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A MODEL FOR THE APPLICATION OF VIETNAMESE IDIOMS AND PROVERBS IN TEACHING PRIMARY SCHOOL MATHEMATICS

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Abstract

This paper provides an in-depth analysis of a novel, researched, and systematized pedagogical model regarding the application of Vietnamese idioms and proverbs in teaching Primary School Mathematics. This model is constructed upon a strictly defined four-component structure: (1) ultural materials (Idioms and proverbs); (2) The decoded mathematical model; (3) Pedagogical application scenarios in specific lessons; and (4) A system of dual educational effectiveness regarding Competencies and Qualities. By situating this approach within the theoretical framework of Ethnomathematics and aligning it with the requirements of the 2018 General Education Curriculum, the article affirms that this is not merely an empirical initiative but a comprehensive, scientifically-grounded methodology. It contributes to addressing challenges in the teaching and learning of Mathematics while simultaneously cultivating cultural values for the younger generation.

Keywords: Vietnamese idioms and proverbs, Primary School Mathematics, Ethnomathematics, Mathematical modeling, Competency development

1. Introduction: The urgent need for a Mathematics teaching method imbued with the "Vietnamese Soul"

In the context of the fundamental and comprehensive innovation of education and training, Primary School Mathematics faces a dual requirement: it must both equip students with a solid foundation of mathematical knowledge and skills and foster and develop core competencies and qualities in accordance with the spirit of the 2018 General Education Curriculum. However, practice shows that a significant number of students still harbor a psychological "fear" of Mathematics, viewing it as a dry, abstract subject detached from real life.

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In response to this concern, many educators have made valuable efforts to introduce cultural elements into lectures in an intuitive way. However, these efforts often remain at the level of individual empirical initiatives, lacking a systematic theoretical foundation and a methodological structure that can be replicated. Previous studies, while acknowledging the potential, have not yet presented a comprehensive model. Notably, a large-scale study conducted in 2022 on 1,822 primary school teachers across Vietnam found a clear reality: there is substantial demand and interest (level 4/5) from the teaching community in applying idioms and proverbs in teaching Mathematics, yet they also encounter difficulties in selecting and methodically constructing pedagogical activities.

This is precisely the research gap that this paper focuses on addressing: the absence of a systematized theoretical model that provides an explicit and feasible methodology to transform folklore resources (specifically idioms and proverbs) into effective pedagogical tools in teaching Mathematics. The objective of this paper is to construct and scientifically justify the "Model for the application of Vietnamese idioms and proverbs in Teaching Primary School between folk knowledge and academic mathematical knowledge.

The significance of the study is demonstrated in two aspects: Scientifically, the model provides a complete theoretical framework and methodology, enriching the field of Vietnamese educational science, especially in the indigenization of advanced educational theories. In practice, it offers teachers a powerful pedagogical tool that not only helps students approach Mathematics more naturally and enthusiastically but also contributes to achieving the goals of the 2018 General Education Curriculum by nurturing love and pride for the national cultural heritage.

2. Research methodology

This study is conducted using a qualitative methodology, primarily employing theoretical analysis and literature synthesis. This approach was selected because the paper's objective is not to empirically test a pedagogical intervention on a specific sample, but rather to conduct an in-depth analysis, appraise its scientific value, and establish a theoretical foundation for a new pedagogical model.

The research procedure was conducted according to the following rigorous steps:

Step 1: Analysis of foundational theoretical works

We conducted a review and in-depth analysis of international and domestic scientific literature regarding relevant core theories, including: Ethnomathematics, Culturally Responsive Teaching, Constructivism, and Situated Learning. This process aims to establish a solid theoretical framework for the model.

Step 2: Analysis of the context and practical requirements of Vietnamese education

The study analyzes directive documents from the Ministry of Education and Training, particularly the objectives and requirements for developing competencies and qualities in the

2018 General Education Curriculum. Simultaneously, we synthesized results from previous empirical studies to ensure that the proposed model adheres to and addresses practical issues.

Step 3: Systematization and model construction

Based on the synthesis of results from the two steps above, we proceeded to construct the structure of the model. This process includes identifying core components, the logical relationships between them, and the operating mechanism of the model. Illustrative examples were carefully selected and analyzed to clarify each component, ensuring the clarity and feasibility of the model.

This approach allows us to construct a model that is not only theoretically valuable but also highly applicable, meeting both the requirements of modern educational science and the urgent needs of Vietnamese education.

