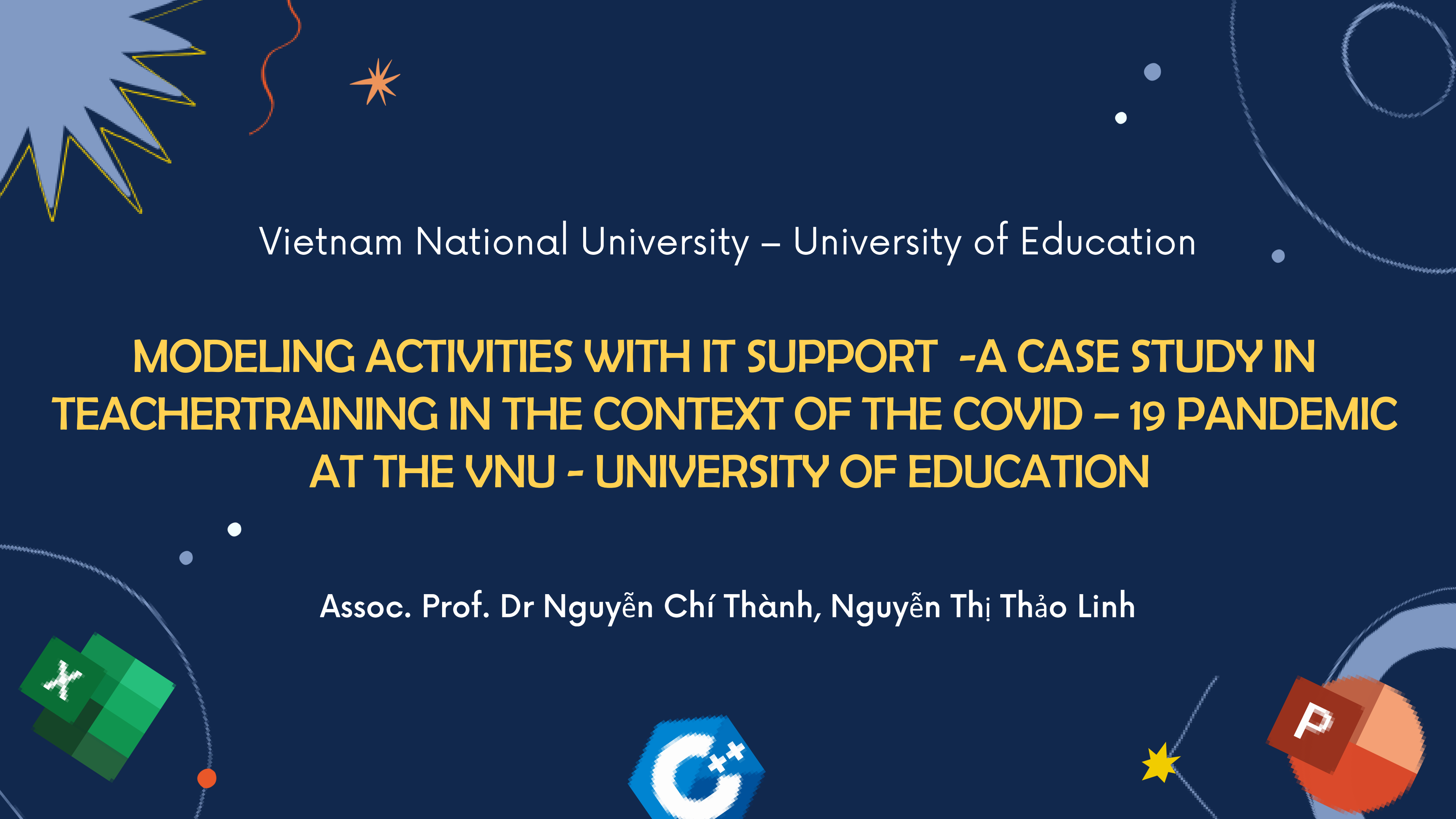




Vietnam National University – University of Education

MODELING ACTIVITIES WITH IT SUPPORT -A CASE STUDY IN TEACHERTRAINING IN THE CONTEXT OF THE COVID – 19 PANDEMIC AT THE VNU - UNIVERSITY OF EDUCATION

