THE DEVELOPMENT OF EXAMINATION ITEMS BANK: A CASE STUDY OF GENERAL EDUCATION AT SUAN SUNANDHA RAJABHAT UNIVERSITY

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ABSTRACT

Study on the Development of a General Education Exam Question Bank. The objective of this study is to enhance the General Education exam question bank through the following steps: 1) Content Validity Analysis: Conducting a content validity analysis by determining the Item-Objective Congruence (IOC) through the perspectives of three experts, consisting of 160 items. 2) Difficulty and Discrimination Analysis: Analyzing the difficulty (p) and discrimination (r) values for each item and 3) Reliability Analysis: Determining the reliability of the exam by calculating the Kuder-Richardson Formula 20 (KR-20) and selecting questions that meet the established standards for inclusion in the question bank. The study involved testing the developed question bank on a sample group of 2,003 students using an 80-item test. The analysis revealed that the reliability of the exam, as measured by KR-20, was 0.829. This indicates that the test has a high level of reliability in assessing learning outcomes. Furthermore, the difficulty values (p) ranged from 0.04 to 0.98, signifying a diverse range of difficulty levels from challenging to relatively easy. The discrimination values (r) ranged from -0.13 to 0.49, suggesting acceptable discriminative power. The study identified a subgroup of high-scoring (H) and low-scoring (L) students, comprising approximately 27% each, totaling around 540 individuals in each group. The overall findings suggest that this exam is highly reliable and effective in assessing learning outcomes.

Keywords: Exam Question Bank, Examination Questions, General Education Course

INTRODUCTION

The advancement of student learning is a critical process in educational management. To achieve effective student development, it is essential to assess the knowledge and abilities of learners and understand the extent to which learning objectives are met. Measurement and evaluation of learning outcomes serve as crucial mechanisms to scrutinize students' academic achievements, with examinations being a widely used tool in this regard (Kankakorn, P., Somporn, S., & Benjama, S., 2018, p. 12).

Testing theories have evolved over time, with contemporary approaches integrating computer technology to streamline processes. In the current era, computers play a significant role in data collection, information retrieval, and the creation of question banks. These question banks serve as comprehensive repositories of high-quality examination questions tailored to assess students' knowledge, skills, and learning outcomes aligned with course objectives and curriculum standards. Furthermore, computerized question banks are instrumental in the

efficient management of accurate and reliable multiple-choice examinations, eliminating the need to create new sets of questions for each examination (McDonald, 2002, as cited in Ratchan Jaroenkaensaai et al., 2021, p. 32).
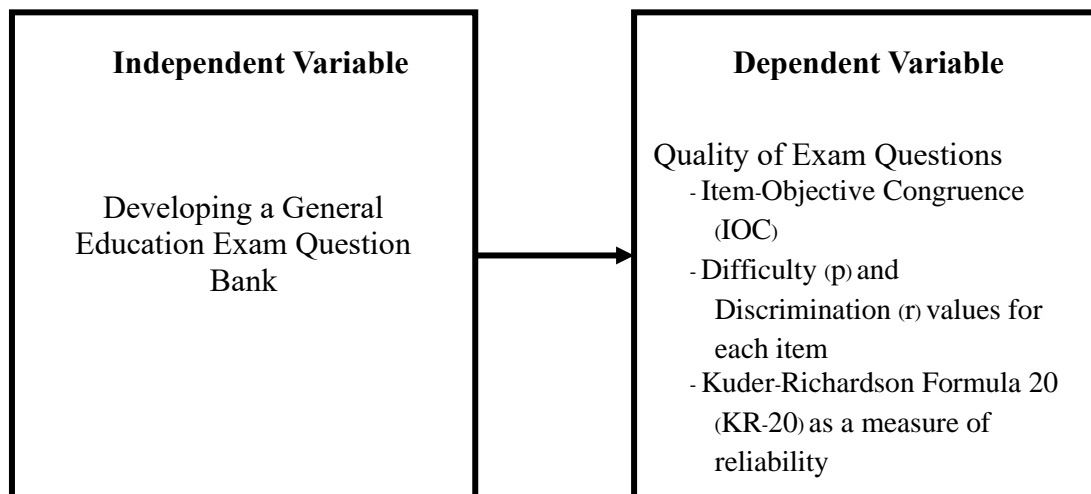
This research focuses on the development of a General Education Exam Question Bank at the Office of General Education and E-Learning Innovation, Suan Sunandha Rajabhat University. The study aims to present an efficient methodology for enhancing the quality of examination questions, utilizing current computer technology. Additionally, it explores the analysis of exam questions for continuous improvement and increased efficiency in the learning process. The computerized question bank not only facilitates convenient storage and retrieval of examination items but also aids in the creation of new assessments tailored to specific learning objectives.