3. Theoretical foundations of cultural integration in Mathematics education

3.1. Ethnomathematics

This model is not a mere random juxtaposition of literature and mathematics. It is built upon the theoretical foundation of Ethnomathematics, pioneered by the Brazilian mathematician and educator Ubiratan D'Ambrosio, defined as the study of the relationship between mathematics and culture. According to this theory, mathematics is not a singular entity bearing a European complexion, but rather a product of human civilization, appearing in diverse forms within the activities of various cultural groups across the world. Ethnomathematics serves as a "bridge between culture and mathematics," exploring mathematical ideas, techniques, procedures, and methods originating from distinct cultural contexts.

Through this lens, the application of Vietnamese idioms and proverbs in teaching Mathematics is no longer a pedagogical "trick" to enliven lectures, but becomes an authentic and valuable Ethnomathematics practice. The treasury of Vietnamese folk songs, proverbs, and idioms, which crystallizes the knowledge, life experience, and worldview of many generations of Vietnamese people, naturally and richly contains mathematical elements. These elements may be present explicitly through numbers and ancient units of measurement *("Kẻ tám lạng, người nửa cân"* [Six of one, half a dozen of the other]*),* metaphorically through spatial and geometric images *("Mẹ tròn con vuông"* [Safe and sound]*),* or by simulating logical and computational processes *("Kiến tha lâu cũng đầy tổ"* [Many a little makes a mickle]*).*

Integrating this intangible cultural heritage into the Mathematics classroom holds profound significance. It fundamentally alters students' perception of the subject's nature. Mathematics is no longer an alien, abstract system of rules to be passively absorbed, but is explored as an organic part of the nation's own cultural heritage. This process is not about "imposing" culture on mathematics, but rather about "unlocking" and "discovering" the mathematical thinking already present within the culture. This helps students realize that their

ancestors, through generations of labor, production, and observation of nature, thought about and practiced mathematics in their own ways, suited to their living context. Consequently, this method not only makes mathematics more accessible but also enhances national pride and appreciation for traditional cultural values.

In other words, exploiting idioms and proverbs not only enlivens the lecture but also helps students "discover" the mathematical thinking already existing within their ancestors' heritage.

3.2. Culturally responsive Mathematics teaching - CRMT

Culturally responsive Mathematics teaching (CRMT) is a pedagogical approach emphasizing the use of students' "cultural funds of knowledge"-including language, lived experiences, and community values-as a bridge for them to acquire new knowledge. The use of idioms and proverbs, familiar sayings that students may have heard from family and community, is precisely a form of CRMT. This approach helps students feel their cultural identity is respected and recognized in the classroom, thereby creating a deep personal connection with the subject and reducing feelings of alienation or anxiety towards mathematics.

The use of folklore in mathematics education has been acknowledged by many international studies. Works by Furner (2017) or Fouze & Amit (2018) have demonstrated that using fairy tales and folk games to teach math helps reduce math anxiety, enhance participation, and improve the retention of complex concepts. Our model inherits this spirit but delves deeper into a specific type of folklore: idioms and proverbs. Incorporating an indigenous intellectual product at the core of teaching and learning mathematics is an act of affirming the value of local knowledge. In a context where many curricula worldwide are still influenced by a Eurocentric perspective, this practice not only improves learning outcomes but also contributes to building a mathematics curriculum imbued with national identity.

3.3. Constructivism

This theory posits that learners do not passively absorb knowledge but actively construct their understanding from existing knowledge and experiences. In our model, Idioms and Proverbs serve as familiar, solid "cognitive schemas" in students' minds. When a new and abstract mathematical concept (e.g., estimation, ratio comparison) is "anchored" to a specific, easily visualized idiom or proverb (e.g., "*Chín bỏ làm mười"* [To willingly disregard small shortcomings in order to preserve social harmony], *"Kẻ tám lạng, người nửa cân* [Six of one, half a dozen of the other] the process of knowledge construction occurs more naturally and effectively. Students can relate the unknown to the known, thereby building a new, profound, and durable understanding. This is a clear demonstration of the core principle of Constructivism: learning is an active process in which learners construct meaning from experience.

3.4. The integration of language and Mathematics

This is also an important theoretical pillar. Much research evidence has indicated a close

relationship between linguistic competence (including vocabulary and syntax) and mathematical ability. Analyzing the structure, vocabulary, and logic in idioms and proverbs not only reinforces literary knowledge but also directly trains analytical thinking skills necessary for mathematics.

Furthermore, idioms and proverbs act as a "metacognitive mnemonic device." Due to characteristics of being concise, rhythmic, rich in imagery, and easy to remember, a proverb can become a solid "anchor" in memory for a mathematical rule. For example, when an abstract rule like inverse proportion is linked to the phrase "*Được mùa lúa, úa mùa cau"* [A good rice harvest coincides with a poor areca harvest], students can easily "recall" this proverb to reconstruct the mathematical rule, turning it into a tool for self-regulating their own thinking process. This approach resonates with studies on integrating reading comprehension into mathematics teaching, which show that this helps students understand mathematical problems more deeply.