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INTRODUCTION

We will explain the reason for choosing topic

METHODOLOGY

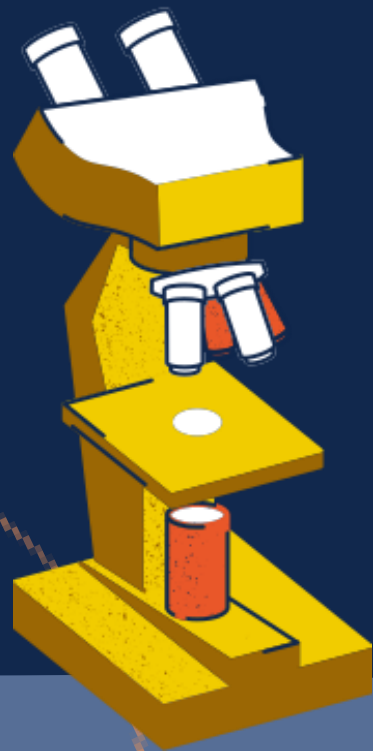
Mathematical modeling, Mathematical modeling competence, and Requirements for mathematical modeling competence

RESULT AND DISCUSSION

Reveal result and discussion on the direction of further research

1

INTRODUCTION



The aim of all subjects

the undergraduate teaching program

to promote students to
approach real-life issues and
find out solutions. Therefore,
developing competencies
considers essential for learners
at this level through the
teaching and learning process

Mathematical modeling with IT support

IMPORTANT

mathematical modeling plays an **important** role in applying mathematical knowledge to solve practical problems

Blum (1993), Pollak (2011)

INDISPENSABLE ELEMENT

The support of technology is an **indispensable element** when teaching mathematical modeling, and most researchers interested in modeling believe it is necessary to have the role of technology

O'rinov, 2020

Question 1

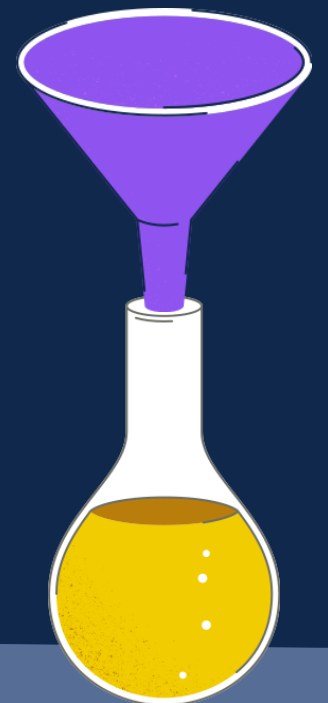
How do math teacher training programs develop modeling teaching capacity with the support of information technology?

Question 2

What is the current status of mathematical modeling activities of pedagogical students?

2

METHODOLOGY



Mathematical competence



According to the General Education
Program in Mathematics 2018

- 1 Thinking ability and mathematical reasoning
 2. Mathematical modeling competence
 3. Math problem solving ability
 4. Mathematical communication skills
 5. Ability to use tools and means of learning mathematics
- 
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Mathematical competence



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- 1 Thinking ability and mathematical reasoning
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Mathematical modeling competence is the synthesis of knowledge, skills, and personal attributes to solve problems related to mathematical modeling