RESEARCH OBJECTIVES

This research study was aimed to
    1) To Develop a General Education Exam Question Bank

CONCEPTUAL FRAMEWORK

Independent Variable	Dependent Variable
Developing a General Education Exam Question Bank	Quality of Exam Questions - Item-Objective Congruence (IOC) - Difficulty (p) and Discrimination (r) values for each item - Kuder-Richardson Formula 20 (KR-20) as a measure of reliability

Figure 1. Conceptual Framework
for Developing a General Education Exam Question Bank

This conceptual framework outlines the steps involved in developing a high-quality general education exam question bank. The framework begins with the identification of the exam objectives, which are the knowledge and skills that students are expected to demonstrate on the exam. Once the exam objectives have been identified, items can be developed that are aligned with those objectives. Item development should be guided by a number of principles, including item-objective congruence, difficulty, and discrimination. Item-objective congruence refers to the extent to which an item measures the intended objective. Difficulty refers to the percentage of students who are expected to answer an item correctly. Discrimination refers to the extent to which an item differentiates between high- and low-performing students.

Once items have been developed, they need to be evaluated for their quality. This evaluation should include a number of factors, such as item-objective congruence, difficulty, discrimination, and reliability. Reliability refers to the extent to which an item consistently

measures the same thing. Items that meet the criteria for quality can then be added to the question bank.

The final step in the development process is to review the question bank regularly to ensure that it is still aligned with the exam objectives and that the items are of high quality. This review should be conducted by a team of experts, including subject matter experts, psychometricians, and classroom teachers.

METHODOLOGY

Population and Sampling:

In this research, the sample group consists of students enrolled in the General Education course for the academic year 1/2565, totaling 3,000 individuals from the Faculty of General Education and Innovation in E-Learning at Suan Sunandha Rajabhat University. The sample is divided into two groups: Group 1 with 1,000 students, used to assess the quality of the tool, and Group 2 with 2,000 students, used for actual data collection. The sampling method employed is simple random sampling.

Research Tool:

The research utilizes the exam questions from the course titled "Civic Literacy," covering Chapters 1-8, with 10 questions per chapter, making a total of 80 questions.

Data Collection:

The researchers collect data on the students' responses to the Civic Literacy course exam, comprising 80 questions. The sample group includes students from the academic year 1/2565.

Data Analysis:

The research employs the following data analysis procedures:

1. Content Validity Analysis:
   - Analysis of the quality of exam questions by calculating the Item-Objective Congruence (IOC) from the perspectives of three content experts.
   - Formula: $IOC = (\sum R)/N$, where R represents the total content expert agreement scores, and N is the number of content experts.

2. Difficulty and Discrimination Analysis:
   - Calculation of the difficulty (p) and discrimination (r) values for each question using the 27% technique. (Kelly, 1939)
   - Formulas: $p = (pH+pL)/2$ for difficulty and $r = (pH+pL)/n$ for discrimination, where pH and pL represent correct responses in the high and low groups, respectively, and n is the total number of students.

3. Reliability Analysis:
   - Calculation of the reliability (r) of the exam using the Kuder-Richardson (1937, 151–60) Formula 20 (KR-20).
   - Formulas: $r = k/(k-1)[(St^2 - \sum pq)/(St^2)]$ or $r = (N\sum \llbracket X^2 - (\sum X)^2 \rrbracket)/(N(N-1))$, where *k* is the number of questions, St^2 is the total variance of test scores, *p* is the proportion of correct responses, *q* is the proportion of incorrect responses, *N* is the number of students, and *X* is the test score.

