

# Transforming Learning Experience with Teachable AI

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# Important Collaborators

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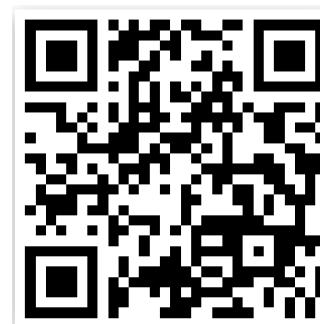


Davy Ng



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<https://www.researchgate.net/lab/CCMIR-Xiao-Hu>

# School Partners



Stewards Pooi Kei College  
香港神託會培基書院



St. Stephen's Girls' College  
聖士提反女子中學



救恩書院  
Kau Yan College



ST. MARGARET'S CO-EDUCATIONAL  
ENGLISH SECONDARY & PRIMARY SCHOOL  
聖瑪加利男女英文中小學



愛秩序灣官立小學  
Aldrich Bay Government Primary School



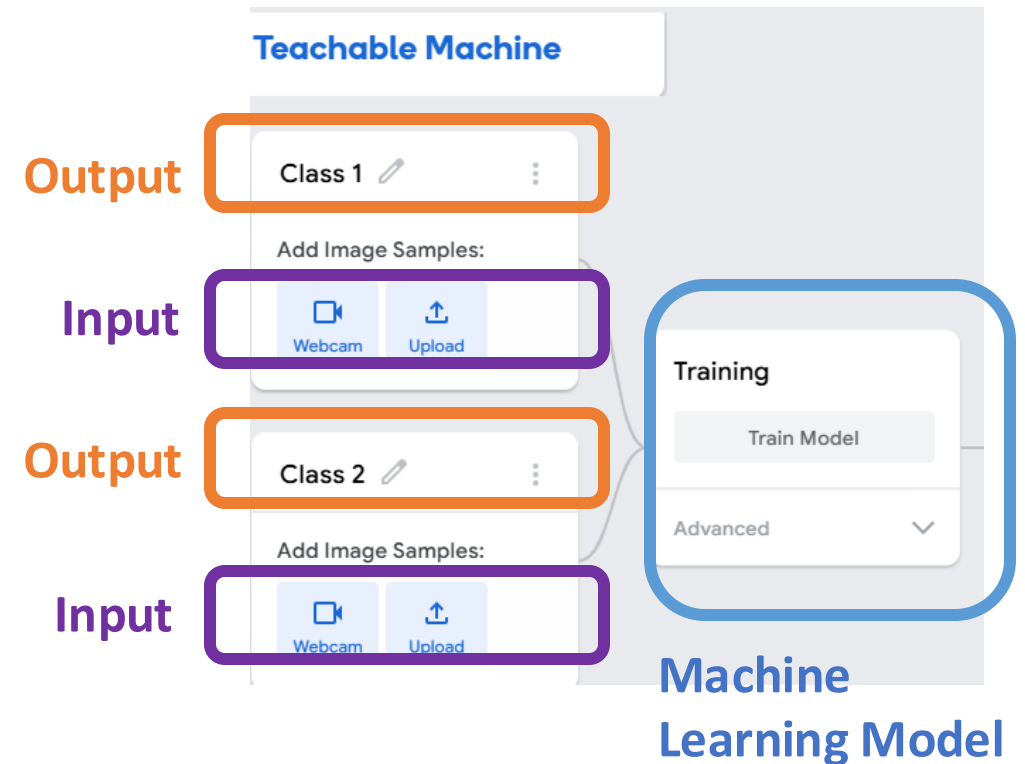
Hong Kong Chinese Women's Club College  
香港中國婦女會中學

# Outline

- **Teachable AI**
- Transforming Learning Experience with Teachable AI
  - Learning AI with music (SPKC, HKCWCC)
  - GenAI-supported ESL writing (Kau Yan College, St. Margaret)
  - GenAI-supported Virtual Reality creation (SPKC, SSGC, ABGPS, Heep Woh)
  - GenAI-supported creative learning (HKU)
  - Self-service learning analytics for teachers (HKU)
  - Automated analysis of student reflections (SPKC, St. Margaret, Kau Yan)
- Benefits and Challenges

# What is Teachable AI?

- AI systems that can be trained / "taught" by users
- Ex. *Teachable Machine*, *Generative AI (GenAI)*
- Makes AI more accessible, adaptable and intuitive
- Enable teachers and learners to actively transform learning experience



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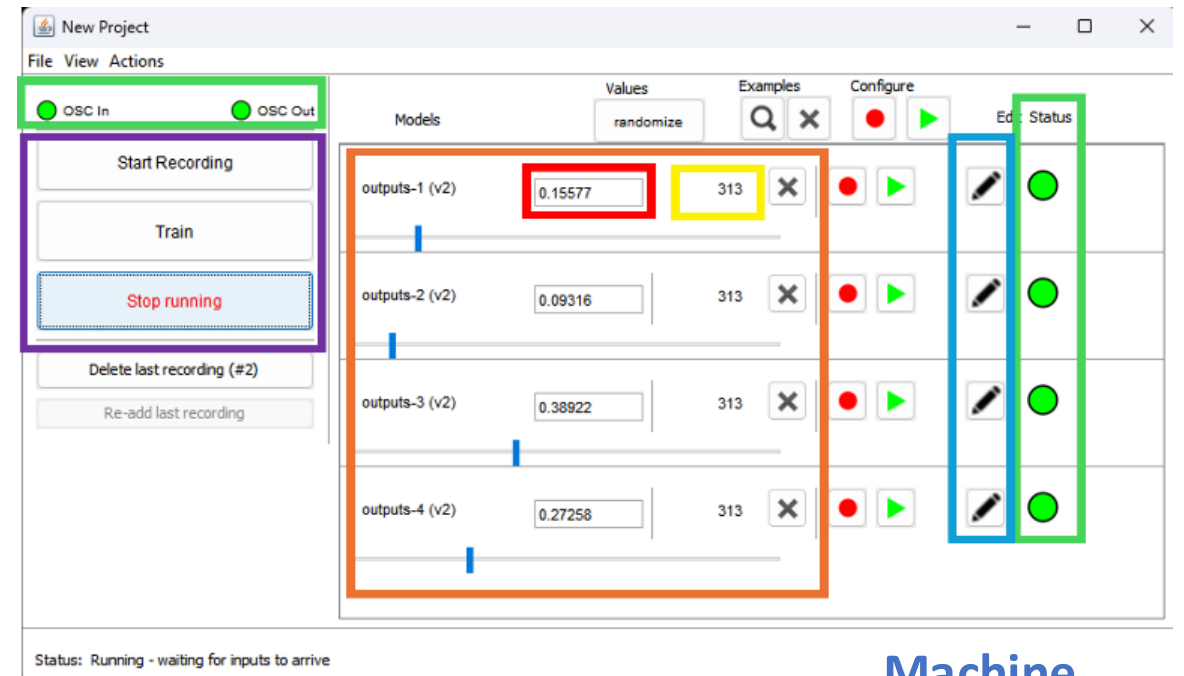


# Creative AI Learning with Music

- Use Music to Improve Learning Engagement & Outcomes
- "Teachable AI" App: WekiMusic

- 4-lesson curriculum
  - Understand, use, create AI
  - Responsibly

Hernández López, N. P., & Hu, X. (2025, July). WekiMusic: Machine learning music activities to foster creative AI education. In *IEEE International Conference on Advanced Learning Technologies (ICALT)*.