Ministry of Education and Training, 2018



Mathematical modeling competence

Definition

Component	Primary school	Secondary school	High school
1. Determine the mathematical model (consisting of formulas, equations, tables, graphs, ...) for situations appearing in practical problems	1. Select mathematical operations, arithmetic formulas, diagrams, tables, and pictures to present and express (spoken or written) the contents and ideas of situations appearing in simple practical problems	1. Use mathematical models (including mathematical formulas, diagrams, tables, pictures, equations, etc.) to describe situations appearing in a number of practical problems that are not too complicated	1. Establish mathematical models (including formulas, equations, diagrams, pictures, tables, graphs, ...) to describe situations posed in some practical problems
2. Solve mathematical problems in the established models	2. Solve problems that arise from available choices	2. Solve mathematical problems in the established models	2. Solve mathematical problems in the established models
3. Give and evaluate the explanation in an actual situation, and improve the model if the solution is unsuitable	3. Give the answer to a situation appearing on a practical issue	3. Show mathematical solutions in an actual situation and get used to verifying the correctness of solutions	3. Explain the correctness of the solution (meaningful, suitable result). Recognize how to simplify, adjust requirements to lead problem dealt with

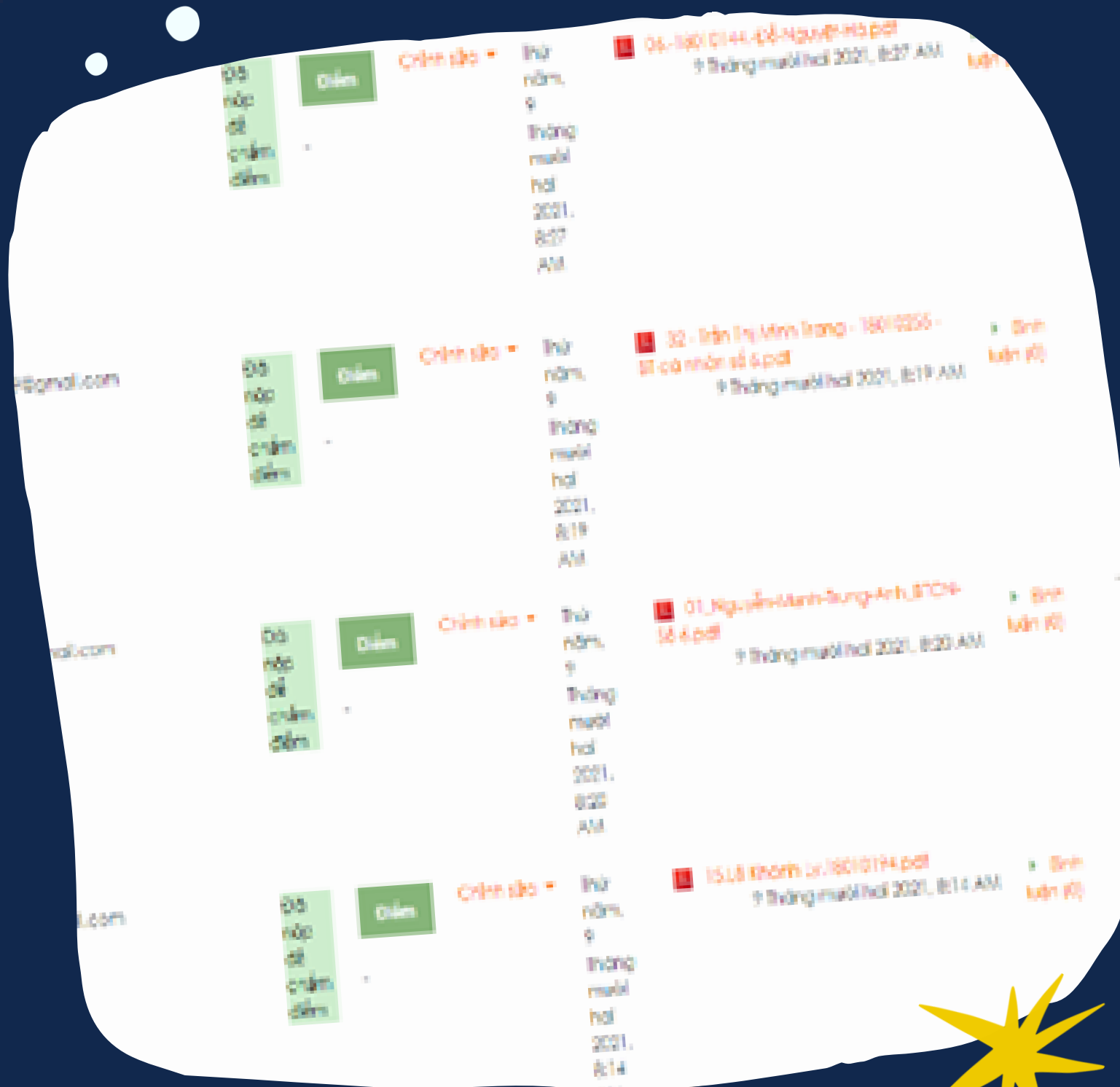
Mathematical modeling competence

Requirements

Authors	Results
Crouch and Haines (2004), Galgraith and Stilman (2006)	Converting actual problems to mathematical models is a challenge for learners. Therefore, there is a need for a support tool in teaching modeling
Sinclair, N., and Jackiw, N. (2010).	Chipboard modeling research – adding and subtracting integers based on Geometer's Sketchpad shows virtual operations provide continuous feedback on the interaction between visual symbols and a more abstract concept of integer totals
Stephen (2010)	Mathematical applications can be modeled, simulated, and rendered more practically and intuitively in virtual environment than in physical environment
O'rinov (2020)	Analyze the relationship between the curriculum content and the application of mathematical models with the support of information technology (Excel and LINGO)
Bùi Minh Đức (2017)	Use GeoGebra in the content of space geometry becomes unique and understandable; contribute to the interest of students and establish a connection between plane geometry and space geometry
