'Yummy Seafood' Comic Book and Poison & Ladder Boardgame - Key Pillars to Knowledge Transfer Programme in Seafood Safety for Different Streaming Primary Schools

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The Critical Importance of Seafood Safety in Malaysia

Aquaculture is a key area of focus for Malaysia's fisheries sector to ensure national food security. In Malaysia, seafood safety is enforced under the Ministry of Health Malaysia (MOH) for the use of local seafood resources and the export of the product. The main laws that regulate food safety are the Food Act 1983 and the Food Regulations. This aims to protect the public from food-related hazards and fraud, as well as to promote and motivate the preparation, handling, distribution, sale and consumption of safe and high-quality seafood.

Lately, we often read about cases of seafood poisoning caused by consumption of canned sardines with presence of worms, mussels, pufferfish, cockles and other shellfish. The occurrences of seafood poisoning cases are also due to lack of knowledge and awareness in public as it may lead to public health and death.

> In general, seafood poisoning can cause mild-moderate symptoms (stomachache, diarrhoea, allergic reactions, headache, fever) to severe symptoms (difficulty to breath, numbness in lips and mouth, body numbness and death in certain cases).

The Educational Gap and Gamification Solution

Seafood-related knowledge among primary school pupils remains underdeveloped due to a lack of curriculum integration. Given the cognitive developmental stage of primary-aged children, educational interventions must be engaging, age-appropriate, and culturally relevant.

Gamification Defined

The use of game elements in non-game contexts

Improved Motivation

Enhances conceptual understanding and behavioral change in children

Story-Based Learning

Comic books and board games support social interaction

Diverse Learners

Strategies align with the needs of different student groups

Gamification is defined as the use of game elements in non-game contexts and has been shown to improve motivation, conceptual understanding, and behavioural change in children. Comic books and board games are two gamified strategies that support story-based learning and social interaction, which align with the needs of diverse learners.

The GSSEEP Programme: A Collaborative Initiative

Universiti Malaysia Terengganu (UMT) lecturers through the Knowledge and Technology Assimilation Grant Scheme (KTAGS 2025) under the Center for Knowledge Transfer, Industry and Community Networking (PPIJIM), UMT conducted a seafood safety knowledge transfer programme led by Associate Professor Dr. Sandra Catherine Zainathan as Project Leader. This programme was initiated in collaboration with Batu Lintang Campus Teacher' Education Institute.

This seafood safety programme was also strengthened with the expertise of its members including Dr. Mok Wen Jye (UMT), Dr. Sharifah Noor Emilia (UMT), Associate Professor Ts Dr. Muhd Danish Daniel Abdullah (UMT) and Dr. Teng Kie Yin (IPG Batu Lintang).

This study was a part of the Gamified Seafood Safety Education Empowerment Programme (GSSEEP), an initiative designed to educate primary school pupils on seafood safety through the use of gamified learning tools, namely a multilingual comic book (Yummy Seafood) and a board game titled 'Tangga Beracun/Poison & Ladder.' The programme integrated visual, interactive, and narrative strategies to enhance students' understanding of seafood safety concepts. By examining their effectiveness in improving knowledge and awareness, the study addressed an important gap in seafood safety education using innovative pedagogical methods.

Programme Scope: 224 Students Across Five Schools

A total of 224 primary school students (Year 4, 5 and 6) from different streaming schools participated in this programme from August 2025 till December 2025. Five primary schools were selected as strategic partners for this high-impact programme, namely:

1

Sekolah Kebangsaan Gong Badak

Kuala Nerus, Terengganu

2

Sekolah Jenis Kebangsaan Cina Chung Hwa Wei Sin

Kuala Terengganu, Terengganu

3

Sri Showme Primary Finnish Inspired School

Seberang Takir, Terengganu

4

Sekolah Jenis Kebangsaan Tamil Jerantut

Jerantut, Pahang

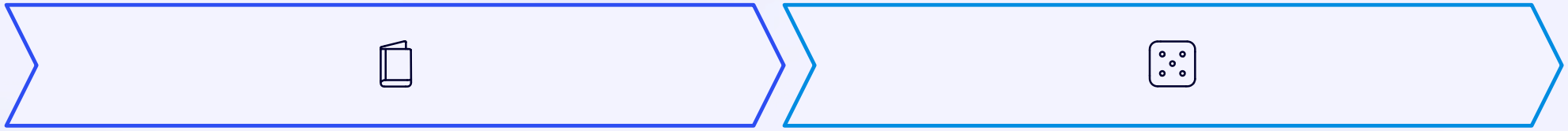
5

Sekolah Jenis Kebangsaan Tamil Bandar Indera Mahkota

Kuantan, Pahang

Two-Phase Implementation Strategy

The programme consists of two phases:



Phase I

A multilingual comic book (Malay, English, Tamil and Mandarin) and practical sessions used as tools to educate the primary school students

Phase II

A seafood safety board game titled 'Tangga Beracun'/Poison & Ladder

The students were instilled with seafood safety knowledge in general and specific to: Paralytic Shellfish Poisoning, *E. coli* bacteria, *Anisakis* sp. parasite, mercury contamination, Antimicrobial Resistance (AMR) as well as prevention and treatment of seafood poisoning.

Five Key Insights from Student Learning

The analysis of students' performance before and after the interventions revealed a positive gain in knowledge related to seafood safety. Thematic analysis of students' reflections revealed five key insights.

01

Environmental Awareness

Many students recognised the danger of consuming seafood during red tide events, and acknowledged mercury contamination reflecting increased environmental awareness.

02

Hand Hygiene Importance

There was consistent emphasis on the importance of hand hygiene, particularly washing hands before handling or eating seafood.

03

Bacterial Understanding

Several students demonstrated understanding of harmful bacteria such as *E. coli*, *Anisakis* parasite and were able to associate it with symptoms like vomiting and diarrhoea.

04

Risk Identification

Students showed the ability to identify high-risk seafood items, such as raw fish and cockles, and the need for proper cooking and handling.

05

AMR Awareness

They understood the basic concept of antimicrobial resistance (AMR) and its effect on human health.

These responses highlighted that the GSSEEP successfully enhanced students' knowledge and their ability to apply it to real-life contexts.

Programme Success and Impact

The findings of this study also confirmed that the Gamified Seafood Safety Education Empowerment Programme (GSSEEP), which utilised a comic book and board game, effectively enhanced seafood safety knowledge among primary school students.

Measurable Improvements

The gamified approach led to measurable improvements in understanding, with successful implementation across different school streams.

Long-term Potential

These outcomes underscore the potential of GSSEEP for long-term curriculum integration.

Public Health Impact

Highlights its sustainability as an innovative educational tool with broader public health implications.

The Research Team and School Partnerships

Figure 1 (Front row, from left): Syarifah Norasilah (Bachelor of Science Aquaculture student), Dr. Sharifah Noor Emilia, Dr. Mok Wen Jye, international postgraduate student from China. Back row: Fazleen Farzana (Bachelor of Science Aquaculture student), Assoc Prof Dr. Sandra Catherine Zainathan, Assoc Prof Ts. Dr. Muhd Danish Daniel and international postgraduate student from China.

Figure 2: Sekolah Jenis Kebangsaan Cina Chung Hwa Wei Sin (Kuala Terengganu, Terengganu) primary school students, headmaster and teachers.

Figure 3: Sri Showme Primary Finnish Inspired School (Seberang Takir, Terengganu) primary school students and teachers.

Programme Implementation Across Schools

Figure 4: Sekolah Kebangsaan Gong Badak (Kuala Nerus, Terengganu) primary school students and teachers.

Figure 5: Sekolah Jenis Kebangsaan Tamil Jerantut (Jerantut, Pahang) primary school students and teachers.

Figure 6: Sekolah Jenis Kebangsaan Tamil Bandar Indera Mahkota (Kuantan, Pahang) primary school students and teachers.

Figure 7: Practical session at the Sri Showme Primary Finnish Inspired School (Seberang Takir, Terengganu). The students were able to view bacteria and parasites under microscopes and antibiotic resistance bacteria in agar plates.