Input

Output

Machine Learning Model

# Outcomes in Classrooms

- 90 secondary 2 students
- Music-based teachable AI vs. Traditional lecture
- $M > T$  significantly in
  - Knowledge about AI
  - Attitudes towards AI (cognitive, behavioral, and affective)
- Students' reflection
  - "[AI] may be the main way for people to create music in the future"



Hernández López, N. P., Hu, X. & Ng, D.T. K. (2025, July). Insights from culturally relevant AI education programme for secondary school students. *In International Conference on Artificial Intelligence in Education (AIED)*.

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# Support Student Writing w/ GenAI

- Theoretical underpinnings
  - GenAI as a collaborator / co-writer
  - Self regulated learning, Co-regulation, Socially shared regulated Learning
  - Feedback framework
- To support the writing **process**
  - Co-design with teachers
  - Learning analytics provide real-time feedback
  - Low-tech barrier; No tech support needed

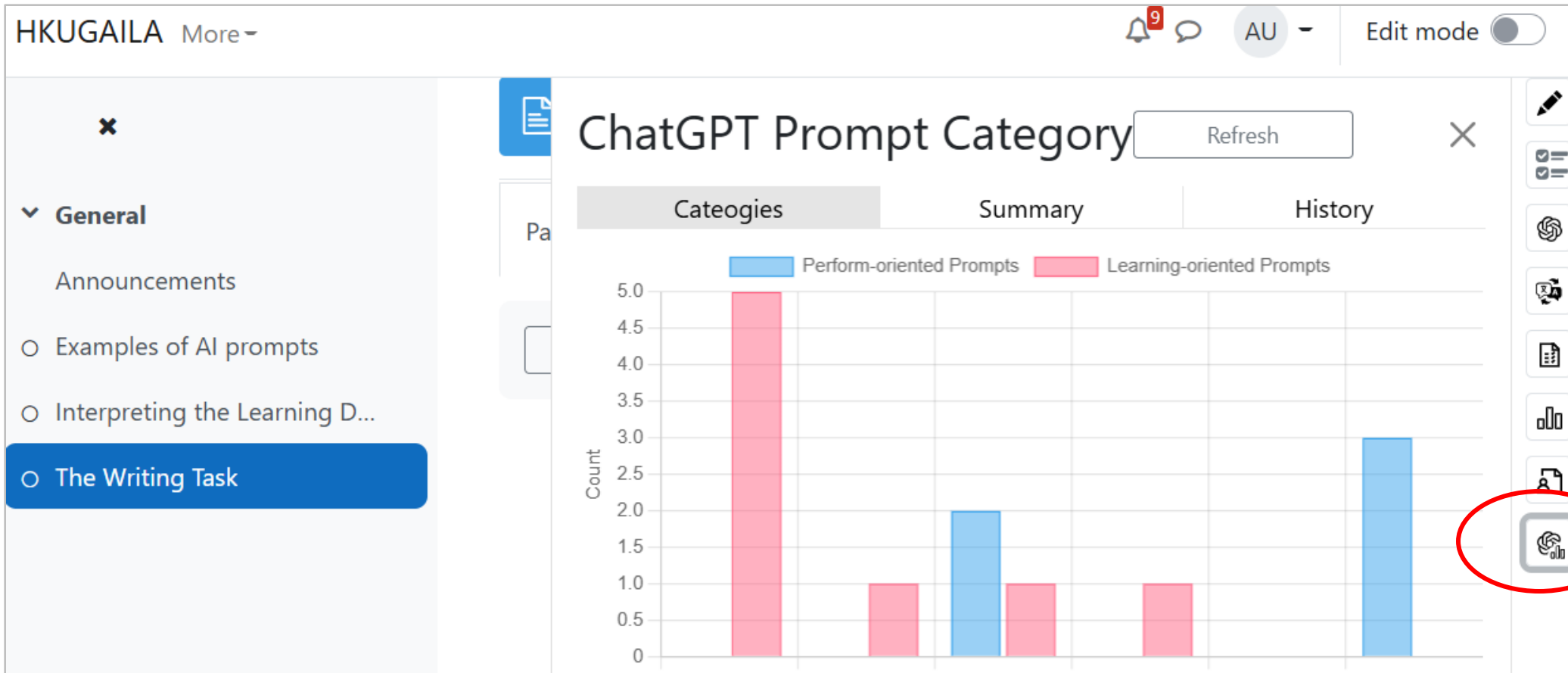


SCOLAR  
語常會

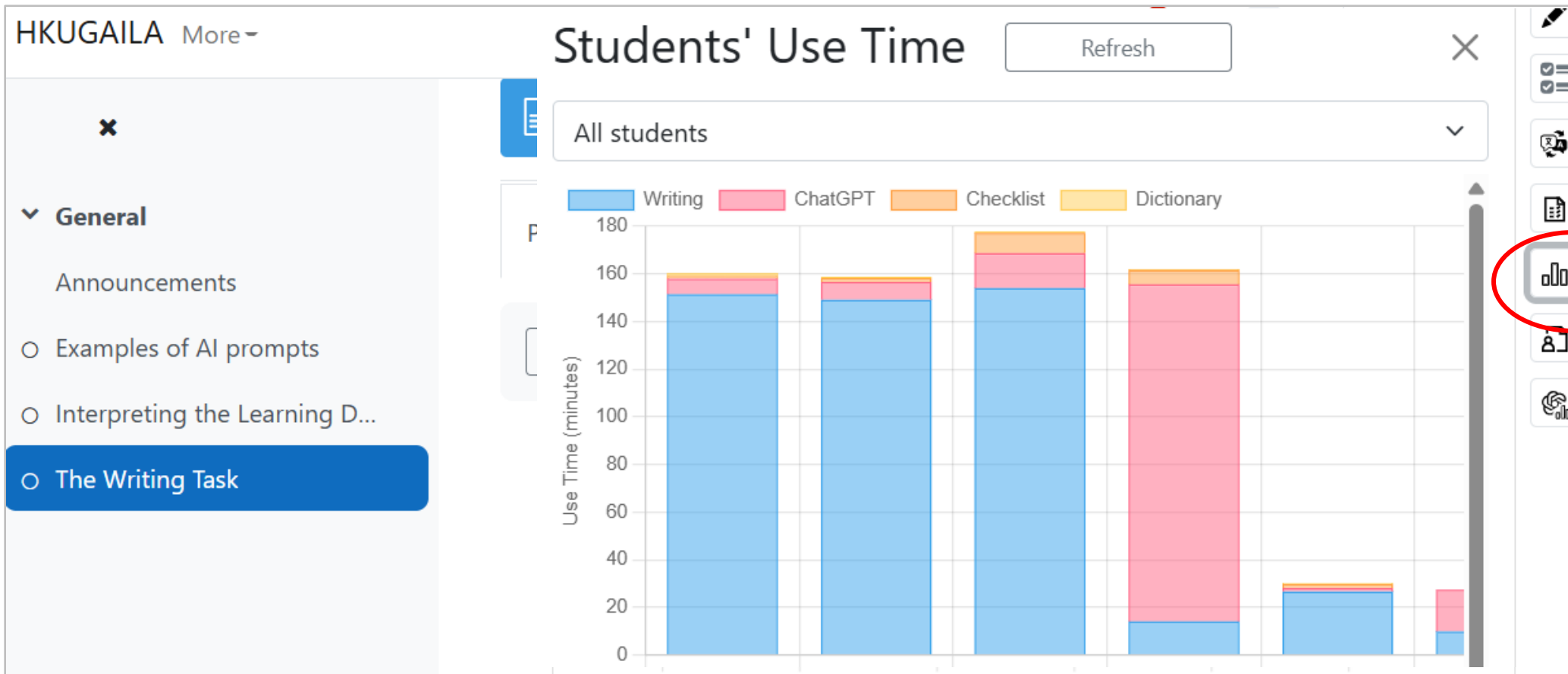
# FLoRA: A Novel Writing Platform (Monash)

The screenshot displays the FLoRA platform interface. At the top, it says "Powered by FLoRA Engine" and "My courses". The main area is titled "Reading zone" and contains a "Catalogue of learning contents" on the left. The catalogue lists various topics, with "1.1 Definition of Artificial Intelligence" selected. The main content area shows the text of this section. Below the reading zone, there are two floating windows: "Essay Writing" and "ChatGPT Tool". The "Essay Writing" window shows the same text as the reading zone and has a "Save Essay" button. The "ChatGPT Tool" window shows a question "What is artificial intelligence?" and the corresponding answer from ChatGPT. On the right side of the interface, there is a vertical toolbar with icons for "Search annotations", "Essay writing zone", "Planner tool", "ChatGPT zone", "Translation tool", and "Timer tool".