Nguyễn Ai Quốc (2018)	Apply parametric equations of straight line to solve physical problems about uniform linear motion in physics with GeoGebra. from which we get the relationship between Maths and other subjects.
Nguyễn Thị Thảo Linh, Nguyễn Chí Thành (2021)	Using Excel in teaching helps students avoid making mistakes when dealing with statistics problems

Mathematical modeling competence

Research



Experimental method

34 students of Mathematics Pedagogy in the course "Teaching and Learning Methodology of Some Topics in Secondary Mathematics Curriculum" and 37 students of Primary Education in the module "Mathematics 1". in the first semester (school year 2021 - 2022) at the VNU - University of Education



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RESULT & DISCUSSION



RESULT

Experimental problem

Students will do and submit the test on the online teaching system of the course implemented on the Moodle platform within 45 minutes

Problem

When planning a summer trip to Phu Quoc, a group of friends including An, Loan, Trang and Tu planned to travel by taxi from home to Noi Bai airport:

- An travels to the airport by himself with a distance of 42km
- Loan moves to the airport by herself with a distance of 14km
- Trang came over to pick up Tu and then went to the airport together, knowing that their house is 8km away from each other, and Tu's house is 7km from Noi Bai

To save costs, this group has researched and selected two car brands that are suitable for the price list:

GIÁ CƯỚC / FARE		
Giá taxi gồm 10% VAT / Taxi fare includes 10% VAT		
Xe 05 chỗ ngồi / 05 seater car		
Lưu ý: hành khách phải trả thêm 50% phí chờ / Passengers are required to pay 50% waiting fee if any		
Giá cước khởi hành / Starting fare	Giá cước di chuyển / Moving fare	Giá cước chờ / Waiting fare
10.000 VNĐ / 1.000đ	14.800 VNĐ/km	11.600 VNĐ/phút
Thời gian chờ: 5 phút / Waiting time: 5 minutes		
Vui lòng kiểm tra hành lý trước khi xuống xe / Please check your baggage before leaving		
ATM VISA		

Figure 2. Price list of Taxi Thủ Đô

Giá cước khởi hành / Starting fare	Giá cước di chuyển / Moving fare	Giá cước chờ / Waiting fare	Giá cước chờ / Waiting fare	Giá cước chờ / Waiting fare
5.000 VNĐ / 0,3 Km	18.600 VNĐ/km	14.200 VNĐ/phút	15.600 VNĐ/phút	12.400 VNĐ/phút
Lưu ý: hành khách phải trả thêm 50% phí chờ / Passengers are required to pay 50% waiting fee if any				
Thời gian chờ: 5 phút / Waiting time: 5 minutes				
Vui lòng kiểm tra hành lý trước khi xuống xe / Please check your baggage before leaving				

Figure 3. Price list of Taxi Mai Linh

So, each of them should choose which company's taxi to move to the airport with the most optimal cost?