3.5. Situated learning

Lave and Wenger (1991) argue that learning is not a process of absorbing abstract information, but a process of participating in a "community of practice" within a meaningful social and cultural context. A classroom using Idioms and Proverbs transforms mathematics learning from an individual, isolated activity into participation in the Vietnamese cultural community itself. Mathematics is no longer a strange subject "in books" but becomes a tool for understanding and interpreting the surrounding world, a world reflected in the very sayings of ancestors. In this way, mathematical knowledge is "situated" within a familiar cultural context, making learning more meaningful and purposeful for students.

4. Global case studies

The model of applying Vietnamese idioms and proverbs, though deeply imbued with national identity, is not an isolated phenomenon. It is part of a global educational movement seeking to humanize Mathematics by connecting it with cultural roots. A comparative analysis with international practices will help identify universal pedagogical principles while simultaneously highlighting the unique contribution of the Vietnamese approach.

The principles of Ethnomathematics have been successfully applied in many places worldwide, utilizing diverse cultural materials:

Africa: In Nigeria and Mozambique, educators have used the shapes of traditional houses (round and rectangular houses) to teach geometric concepts such as perimeter, area, and solids in an intuitive and relatable way. Students are challenged to find the maximum area that can be enclosed by a given perimeter, thereby understanding the optimization thinking of ancestors in architecture. This bears a distinct resemblance to the Vietnamese model's use of the image *"Mẹ tròn con vuông"* [Both mother and child are safe and healthy after childbirth] as a geometric metaphor.

The Americas: Programs for Indigenous students in North America have integrated traditional weaving patterns to teach symmetry, translation, and repetition rules. Similarly, estimation methods for land area or timber volume used by Brazilian farmers have been introduced into the curriculum to teach measurement and spatial geometry.

Oceania: In Hawaii, pioneering educational programs have developed place-based learning methods, connecting subjects, including Mathematics, with the natural environment and indigenous wisdom. These programs aim to "build capacity and networks... through the creation of relevant, contextualized, and sustainable materials and strategies." This goal resonates strongly with the aspiration of the Vietnamese model to create a mathematics foundation "imbued with the Vietnamese soul".

A comparative analysis reveals that the core idea of using cultural products is a universal principle in Ethnomathematics. The innovation of the Vietnamese model lies not in the act of cultural integration itself, but in the identification of a specific cultural medium- Vietnamese idioms and proverbs, a concise, intellectually rich, and popular linguistic form, as a particularly powerful tool for conveying mathematical concepts. This shifts the model's contribution from a methodological invention to a sophisticated cultural application.

5. Research results

5.1. The four-component structure of the model for the application of idioms and proverbs in teaching primary school Mathematics

The core of the model lies in a tightly linked and intentional four-component structure, forming a complete pedagogical cycle.

1. Selected cultural materials: Each idiom or proverb is selected not only for its familiarity but also for its potential to contain a specific mathematical or logical structure.

2. Decoded mathematical odel: This is the pivotal step, demonstrating our in- depth analysis. Each proverb is "decoded" to reveal one or more metaphorical mathematical models within, such as: equivalence, comparison, accumulation rules, geometric concepts, or causal logic.

3. Pedagogical Application Scenarios: The mathematical model, once decoded, is mapped onto a specific lesson or knowledge unit in the current Mathematics curriculum. This process includes activities, guiding questions, and detailed learning situations.

4. Analysis of Dual Educational Effectiveness: This is a significant difference. This model does not stop at transmitting knowledge, but intentionally impacts both aspects in parallel:

- *Mathematical Competencies:* Developing core competencies such as thinking and reasoning, modeling, problem-solving, and mathematical communication.
- *Mathematical Qualities:* Cultivating important qualities such as perseverance, carefulness, honesty, responsibility, and especially love for the subject and national culture.

5.2. In-depth analysis of model components through typical examples

To demonstrate the systematic nature of the model, we would like to analyze in depth some typical examples in Grade 2 Mathematics:

Example 1: Direct Quantitative Linkage

- Proverb: *"Kẻ tám lạng, người nửa cân"*. [Six of one, half a dozen of the other.]
- Mathematical Model (decoded):

+ Mass measurement quantities (ancient units: *lạng*, *cân*).

+ Principle of equivalence and equality (8 *lạng* = 0.5 *cân*).

+ Comparison and unit conversion.