# GAILA: GenAI and Learning Analytics (HKU)



# GAILA: GenAI and Learning Analytics (HKU)



How much time students use GenAI tools

# GAILA: GenAI and Learning Analytics (HKU)

HKUGAILA More ▾

✕

▼ General

- Announcements
- Examples of AI prompts
- Interpreting the Learning D...
- The Writing Task

## Students' Essay

Pa

Essay

Text detected in ChatGPT log (11.6%)    Text pasted from ChatGPT (17.4%)

- Small sport, big audience
- Define e-sports
- A sport in which professional players compete in multiplayer video games in competitions
- Reason for e-sports club
- e-sports are increasing in popularity

Latest ChatGPT grading

Content: 6

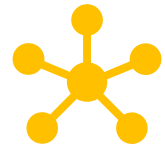
Your essay is relevant and extensive, fulfilling the requirements of the question. You have well-developed ideas and have shown creativity and

Duplication detection and feedback on writing

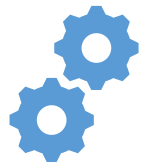
# Classroom Implementation



- Two secondary schools in Hong Kong



- To examine how students interact with GenAI and how it relates to performances



- AI literacy
- Reflections
- Performance
- Behaviors

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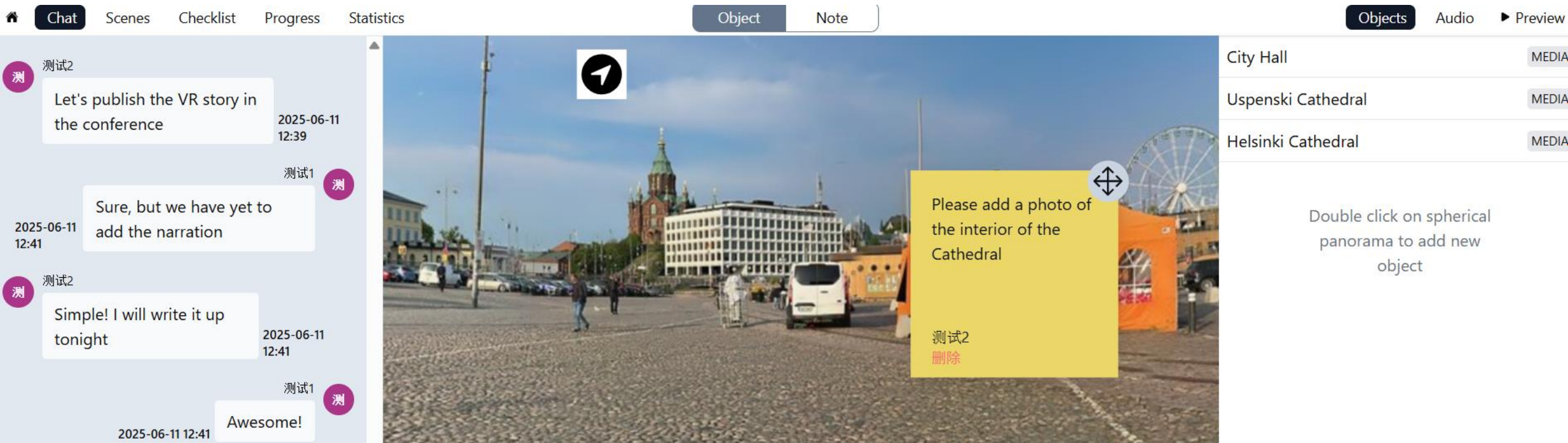


# GenAI-supported Collaborative Maker Activities

- Theoretical underpinnings
  - Constructionism
  - Collaborative learning
  - GenAI as an assistant / tutor
- To support the creation **process**
  - Co-design with teachers
  - Learning analytics provide real-time feedback
  - Low-tech barrier; No tech support needed



# CLEVR Platform



Wang, Z., Ng, J. T. D., Liu, R., & Hu, X. (2022, July). Learning Analytics Enabled Virtual Reality Content Creation Platform: System Design and Preliminary Evaluation. In *Proceedings of the 2022 IEEE International Conference on Advanced Learning Technologies (ICALT)* (pp. 161-163).