What is the total amount they have to pay then?

1. Present the steps to solve the problem. State how IT applications can be used in the above article.
2. State the teaching objectives and show how to guide students (grade 10) to solve math problems.

Table 1. Statistics of experimental results

Perform			Mathematics Pedagogy	Primary Education	Sum
Mathematical modeling steps	Do	Correct	3	0	3
		Wrong	2	0	2
	Do not	Correct	2	3	5
		Wrong	27	34	61
IT support	recommend		14	10	24
	Not recommend		20	27	47

RESULT 1

1. **66 out of 71** students did not perform the steps of mathematical modeling
2. Most students have **little knowledge** about the processes of mathematical modeling
3. **61 out of 66** students (accounting for 92.4%) miscalculated the results.

Bài tập Cá nhân: Giải toán và hướng dẫn giải toán.

Họ tên: Nguyễn Minh Trung Anh
Mức SV: 18010101
Lớp: QH-20188 - Toán.

1. Các bước giải bài toán:
- Tổng quát: chúng các bạn phải đi chuyển là:
 t_1 An: 4.2 (km)
 t_2 loan: 14 (km)
 t_3 Trang + Tú: 15 (km). (1)

- Từ bảng giá của hai hãng taxi, ta có bảng giá chung như sau: (Bảng 1)

Quãng	0 → 0.3 km	0.3 → 2 km	2 → 10 km	10 → 25 km	25 km →
Hãng	(0.3 km)	(1.7 km)	(8 km)	(15 km)	
Thủ đô	10 k	14.8 k	14.8 k	14.8 k	11.6 k
Mai Linh	5 k	18.6 k	14.2 k	15.6 k	12.9 k

- Tính số tiền mà các bạn phải trả theo từng hãng taxi

Bạn	Thủ đô	Mai Linh
An	$T = 0.3 \cdot 10 + 1.7 \cdot 14.8 + 14.8 \cdot 8 + 14.8 \cdot 15 + 11.6(12-25) = 505.70$	$T = 5 \cdot 0.3 + 18.6 \cdot 1.7 + 14.2 \cdot 8 + 15.6 \cdot 15 + 12.9(12-25) = 595.5$
loan	$T = 10 \cdot 0.3 + 14.8 \cdot 1.7 + 14.8 \cdot 8 + 14.8 \cdot (14-10) = 205.70$	$T = 5 \cdot 0.3 + 18.6 \cdot 1.7 + 14.2 \cdot 8 + 15.6 \cdot (14-10) = 209.12$
Trang + Tú	$T = 10 \cdot 0.3 + 14.8 \cdot 1.7 + 14.8 \cdot 8 + 14.8 \cdot (15-10) = 220.50$	$T = 5 \cdot 0.3 + 18.6 \cdot 1.7 + 14.2 \cdot 8 + 15.6 \cdot (15-10) = 224.72$

Figure 4. Solution of a student that does not perform the steps of MHH

RESULT 2

Họ và tên: Trần Thị Trang
MSSV: 19010161

1. Các bước giải toán

TH1: Đi taxi Thuê Đ. : $y = 2,5x + 10$

Số tiền An phải trả là: $10.000 \cdot 0,3 + 19.800 \cdot 24,7 + 11.600 \cdot 17 = 56.576$ (đồng)

Số tiền Loan phải trả là: $10.000 \cdot 0,3 + 19.800 \cdot 13,7 = 20.5760$ (đồng)

Số tiền Trang qua nhà Tú là: $10.000 \cdot 0,3 + 7,7 \cdot 19.800 = 116.960$ (đồng)

Số tiền Tú và Trang đi sân bay là: $7 \cdot 19.800 = 10.3600$ (đồng)

Vậy tổng số tiền các bạn phải trả là: 99.2080 .