RESULT

Upon analyzing the alignment of exam questions with content definitions, it was found that the Item-Objective Congruence (IOC) values for 154 questions ranged between (0.60 – 1.00), meeting the established criteria. However, six questions did not meet the criteria and were

selected for further testing with a sample of 2,003 students to verify their quality in the next steps.

Table 1: Summary of Exam Question Alignment Index (IOC) for Civic Literacy Course

Exam Questions	IOC Value	Alignment Status
154	(0.60 – 1.00)	Passed
6	< 0.60	Not Passed

Analysis of Difficulty, Discrimination, and Reliability

The analysis of difficulty and discrimination for the Civic Literacy course exam with 80 questions revealed the following:

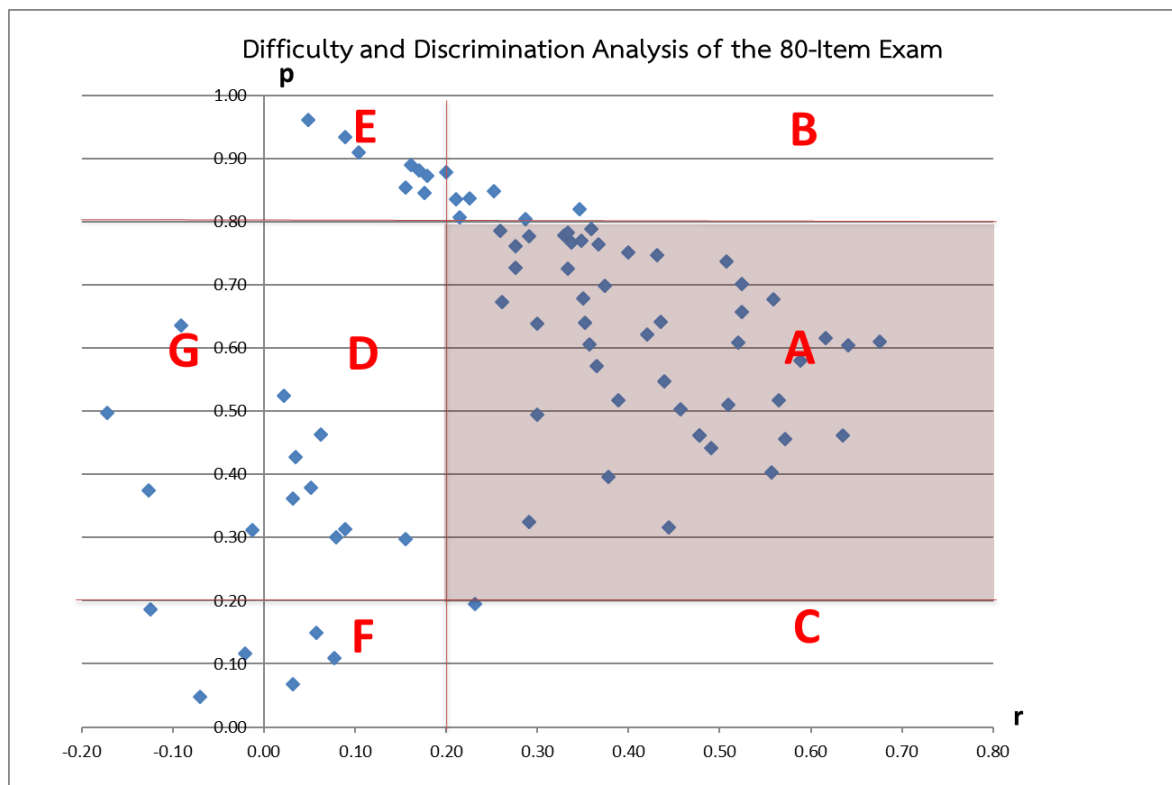Difficulty values (p)   : Ranged from 0.04 to 0.96.
Discrimination values (r) : Ranged from -0.17 to 0.68.
The reliability of the exam, determined by the Kuder-Richardson Formula 20 (KR-20), was calculated as 0.829 from:

$$\text{KR-20} \ = \ \frac{k}{k-1}\left[\frac{S_t^2 - \sum pq}{S_t^2}\right]$$

$$\text{KR-20} \ = \ \frac{80}{80-1}\left[\frac{88.854 - 16.14}{88.854}\right]$$

$$\text{KR-20} \ = \ 0.829$$

Figure 2. Graph Showing Difficulty (p) and Discrimination (r) Values for Civic Literacy Course Exam

CONCLUSION

In this research study, our primary objective was to improve the quality of General Education exam questions by conducting a comprehensive analysis of content validity, difficulty, discrimination, and reliability. Specifically, we focused on the Civic Literacy course exam, which consisted of 80 questions and was administered to a sample group of 2,003 students.