# More Power Brought by GenAI



Home **ChatGPT** Text to Image Profile Logout

## My Classrooms

### CCMIR Test

CCMIR Test classroom

### Demo Assignment

A demo assignment

[Submit Assignment](#)

[Peer Evaluation](#)



list cultural heritage in hong kong



Hong Kong is a city rich in cultural heritage, and there are many examples of traditional architecture, customs, festivals, and arts that are unique to the city. Here are some of the cultural heritage sites and practices in Hong Kong:

1. Wong Tai Sin Temple - A Taoist temple that dates back to the 1920s, it is a popular pilgrimage site for devotees who come to pray for good fortune, health, and success.
2. Tai O Fishing Village - A traditional fishing village that dates back to the 19th century, featuring stilt houses and a bustling fish market.
3. Cheung Chau Bun Festival - An annual festival celebrated on Cheung Chau Island, where traditional buns are made in the shape of a tower to celebrate a successful plague prevention campaign.
4. Lai Chi Kok Amusement Park - A historic amusement park that opened in 1949 and was one

# Text to Image Generator

Home ChatGPT **Text to Image** Profile Logout

digitizing cultural heritage

Stable Diffusion v2

Recent Generations

**Stable Diffusion v2**  
digitizing cultural heritage

Stable Diffusion v2

Select model

- Stable Diffusion v1
- Stable Diffusion v2**
- Openjourney
- DALL-E 2

Generate

Download

# Background Music Recommender / Generator

Custom Search    Recomm

chill piano

Genre    Mood    Instrument

CHILL PIANO GU  
BEAT

lofi    hiphop    piano

Bright, chill and c  
guitar

chillout    corpo

Igor Pumphonia -  
downtempo    c  
guitar

Search the

documenta

cinematic

film

love

soft

advertising

commercia

atmospher

Custom Search    Recommendation    Recently Playe

Based on your narration script, the system recommends following searching criterias for background music:

- ✔ **Keyword: Buddhist** "Mengle Great Buddha Temple was destroyed in the war in 2883 of the Buddhist calendar."
- ⊕ **Theme: traditional** "fully display the history and traditional culture of Southern Buddhism"

Based on your scene image, the system recommends following searching criterias for background music

- ⊕ **Keyword: Temple** from image recognition results
- ⊕ **Keyword: Tree** from image recognition results

Buddhist Chants and Bowls meditation

Describe the music you want to generate

**Generate Preview**

Recent Generations

An urban soundscape with a blend of electronic and traditional elements, reflecting the hustle and bustle of a busy city pier. Incorporate ambient textures, a steady beat to represent the flow of people, and occasional melodic flares that mimic the interplay of conversations and city life. Aim for a modern, yet timeless feel, suitable for people coming and going, evoking a sense of constant movement and urban vitality.

▶ 0:00 / 0:05    🔊    ⋮

**Extend**    **Select**

# Learning Analytics

Chat Scenes **Checklist** Progress

Chat Scenes Checklist **Progress** Statistics

**Components** **Class progress** **You**

Upload a spherical panorama **21.8%** Done

Input a **Not yet**

**VR creation (1) - Capture**

- Capture spherical panorama
- Upload spherical panorama

**VR creation (2) - Materials**

- Fil
- Fil
- Th
- Th
- Up
- Ac
- Ac

**Timeline of edit counts**

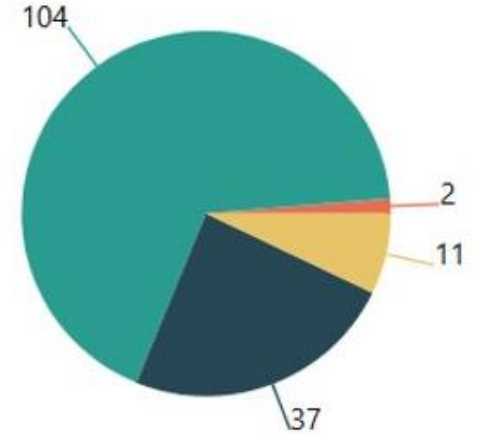
Category	11-21	11-22	11-23	11-24	11-25	11-26	11-27
A	185	210	230	250	258	270	280
E	112	130	150	180	185	200	210
D	112	130	150	180	185	200	210
B	112	130	150	180	185	200	210
E	112	130	150	180	185	200	210

Average: 0.83 2

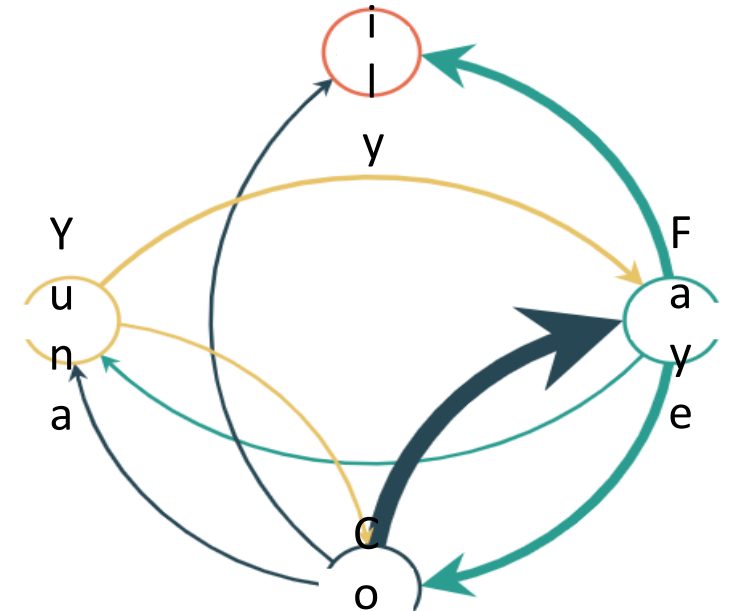
Average: 1.69 2

## Work Distribution

No. of edits made by each student in this group



## Network of build-on relationships in group



# "Learning Without Wall"



- Context: Summer program where students visited different places in Hong Kong and/or abroad
- Learning task: In groups of 5-6, **co-create VR stories** to present visited places (e.g., parks in Hong Kong, beaches in U.S.A., etc.)