TH2: Đi taxi Mai Linh

Số tiền An phải trả là: $5000 \cdot 0,3 + 1,7 \times 18600 + 8 \times 14200 + 15.15600$
 $+ 17 \times 12.400 = 591.520$ (đồng)

Số tiền Loan phải trả là: $0,3 \times 5000 + 1,7 \times 18600 + 8 \times 14200 + 4 \times 15600$
 $= 209.192$ (đồng)

Số tiền Trang qua nhà Tú là: $0,3 \cdot 5000 + 1,7 \times 18600 + 6 \times 14200$
 $= 118.320$ (đồng).

Số tiền Tú và Trang đi sân bay là: $2 \cdot 14200 + 5 \times 15600 = 106.400$ (đồng)

Ta thấy vậy tổng đi khi đi taxi Thuê Đ. thì số tiền các bạn phải trả sẽ có mức tối ưu hơn. Vậy tổng số tiền các bạn phải trả khi ra sân bay là: 992.080 (đồng).

- Chúng ta có thể sử dụng phần mềm Excel: nhập lệnh để tính số tiền thuê taxi theo thời gian tương ứng, sau đó nhập lệnh để nhận giá trị nhỏ nhất qua các tương ứng đã thuê.

1. Students only concentrate on **how to solve** the problem **without making comments** from the determined data

2. Most students **do not compare** with reality.

Figure 5. Wrong solution of a student that does not perform the steps of

RESULT 3

1. Gọi x là quãng đường di chuyển (km, $x > 0$). $f(x)$ là số tiền cần trả (nghìn đồng)

$$\text{Taxi Thủ Đức: } f(x) = \begin{cases} 10x; 0 \leq x < 0,3 \\ 10.0,3 + (x - 0,3).14,8 & ; 0,3 \leq x < 25 \\ 10.0,3 + (25 - 0,3).14,8 + (x - 25).11,6; x \geq 25 \end{cases}$$

$$\text{Hay } f(x) = \begin{cases} 10x; 0 \leq x < 3 \\ 14,8x - 1,44; 0,3 \leq x < 25 \\ 11,6x + 78,56; x \geq 25 \end{cases}$$

Taxi Mai Linh tương tự, ta thu được hàm sau:

$$g(x) = \begin{cases} 5x; 0 \leq x < 0,3 \\ 18,6x - 4,08; 0,3 \leq x < 2 \\ 14,2x + 4,72; 2 \leq x < 10 \\ 15,6x - 9,28; 10 \leq x < 25 \\ 12,4x + 70,72; x \geq 25 \end{cases}$$

Ta tính và so sánh $f(x)$ và $g(x)$ để biết chọn taxi hãng nào để đi chuyển sẽ có mức kinh phí tối thiểu.

An đi quãng đường 42km, ta thấy $f(42) < g(42)$ nên An nên đi Taxi Thủ Đức.

Tính toán tương tự với Loan đi quãng đường 14 km, $f(14) = 205,76 > 203,52 = g(14)$ nên Loan đi Taxi Mai Linh.

Students **quickly make accurate conclusions** according to the steps of modeling

Figure 6. The correct solution of a student

according to the steps of modeling



Table 2. IT that students propose to use

Powerpoint	Excel	C++	Maple	Calculator	Geometer's Sketchpad	Mindmap	Sum
5	8	2	3	2	3	1	24

With sentence 2 with the content of IT application, **24 out of 71 students** who proposed IT application in teaching the above problem. The number shows that most students **have not understood the applications of IT used in teaching**, even though **senior students have studied IT related subjects** such as Basic Informatics, Teaching Theories and Technology...



Thank you for your attention.