Our analysis began with Item-Objective Congruence (IOC) Analysis, where we assessed the alignment of the exam questions with content definitions. Out of the initial 154 questions, the majority showed a strong alignment with IOC values ranging from 0.60 to 1.00. However, six questions did not meet the established criteria, requiring further evaluation.

Subsequently, we conducted an analysis of difficulty and discrimination values, revealing a diverse range that indicated varying levels of difficulty and acceptable discriminative power. The exam's reliability, as measured by KR-20, was found to be high (0.829), affirming its effectiveness in assessing learning outcomes.

In conclusion, our overall findings indicate that the majority of exam questions exhibit a high level of alignment, reliability, and validity. These questions can confidently be integrated into the General Education question bank, enriching the available resources for future assessments. This development is as effective as the study conducted by Chaiwat Jiuphanich (2019), which demonstrated improved problem-solving skills through the development of learning materials via mobile devices in information technology and educational communication at Suan Sunandha Rajabhat University. The research results showed an efficiency rate of 83.91/86.98, surpassing the set criteria of 80/80, and higher learning achievement with a t-value of 58.61, making it a valuable guideline for the development of learning activities in other subjects. Moving forward, the questions that did not meet the alignment criteria will undergo further testing with a larger student population. This iterative process aims to refine and enhance these questions to ensure their effectiveness in assessing civic literacy. The results presented in this study offer valuable insights for educators, curriculum developers, and educational researchers, guiding their efforts to improve the quality of General Education exams. As a recommendation for future research, it would be beneficial to explore how question quality impacts student performance and engagement. Additionally, investigating the effectiveness of interventions designed to address identified shortcomings in exam questions could provide further opportunities for improvement. In summary, this study lays the groundwork for an improved question bank that aligns with the goals of General Education. Our commitment to continuous refinement and adaptation ensures that assessments remain relevant and valuable tools for evaluating students' civic literacy and understanding of fundamental concepts in General Education. If the exam is of good quality and follows an appropriate measurement and evaluation process, it can be used to measure students' learning skills. Like Apantee Poonputta. (2020). did the research of The Development of Skills for Building Instruments of Students for Learning Assessment, Teamwork Skills and Learning Achievement in Measurement and Evaluation Educational Using Exercises of Learning Together (LT) Collaborative Learning Model. The sample subjects of the study were twenty-one of undergraduate students at Mahasarakham University. They were selected by simple random sampling. The research instrument is consisted of lesson plans of LT collaborative learning model, which is by average appropriateness of the lesson plans was the highest level (X = 4.80); an assessment test of skills for inventing the instruments of learning assessment with 0.44-0.78 discrimination indices and 0.91 reliability index of Cronbach's alpha, an assessment test of teamwork skills with 0.38-0.87 discrimination indices and 0.96 reliability index, and a test with 0.33-0.76 difficulty indices, 0.24-0.71 discrimination indices and 0.93 reliability index of Lovett method. The statistics used were percentage, mean, standard

deviation and t-Distribution (t-test for dependent samples). The research findings were as follows: 1) the skills of the students to build an instrument for learning assessment were high level. 2) Regarding the comparison of the research results, 2.1) the results revealed that the skills of the students to build an instrument for learning assessment after using the exercises of LT collaborative learning model were significantly higher than those of before using the exercises at the .05 level. 2.2) The results revealed that the teamwork skills after using the exercises of LT collaborative learning model were significantly higher than those of before using the exercises at the .05 level. 2.3) The results revealed that learning achievement after using the exercises of LT collaborative learning model were significantly higher than those of before using the exercises at the .05 level.

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