Story - 2G-3



Story - 2P-5



<https://ccmir.hku.hk/clevr/discover>

# School Heritage Digitization



St. Stephen's Girls' College  
聖士提反女子中學

- Campus with officially declared historic monuments
- Learning task: **To co-create VR stories** for presenting history and heritage of the school



© Antiquities and Monuments Office



© Antiquities and Monuments Office

Student Creations



# Environmental Education in Primary Schools



Hu, X. & Ng, J.T. D. (2025). Low tech-barrier virtual reality content creation for cultural heritage education: Learning outcomes and pedagogy. *Technology, Pedagogy and Education*.

### 數碼體驗香港生態地圖：學生創作的VR作品



### 港大環保小先鋒計劃高小生VR全景認識生態

2023-12-19 00:00



港大教育學院與學界及業界合作，推行環保教育計劃，讓高小生拍攝並製作郊區的VR全景照片，認識本地生態。

## VR Stories made by students in 12 schools

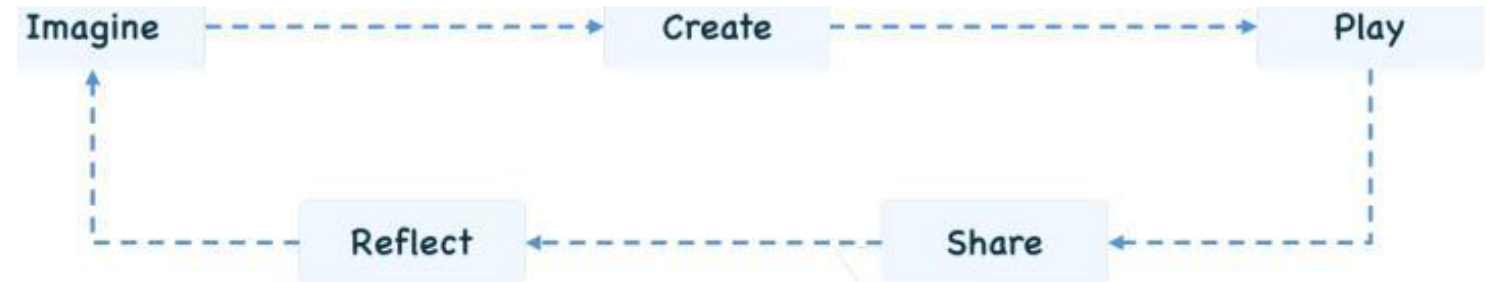


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# Support Student Creative Learning w/ GenAI

- Theoretical underpinnings
  - Five stages of the iterative creative learning path
- Mariscope: GenAI-supported Creative Learning Platform



Lin, W. & Hu, X. (2025). GenAI-Supported Creative Learning in Digital Museum Education: A Case Study of Maritime Art Painting Creation. In *ACM CHI*. <https://doi.org/10.1145/3706599.3719910>

# Mariscope: Gallery view (Imagine)


Gallery

Canvas

Plaza

Lens

Logout



Rembrandt's stolen masterpiece, *The Storm on the Sea of Galilee* (1633).


Marine art, also known as maritime art, is a form of figurative art that includes painting, drawing, printmaking, and sculpture, drawing its main inspiration from the sea. Maritime painting focuses on ships and the sea, particularly flourishing between the 17th and 19th centuries. In practice, the term often covers artworks depicting rivers, estuaries, coastal scenes, and any depictions of boats without strict boundaries—largely because subjects that could be observed or sketched from land played a significant role in this genre.

Strictly speaking, "maritime art" should involve elements of human seafaring, while "marine art" could also include pure seascapes with no human presence. However, this distinction is not always rigorously followed in practice.

Ships and boats have been featured in art since ancient times, but marine art only emerged as a distinct genre with specialized artists in the late Middle Ages. The "ship portrait," a depiction of a single vessel, became popular during this time and remains so today. With the rise of landscape painting during the Renaissance, "marine landscapes" gained prominence in art, though pure seascapes without human or ship elements only became common later.

Hi! Welcome to learn maritime art with me. You can ask me any questions about this art form here! What topic would you like to know about? Would you like to try creating maritime art paintings?

