGY

Research Design

This study employed a quantitative approach using a survey research design to develop and evaluate a questionnaire instrument on the safety management of co-curricular activities in schools. The instrument development process was carried out based on the instrument construction procedures proposed by Morrow et al. (1995). The primary focus of this study was the development of a questionnaire instrument with a high level of validity and reliability.

Sampling

The study was conducted in the Kota Belud district, Sabah, involving eight daily secondary schools. Respondents were selected using a simple random sampling method to ensure that every teacher had an equal opportunity to be selected as a research respondent. A total of 150 secondary school teachers were selected as respondents for the pilot study.

Instrumentation

The study utilised a questionnaire instrument developed to measure the safety management of co-curricular activities in schools. The instrument was constructed based on the instrument development procedures proposed by Morrow et al. (1995) to ensure satisfactory levels of validity and reliability. The questionnaire instrument consisted of three principal factors, namely environmental factors, equipment factors, and student factors. A total of 35 items were developed, comprising 13 items for environmental factors, 11 items for equipment factors, and 11 items for student factors. The instrument employed a five-point Likert scale ranging from “Strongly Disagree” to “Strongly Agree”.

Statistical Analysis

Research data were analysed using the Statistical Package for the Social Sciences (SPSS) software. Statistical analyses were conducted to evaluate the validity and reliability of the developed questionnaire instrument. Exploratory Factor Analysis (EFA) using the Principal Component Analysis (PCA) method was performed to determine the construct validity of the instrument and to identify the underlying factor structure. The Kaiser-Meyer-Olkin (KMO) test and Bartlett’s Test of Sphericity were conducted to assess the suitability of the data for factor analysis. In addition, the Rotated Component Matrix with Varimax Rotation was employed to examine factor loadings for each item. Reliability analysis was conducted using the Cronbach’s Alpha coefficient to determine the internal consistency of the instrument.

Questionnaire Instrument Development Procedures

Step 1: Examining Questionnaire Criteria

The researcher identified criteria and items that were appropriate to the research objectives and co-curricular activities in schools. Item construction took into consideration the research objectives, question types, level of difficulty, and time required to complete the questionnaire. A power test approach was employed to ensure that respondents provided careful and honest responses (Morrow et al., 1995).

Step 2: Analysing Questionnaire Components and Items

The instrument was developed based on three principal constructs, namely environmental factors, equipment factors, and student factors. The questionnaire consisted of 35 items comprising 13 environmental factor items, 11 equipment factor items, and 11 student factor items. These constructs were developed based on previous studies related to the safety management of co-curricular activities in schools (Kalaiselvan & Daud, 2021).

Step 3: Identifying Previous Studies and Instruments

The researcher reviewed previous studies, theories, models, and guidelines related to safety management as the foundation for item development. The principal references included studies conducted by Kalaiselvan and Daud (2021), Zakaria (2016), Santhanadass (2015), the Occupational Safety and Health Guidelines for Co-curricular Activities in Schools (2018), and the MOE School Safety Manual (2002).

Step 4: Selection of Questionnaire Instrument Items

The selection of items was carried out based on the suitability of the content and the objectives of the study. The items were constructed using clear and easily understandable language. The instrument employed a five-point Likert scale ranging from “Strongly Disagree” to “Strongly Agree.” The use of the Likert scale facilitated the measurement of respondents’ perceptions and levels of agreement regarding the developed items.

Step 5: Preparation of Questionnaire Procedures

The researcher prepared systematic questionnaire administration procedures to ensure that the data collection process was conducted smoothly. Respondents were provided with an explanation regarding the purpose of the study and were given sufficient time to complete the questionnaire.

Step 6: Expert Validity

To ensure that the instrument possessed satisfactory validity, the researcher appointed five experts comprising language experts and content experts in the field of co-curricular safety management. The language experts evaluated aspects such as grammar, sentence structure, and item clarity, whereas the content experts assessed the suitability of the items in relation to the research objectives and the developed constructs. Items deemed unsuitable were revised and refined based on the opinions and recommendations of the experts prior to their use in the pilot study.