- Application in specific lesson:

Lesson 17: "Practice and experience with kilograms, liters" (Math 2 Textbook, KNTT). The learning situation is built around comparing objects with seemingly different masses but which are actually equal, helping students deeply understand the nature of unit conversion.

- Educational Effectiveness:

+ Mathematical Competencies: Developing thinking and reasoning competencies (why does 8 equal 0.5?), problem-solving competencies (applying to solve comparison problems).

+ Mathematical Qualities: Training carefulness and accuracy when working with measurement units.

Example 2: Metaphorical Geometric Linkage

- Idiom: *"Lên thác xuống ghềnh"*. [Trials and tribulations]

- Mathematical Model (decoded):

+ Polygonal chain (a series of consecutive line segments changing direction abruptly).

+ Changes in height and slope.

- Application in specific lesson: Lesson 26: "Polygonal chain. Quadrilateral" (Math 2 Textbook, KNTT). The image of a boat going "up waterfalls and down rapids" (lên thác xuống ghềnh) is used as a visual aid to introduce the concept of "polygonal chain," helping students memorize geometric characteristics naturally instead of rote learning dry definitions.

- Educational Effectiveness:

+ Mathematical Competencies: Developing mathematical modeling competencies (transitioning from real-world images to geometric models), thinking and reasoning competencies.

+ Mathematical Qualities: Cultivating perseverance and resilience, not fearing difficulties, akin to the spirit of the idiom.

Example 3: Process & Analogous Logic Linkage

- Proverb: *"Sai một ly, đi một dặm"*. [A miss is as good as a mile]

- Mathematical Model (decoded):

+ Causal relationship in calculation: a small initial error can lead to a large deviation in the result.

+ The importance of absolute precision in intermediate steps.

- Application in specific lesson: Applied throughout lessons requiring multi-step calculations such as "Set up the calculation then calculate." Teachers use this proverb to remind students of the importance of aligning columns and remembering correct positions when performing addition and subtraction with regrouping.

- Educational Effectiveness:

+ Mathematical Competencies: Developing mathematical thinking and reasoning competencies, communication competencies (when explaining their own errors or those of friends).

+ Mathematical Qualities: Training the virtues of carefulness, meticulousness, and responsibility for one's own work results.

The above analyses show that the core value of the model lies not in the isolated use of individual proverbs, but in the ability to construct a structured pedagogical methodological system that can be applied and replicated consistently.

5.3. Analysis of the compatibility and resonance of the model with the 2018 general education curriculum

Any pedagogical innovation must be appraised based on its suitability and ability to meet the requirements of the current educational curriculum. The following analysis will demonstrate that the model of applying idioms and proverbs is not merely an extra-curricular activity to "enrich" knowledge, but a powerful tool to realize the core objectives of the 2018 General Education Curriculum for Primary School Mathematics.

The examples analyzed in the model reveal a deep and natural compatibility with the requirements of the new curriculum.

- With the proverb "*Kẻ tám lạng, người nửa cân*", students do not merely learn about unit conversion. They practice Mathematical Thinking and Reasoning Competence when explaining why two seemingly different numbers (8 and 0.5) represent an equivalent value. When applying this principle to solve comparison problems, they are developing Mathematical Problem Solving Competence. Simultaneously, the process of working with measurement units requires precision, thereby cultivating the Qualities of carefulness and honesty.

- With the idiom *"Lên thác xuống ghềnh"*, the image of a boat overcoming dangerous river sections becomes a perfect visual model for the concept of a "polygonal chain". This is a typical example of developing Mathematical Modeling Competence - transforming an image from real life into an abstract geometric object. Transcending knowledge, this image also

evokes and fosters the Qualities of diligence, perseverance, and not shying away from difficulties.

- With the proverb *"Sai một ly, đi một dặm"*, teachers have an effective tool to emphasize the importance of precision in calculation. When students discuss how a small error (e.g., misalignment of columns during calculation) led to such a large incorrect result, they are practicing mathematical communication competence. Recognizing the consequences of errors and making efforts to correct them helps form the *Quality of responsibility* for one's own work results.

This model functions as a natural "competency accelerator" for the 2018 curriculum. The greatest pedagogical challenge of the new curriculum is teaching abstract competencies such as "mathematical modeling" to young students. This model provides a perfect solution: the image of "*lên thác xuống ghềnh*" acts as an immediate pre-model, possessing cultural resonance, for the abstract geometric concept of the "polygonal chain". The proverb acts as a cognitive bridge, making the leap to abstraction natural rather than forced. Therefore, the model is not only suitable for the new curriculum; it actively addresses one of the curriculum's central implementation challenges.