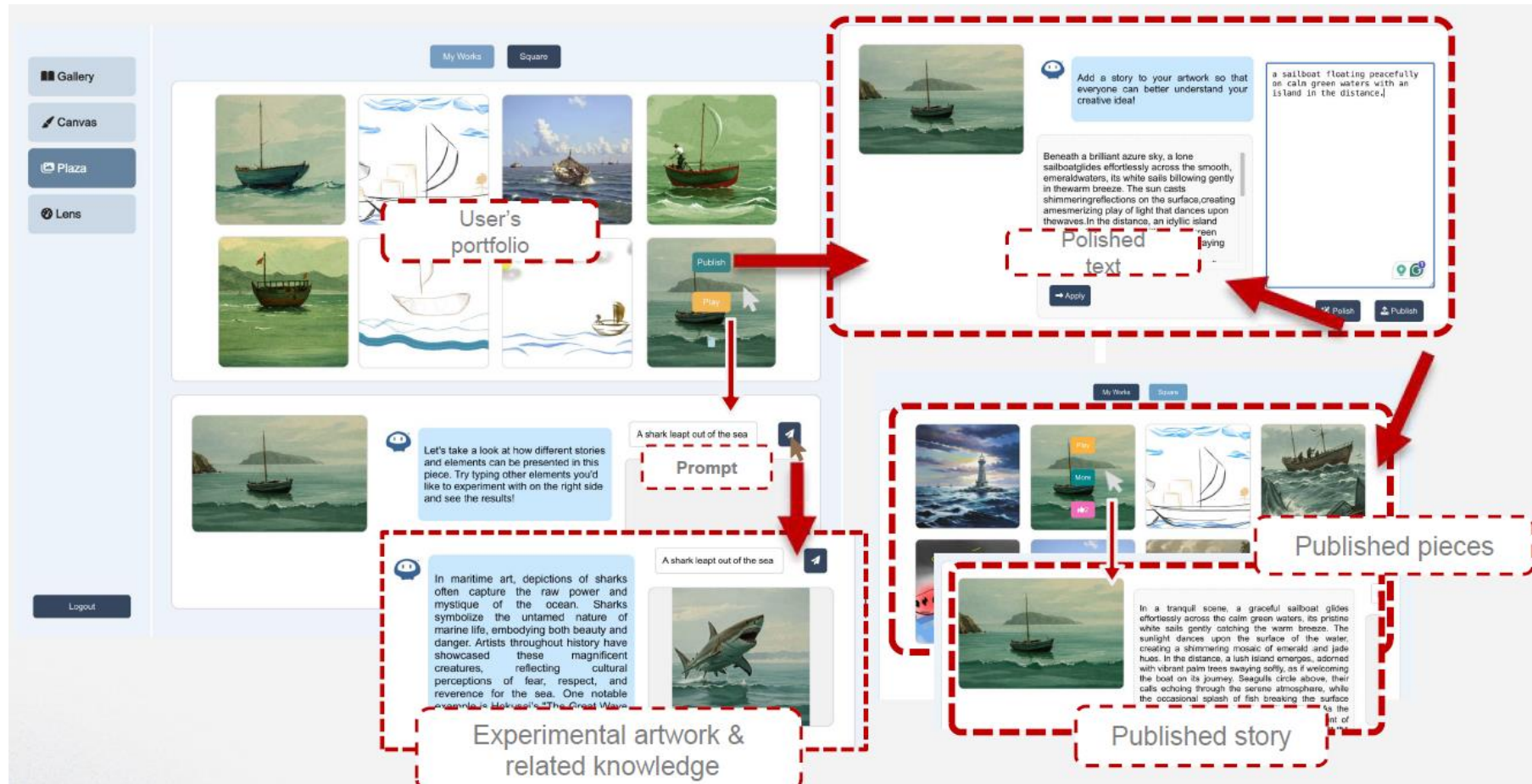
Send



# Mariscope: Canvas view (Create)

The screenshot displays the Mariscope Canvas View interface. On the left, a navigation menu includes 'Gallery', 'Canvas', 'Plaza', and 'Lens'. The central canvas shows a painting of a boat on the ocean under a yellow moon. A toolbar on the left side of the canvas contains various drawing tools. On the right, there are several text boxes and a 'Logout' button. A red dashed box highlights a 'Prompt' box containing the text 'One night, in the moonlight'. Another red dashed box highlights a 'Feedback & guidance' box containing the text 'Great start! To enhance your boat drawing, begin by adding some details to the sail; maybe a few lines to suggest texture or folds. For the water, try varying the shades of blue; use a lighter tone closer to the boat for reflection and a deeper blue farther away. Consider adding some ripples around the boat to convey movement. You might want to include a horizon line to give a sense of depth and scale.' A third red dashed box highlights a 'Reference image' box containing a painting of a boat on the ocean. A fourth red dashed box highlights a 'Reference image' box containing a painting of a boat on the ocean. The text 'Canvas View' is visible in the bottom right corner.

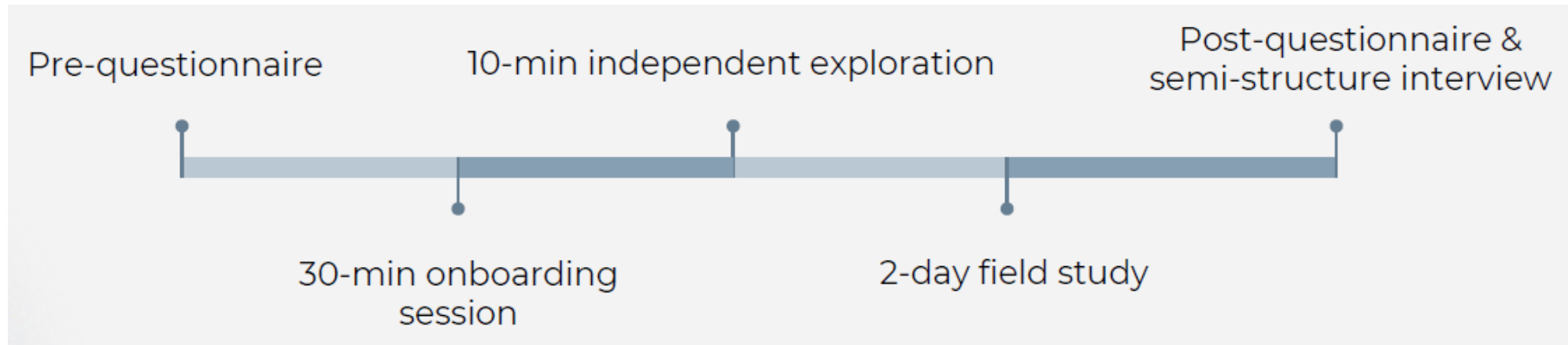
# Mariscope: Plaza view (Play and Share)



# Mariscope: Lense view (Reflect)

The screenshot displays the 'Lens' view of the Mariscope application. On the left, a sidebar contains navigation options: Gallery, Canvas, Plaza, and Lens (selected), along with a Logout button at the bottom. The main area is titled 'Work Archive' and shows a grid of six small drawings of sailboats on water. A red dashed box highlights a 'Feedback on selected work' section. This section contains three text boxes: a top box with detailed feedback on a drawing, a middle box with an encouraging message about the creative process, and a bottom box with a reflection prompt: 'I want to talk about: What is the reason behind choosing these colors?'. Below the feedback is a 'Reflective Studio' section with a refresh icon and a text input field containing 'Did you learn any new painting techniques through your recent creation?'. A 'Reflective questions' box contains the prompt: 'What is the reason behind choosing these colors?'. To the right of the 'Reflective Studio' is a 'Reflection guidance' section with a text box containing: 'Great! Let's delve into your choice of colors. What emotions or themes are you trying to convey with your palette? How do the colors relate to the maritime setting you are depicting? Can you identify a specific mood?'. A 'Send' button is located at the bottom right of the reflection guidance section.

# Learner Evaluation



- Knowledge acquisition and creative self-efficacy
- Supports received during creative learning
- System usability and user experience

# Short Summary on Contributions

- Among first research on **creative learning**
- Theory-grounded
- Can be adapted to various art forms/styles
- Both formal and **nonformal education** contexts
- **Low-tech barrier**; No tech support needed

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# Generate Learning Analytics Dashboard (LAD)

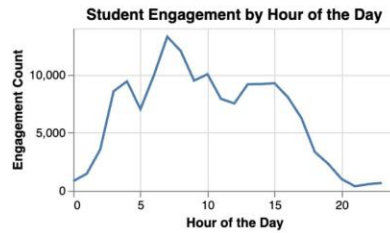
- Inspired by self-service business intelligence
- Aim to support teachers with **personalized LAD**
- **Participatory design** with university teachers

Wang, Z., Lin, W., & Hu, X. (2025, March). Self-service teacher-facing learning analytics dashboard with large language models. In *Proceedings of the 15th International Learning Analytics and Knowledge Conference (LAK)*.