Step 7: Pilot Study

The pilot study was conducted in the Kota Belud district, Sabah, involving eight secondary schools selected through simple random sampling. A total of 150 secondary school teachers were selected as respondents for the pilot study to evaluate the validity and reliability of the developed questionnaire instrument. Bruce Thompson (2004) suggested that a sample size of 150 respondents is appropriate when the developed factors contain 10 or more variables with factor loadings of approximately .40. Furthermore, Guadagnoli and Velicer (1988), through Monte Carlo simulation studies, explained that a sample of approximately 150 respondents is adequate when the items demonstrate high factor loadings. This view is further supported by Tabachnick and Fidell (2007), who stated that factor analysis can be effectively conducted using a sample of approximately 150 respondents if the factor structure demonstrates high and stable factor loadings. Therefore, the number of respondents utilised in this study was considered adequate and appropriate for conducting Exploratory Factor Analysis (EFA).

Step 8: Determining the Validity and Reliability of the Instrument

Content Validity

The content validity of the instrument was determined through evaluations conducted by Malay language experts and content experts in the field of co-curricular safety management. The evaluation results indicated that the language validity value obtained was $r=.91$, while the content validity value was $r=.92$. These values demonstrate that the questionnaire items were at a very satisfactory level and were appropriate for use in the actual study.

Construct Validity (Factor Analysis)

The construct validity of the instrument was examined using Exploratory Factor Analysis (EFA) through the Principal Component Analysis (PCA) method. Prior to conducting factor analysis, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity were performed to determine the suitability of the data for analysis. The findings indicated that the KMO value obtained was $r=.826$, while Bartlett's Test of Sphericity demonstrated a significant value of $p=.001$. These values indicate that the research data were appropriate for factor analysis. The developed questionnaire instrument consisted of 35 items divided into three principal constructs, namely environmental factors, equipment factors, and student (human) factors. The environmental factor comprised 13 items, the equipment factor comprised 11 items, and the student factor comprised 11 items. The distribution of these items was conducted based on safety constructs identified through the literature review and needs analysis in the thesis.

Subsequently, the Kaiser Criterion technique was employed to determine the number of retained factors based on eigenvalues exceeding one. The Total Variance Explained analysis revealed that three principal constructs were successfully established, namely environmental factors, equipment factors, and student factors, with a total cumulative variance of 79.285%. For the environmental factor, factor analysis demonstrated that this construct possessed high and stable factor loadings, with all 13 items successfully retained within the same construct. This construct encompassed aspects such as the safety of activity areas, weather conditions, activity implementation spaces, and safety facilities in schools. With regard to the equipment factor, a total of 11 items were successfully loaded into a distinct construct with factor loadings exceeding .50. This construct involved aspects related to equipment maintenance, equipment storage, periodic inspections, and the use of equipment in accordance with established safety procedures.

In addition, the student factor, or human factor, also demonstrated a satisfactory construct structure, whereby all 11 items were successfully loaded into the same construct without substantial factor overlap. This construct included aspects such as student discipline, compliance with safety instructions, behaviour during activities, and students' level of safety awareness. The Rotated Component Matrix analysis using the Varimax Rotation technique indicated that all items achieved factor loadings exceeding .50 and were grouped within their respective constructs appropriately. No items demonstrated substantial overlapping factor loadings across constructs. Therefore, all items were retained in the final research instrument as they fulfilled the requirements of factor analysis and successfully supported the development of the three principal constructs of the school safety management questionnaire instrument.