Furthermore, this model inherently promotes "mathematical communication" in a way that standard textbook problems cannot. A standard problem usually has a single correct answer and a limited path for discussion. However, a proverb opens up a space for interpretation. Discussing "why" 8 *lạng* equals half a *cân*, or what "sai một ly" might imply in a specific calculation, invites debate, justification, and the use of mathematical language in an authentic communicative context. The model naturally creates the interactive, dialogic classroom environment that the new program seeks to promote.

5.4. The three-stage application process in the classroom

Based on the methods highly rated by teachers in Survey 7, a flexible three-stage pedagogical process is proposed for implementation within a single lesson:

Stage 1. Elicitation & Exploration

- Objectives: To create interest, mobilize students' prior knowledge regarding both idioms/proverbs and mathematics, and introduce the context for the lesson.

- Activities:

+ Using idioms/proverbs as a warm-up activity. The teacher can present an idiom/proverb and ask students to explain its meaning.

+ Organizing a "Find mathematical keywords" game within idioms/proverbs. For example, in the proverb "*Kẻ tám lạng, người nửa cân*", students need to identify the keywords "tám lạng" and "nửa cân".

+ Posing guiding questions to connect the meaning of the idiom/proverb with a real-life

problem that can be solved using mathematics.

Stage 2. Application & Problem Solving

- Objectives: To form new mathematical concepts and practice problem-solving skills within a meaningful context.
- Activities:

+ Constructing word problems directly from the context of idioms/proverbs. For example, from the proverb *"Sai một li đi một dặm"*, one can construct a problem regarding accumulated error in measurement: "If each step of a land surveyor is off by 1 mm, what is the total error after walking 1,000 steps?".

+ Using idioms/proverbs to illustrate a mathematical concept. For example, using the proverb "*Một công đôi việc*" to introduce simple optimization problems. This stage corresponds to the "Exploration" and "Application" activities highly rated by teachers in the survey.

Stage 3. Creation & Extension

- Objectives: To develop higher-order thinking, reinforce knowledge, and encourage students to transfer learned knowledge to new situations.
- Activities:

+ Asking students to work in groups to self-collect other idioms/proverbs containing mathematical elements and present them to the class.

+ Assigning tasks for students to self-pose a new math problem based on a given idiom/proverb.

+ Organizing small learning projects, for example: "Mathematics in our ancestors' weather forecasting experience," in which students collect weather-related idioms/proverbs and explore the probability rules behind them. This activity corresponds to the use of idioms/proverbs in the "Review" stage.

5.5. Expansion Potential of the Model

Drawing from the studies above, we are currently in the process of constructing a "roadmap" that maps the treasury of idioms and proverbs onto the entire Primary School Mathematics curriculum, covering more complex concepts such as fractions (*"Chia ngọt sẻ bùi"* [Share the weal and woe]), ratios (*"Một vốn bốn lời"* [Make a killing]), or elements of statistics and probability (*"Tháng bảy kiến đàn"* [Ants on the march, rain in the arch]).

For effective implementation, the model needs to be integrated into modern teaching methodologies such as Project-Based Learning, Game-Based Learning, or Flipped Classroom. For instance, a project titled "Designing my garden" could commence with the proverb *"Liệu cơm gắp mắm"* [Cut your coat according to your cloth] to teach students how to plan, estimate costs, and calculate area in a realistic manner.

The evaluation of effectiveness also requires a comprehensive approach, extending beyond mere scores. It is necessary to utilize competency assessment tools such as rubrics,

combined with learning interest surveys and logs tracking students' progress in qualities, fully compatible with the spirit of Circular 27.

6. Conclusion

In this study, we have elucidated that the "Model for the application of Vietnamese idioms and proverbs in teaching Primary School Mathematics" is not merely a creative pedagogical method but a methodological system with a solid scientific basis, profound philosophical value, and complete compatibility with the innovation orientations of Vietnamese education.

This model offers a potential solution to address the dual challenge in mathematics education: making Mathematics more relatable, meaningful, and less "intimidating" to students, while simultaneously realizing the goals of developing competencies and qualities as required by the 2018 General Education Curriculum. By exploiting the nation's intellectual treasury, the model has constructed a natural bridge between folk knowledge and academic mathematical knowledge, between culture and science.

The realization of this model is not merely a matter for the field of mathematics education alone. More profoundly, it is a strategic pathway to introduce culture into schools in a vivid and substantial manner, helping the younger generation not only to excel in Mathematics but also to further love, understand, and take pride in their ancestral intellectual heritage. This is precisely the philosophy of comprehensive education that we are aiming for: educating individuals who possess knowledge, competency, and a soul rich in Vietnamese identity.

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