## Domain-focused Chatbot

Prompt

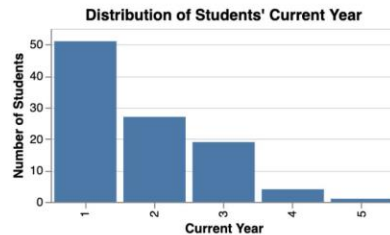
At what hours of the day do students typically engage and use the platform?



Add to dashboard

Prompt

What's the distribution of students' current year



Add to dashboard

Type your question

Chatbot

generate some questions

Here are some questions that teachers might ask regarding student learning and engagement data:

1. What is the average rating given by students in reviews?
2. How many events (like logins or interactions) have students participated in over the last month?
3. What is the distribution of total entities created by students in their stories?
4. How many reviews has each student received?
5. What is the average number of events per student in a specific grade?
6. How do student engagement levels (number of events) vary by year?
7. What is the trend of student engagement over the past few months?
8. How many stories have been created by students in each grade?
9. What is the average rating received by students based on their reviews?
10. How many students are there in each grade level?

These questions can help teachers gain insights into student performance, engagement, and overall learning experiences on the platform.

interpret the result

The bar chart representing the distribution of students' grades shows the number of students achieving each grade. Here's a breakdown of the results:

- **\*\*A\*\***: 28 students received an A, indicating a strong performance.
- **\*\*A+\*\***: 9 students achieved an A+, which is the highest grade, suggesting that a smaller group of students excelled exceptionally.
- **\*\*A-\*\***: 20 students received an A-, showing a solid understanding of the material.
- **\*\*B\*\***: 13 students earned a B, reflecting a good level of performance.
- **\*\*B+\*\***: 28 students received a B+, indicating a significant number of students performed well.
- **\*\*B-\*\***: Only 2 students received a B-, suggesting that very few students fell into this category.
- **\*\*C+\*\***: Similarly, 2 students received a C+, indicating a lower level of performance.

Overall, the majority of students are performing well, with a notable number achieving grades in the A and B ranges. The distribution suggests that while there are some students who are struggling (with only a couple receiving lower grades), the overall performance is quite strong.

Visualization

Visualization

# Evaluation with Common Questions from Teachers

Task #	Indicator Group	Description	Teacher's Question
Task #1	Learner-related	Information describing the learners	What is the distribution of students by their current academic year?
Task #2	Action-related	Information about actions performed by learners	Who are the top ten students with the highest engagement on the platform?
Task #3	Content-related	Information about contents learners' interacted with or produced	What is the distribution of number of multimedia elements in students' stories?
Task #4	Result-related	Information about outcome of learners' activities	What is the distribution of students' grades?
Task #5	Context-related	Information about the context where learning took place	At what hours of the day do students typically use the platform?
Task #6	Social-related	Information about how learners interact with each other	Who are the top ten students receiving the lowest ratings from their peers?

Schwendimann, B.A., et al. (2016). Perceiving learning at a glance: A systematic literature review of learning dashboard research. *IEEE transactions on learning technologies*, 10(1), 30-41.

# Short Summary on Contributions

- Among first research on generating LAD
- Grounded in literature
- Can be integrated in **any courses with online/digital data**
- Low-tech barrier: **Suitable for busy teachers**
- No tech support needed

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# Problem & GenAI Solution

- Student textual output:
  - Reflections, journals, discussions, prompts, ....
- Highly informative but too time-consuming to analyze
- **Automation!**
- **Can GenAI help?**



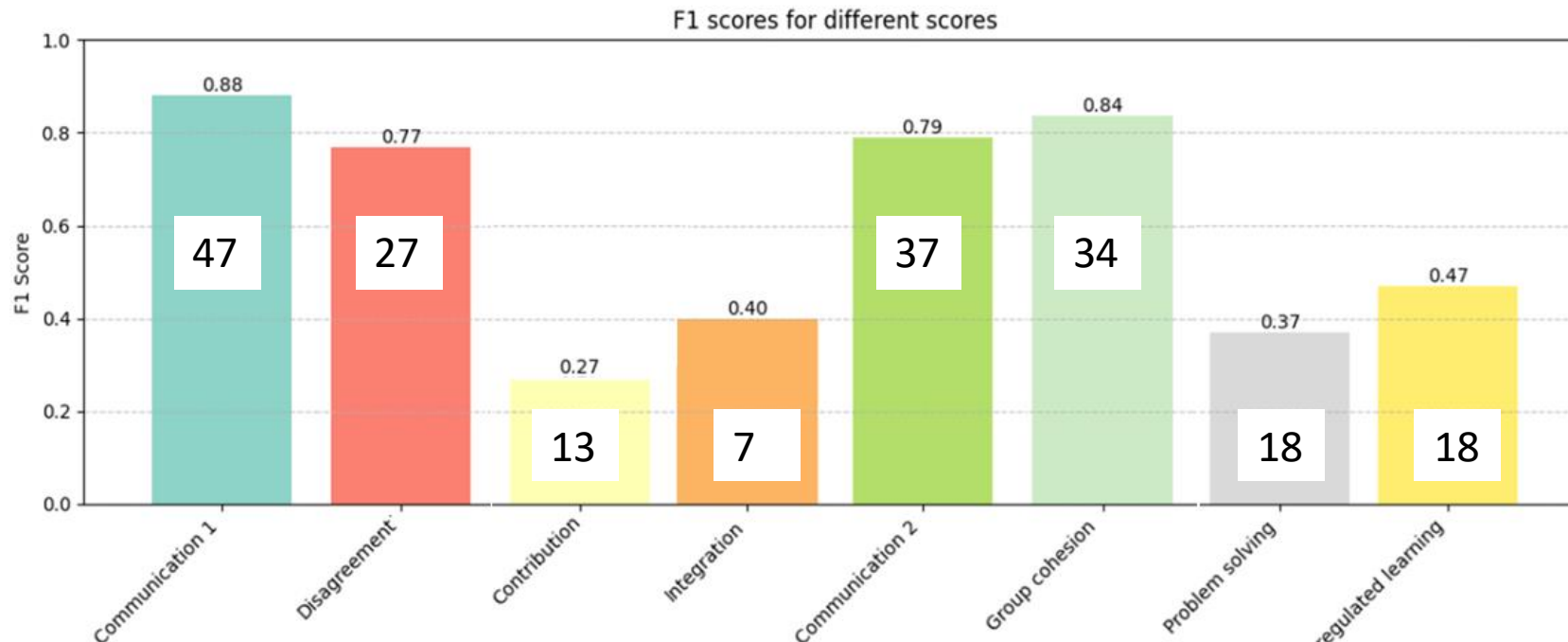
Tang, S., Yip, K., Chan, C. K. K & Hu, X. (2025). Using generative AI for analyzing student reflections on collaborative virtual reality creation. In *Proceedings of the Annual Meeting of the International Society of the Learning Sciences (ISLS)*.