Instrument Reliability

Instrument reliability was examined using the Cronbach's Alpha coefficient to determine the internal consistency of the questionnaire items. The analysis results revealed that the Cronbach's Alpha value for the environmental factor was $r=.97$, the equipment factor was $r=.96$, and the student factor was $r=.97$. The overall Cronbach's Alpha value for the instrument was $r=.98$. These values indicate that the instrument possesses a very high level of reliability and consistency for use in the actual study (Cronbach, 1989).

RESEARCH FINDINGS

The findings of the study indicate that the developed questionnaire instrument on the safety management of co-curricular activities possesses a very high level of validity and reliability. Based on expert evaluations, the language validity value obtained was $r=.91$, while the content validity value was $r=.92$. These values demonstrate that the developed items fulfilled the objectives of the study and were appropriate for measuring the safety management of co-curricular activities in schools.

In terms of construct validity, the Kaiser-Meyer-Olkin (KMO) test results indicated a value of $r=.826$. This value demonstrates that the study sample consisting of 150 teachers was adequate and appropriate for conducting Exploratory Factor Analysis (EFA). In addition, the results of Bartlett's Test of Sphericity showed a significant value of $p=.001$, indicating that significant relationships existed among the questionnaire items and that the data were suitable for factor analysis. The results of the Total Variance Explained analysis

revealed that three principal constructs were successfully established, namely environmental factors, equipment factors, and student factors. These three constructs accounted for 79.285% of the total variance of the instrument. This value indicates that the construct structure of the developed instrument was stable and robust in measuring the safety management aspects of co-curricular activities in schools.

Furthermore, the Rotated Component Matrix analysis demonstrated that all items achieved factor loadings exceeding .50 and were grouped within their respective constructs appropriately. No items demonstrated substantial overlapping factor loadings across constructs. These findings indicate that each item successfully measured the intended construct accurately and consistently. Therefore, all items were retained in the final research instrument. From the reliability perspective, the Cronbach's Alpha analysis indicated that the environmental factor obtained a value of $r=.97$, the equipment factor obtained $r=.96$, and the student factor obtained $r=.97$. Meanwhile, the overall Cronbach's Alpha value for the instrument was $r=.98$. These values indicate that the questionnaire instrument possesses a very high level of internal consistency and is reliable for use in the actual study. The high alpha values further demonstrate that the items within each construct possessed strong and consistent relationships in measuring the safety management of co-curricular activities in schools.

Overall, the findings of the study demonstrate that the developed questionnaire instrument possesses a very high level of validity and reliability. The instrument not only fulfils the requirements of research instrument development but is also suitable for use as a measurement tool in studies related to the safety management of co-curricular activities in schools.

DISCUSSION

This study successfully developed a questionnaire instrument on the safety management of co-curricular activities in schools with a high level of validity and reliability. The findings revealed that the language validity value ($r=.91$) and content validity value ($r=.92$) were at a very satisfactory level. These findings demonstrate that the developed items fulfilled the objectives of the study and were appropriate for measuring the safety management of co-curricular activities in schools. Construct validity through Exploratory Factor Analysis (EFA) further indicated that the instrument items successfully formed three principal constructs, namely environmental factors, equipment factors, and student factors. In addition, the Cronbach's Alpha values obtained for environmental factors ($r=.97$), equipment factors ($r=.96$), student factors ($r=.97$), and the overall instrument ($r=.98$) were at a very high level. These findings are consistent with the views of Loewenthal and Lewis (2018), who asserted that a good instrument should produce stable and consistent scores throughout the measurement process. Therefore, this questionnaire instrument is considered appropriate for use in studies related to safety management in schools (Raj & Jaffry Zakaria, 2022).

The study also found that environmental factors constitute one of the important elements in the safety management of co-curricular activities in schools. This factor involves the condition of activity areas, weather conditions, activity spaces, and the level of safety of the locations utilised during co-curricular activities. Unconducive environments, such as narrow fields, unsafe areas, and hot weather conditions, may increase the risk of injuries and accidents among students. These findings are consistent with the study conducted by Kalaiselvan and Daud (2021), which stated that environmental factors have a direct relationship with student safety during the implementation of co-curricular activities. Equipment factors were also identified as a major factor in determining the level of safety in co-curricular activities. The study found that damaged, obsolete, non-compliant, and poorly maintained equipment may pose hazards to students during activities. In this thesis, emphasis was placed on equipment safety aspects such as regular maintenance, safe storage, and the use of equipment according to procedures established by schools and the Ministry of Education Malaysia. These findings support the views of Jaffry Zakaria, Mohd Harun, and Norlena Salamuddin (2018), who explained that weaknesses in equipment management are among the primary causes of accidents during co-curricular activities.

Furthermore, student factors also play an important role in the safety management of co-curricular activities in schools. This factor involves students' behaviour, discipline, focus, and compliance with safety instructions

during activities. The study found that careless attitudes, lack of focus, and failure to comply with teachers' instructions may increase the risk of accidents and injuries. This thesis also explains that the lack of safety awareness and knowledge among students constitutes one of the contributing factors to incidents occurring during co-curricular activities. These findings are consistent with the study conducted by Awang and Suyanto (2017), which stated that student behaviour is an important factor in determining safety levels during activities.

Overall, the three factors, namely environmental factors, equipment factors, and student factors, were successfully proven to be the principal constructs in the development of the questionnaire instrument on the safety management of co-curricular activities in schools. These three factors demonstrate significant relationships in ensuring that student safety is consistently safeguarded during co-curricular activities. The developed instrument was also found to be appropriate for assisting schools, teachers, and researchers in evaluating the level of safety management of co-curricular activities in a more systematic and consistent manner (Ramachandran & Kenayathulla, 2018).

RECOMMENDATIONS

Based on the findings of the study, the developed questionnaire instrument on the safety management of co-curricular activities was found to possess a high level of validity and reliability and is therefore suitable for evaluating the level of safety management in schools. Consequently, this instrument is recommended for use by schools, District Education Offices, and State Education Departments as a standard instrument for assessing the safety aspects of co-curricular activities in a more systematic and consistent manner. The utilisation of this instrument may assist school administrators in identifying weaknesses in safety management and implementing appropriate improvement measures.

Furthermore, improvements to the questionnaire items should be conducted periodically to ensure that the developed instrument remains relevant to current changes within the education system and the implementation of co-curricular activities in schools. Technological advancements, changes in safety procedures, and the increasing diversity of co-curricular activities require an instrument that is flexible and continuously updated in accordance with current needs.

Future studies are also recommended to involve larger sample sizes and include schools from other states in order to enhance the generalisability of the questionnaire instrument. The involvement of respondents from diverse school backgrounds and locations may provide more comprehensive findings regarding the safety management of co-curricular activities in Malaysia. In addition to co-curricular advisory teachers, future research may also involve students, school administrators, and external trainers as respondents to examine the suitability and stability of the instrument constructs across different groups. In addition, the researcher recommends that new constructs, such as emergency management factors, psychosocial factors, and the utilisation of safety technology, be incorporated into the questionnaire instrument in future studies. The inclusion of these constructs is expected to further strengthen the safety management instrument and provide a more comprehensive understanding of safety aspects in co-curricular activities within schools.

From a methodological perspective, future studies are recommended to employ advanced factor analysis techniques such as Confirmatory Factor Analysis (CFA) to further strengthen the construct validity of the developed instrument. The use of CFA may assist in confirming the construct structure of the instrument in greater detail and improving the accuracy of measuring the safety factors under investigation. Overall, the questionnaire instrument on the safety management of co-curricular activities developed in this study has the potential to serve as an important reference for researchers and relevant authorities in efforts to strengthen safety management in schools. Instruments possessing high validity and reliability may help ensure that the evaluation of safety aspects is conducted accurately, consistently, and effectively in order to safeguard the well-being of students and the school community.

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