# How?

- **Developing coding scheme**
  - Informed by learning theories
- **Prompting GenAI, with --**
  - Purpose
  - Specific task: Identify a code for each response
  - Feed code name and definition with a few randomly selected text examples of each code – “Few shots”
- **Evaluation**
  - Compare GPT classification with human coding

# Evaluation

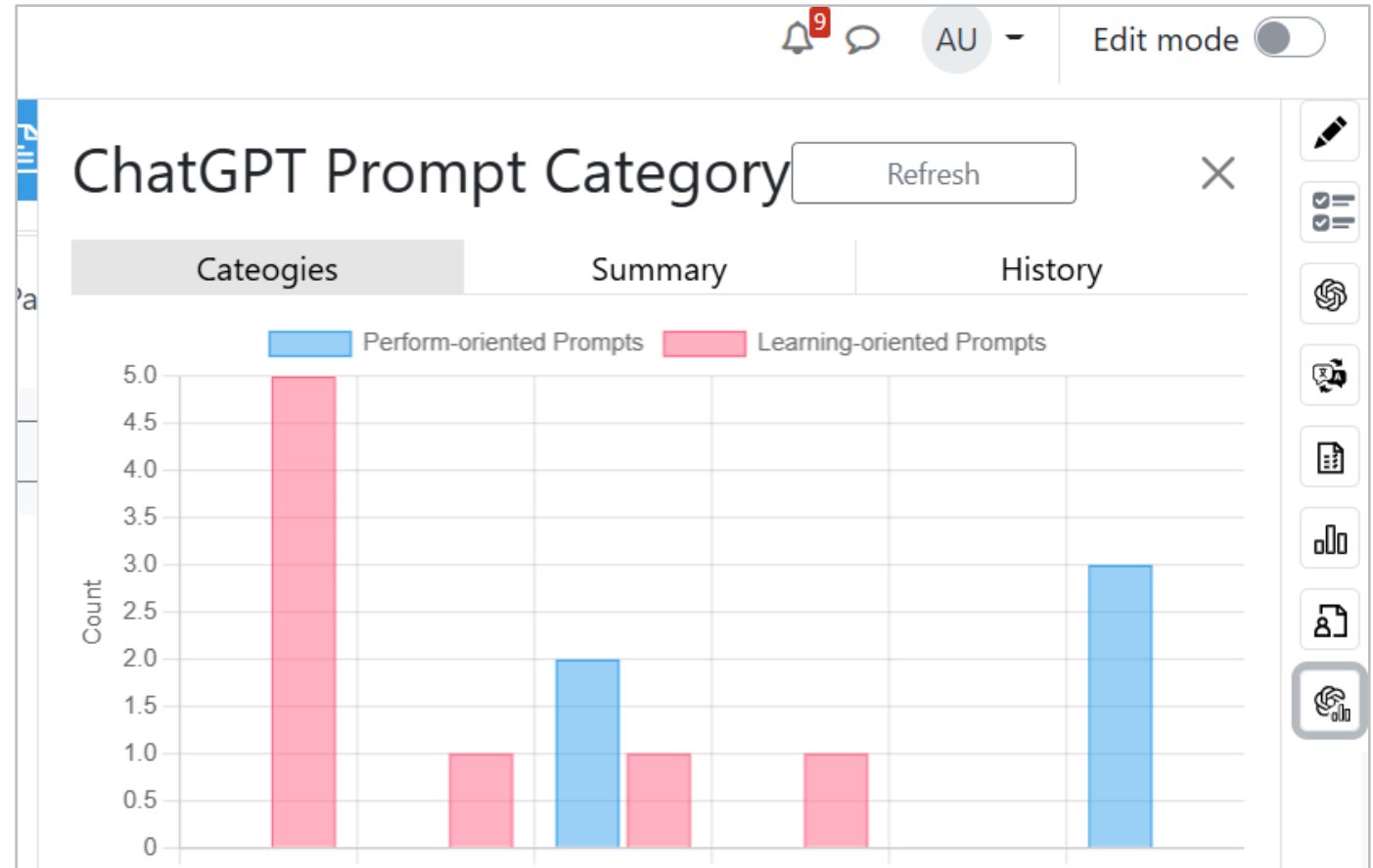
- “Learning Without Wall”
- 150 students co-created VR content
- Reflected their learning process, including **problems (n = 94)** & **solutions (n = 107)** in **collaboration**





# Used in Classrooms

- Promising
- Be cautious
- Nuanced codes need fine-tuning with more examples
- Timely and sustainable feedback



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- **Benefits and Challenges**

# Benefits, Challenges & Success Factors

- Teachable AI is powerful & HIGHLY FLEXIBLE
- Practically important problem / Stakeholders' needs
- Theoretical grounding
- Caution: Avoid OVER-RELIANCE!
- **PARTNERSHIP**



Adapted from Syed, et al., (2018) Learning analytics modular kit: A closed loop success story in boosting students. *LAK*.

# Identify Problems

- Stakeholders' **Needs** in the AI-populated era
  - **Teachers'** needs for understanding, monitoring, facilitating and assessing student-AI interactions
  - **Students'** needs for improving competencies of working with AI
  - **Policy makers'** needs....
- In which ways **Teachable AI can help** meet these needs
  - To enhance, not confine, learning
  - Transparency, trustworthiness
  - ...
- Generalizable **frameworks / models / theories / guidelines**
  - How **SHOULD** learners and AI collaborate?

# Partnership with Teachers

- Challenging, for good reasons
- Align interests
  - To understand teachers' needs, concerns and constraints
  - To integrate into teaching & learning practice
  - Solve problems, value added



# Thank You!

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