

Using Generative AI Tools to Empower Effective Course Design

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Hello!

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Research topic: gamification, learning
engagement



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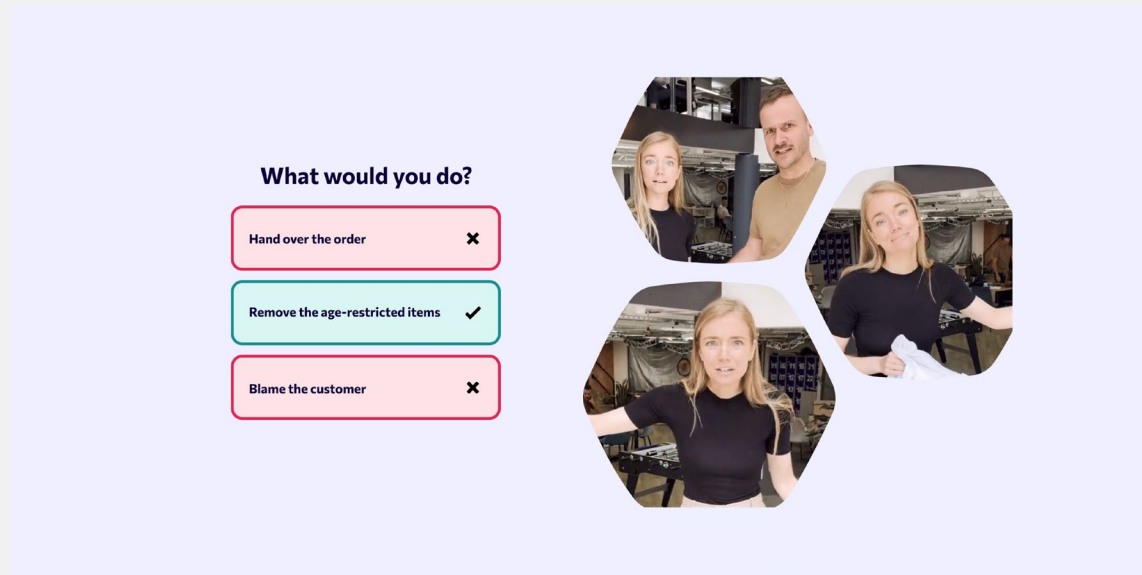


WhatsApp

Introduction

Scenario -based learning (S B L)

- Uses scenarios as a medium to let students apply learning to **real-world experiences**



Scenario -based learning (S B L)

- uses scenarios as a medium to let students apply learning to real - world experiences
- SBL integrates elements such as **challenges**, **narratives** , **role- play**, **choices**, and **authenticity** (M. S. S mith et al., 2018).

Digital storytelling

-enhanced SBL

- Scenarios focusing on pure reasoning **without emotional connection** is **unlikely to engage readers** in the long term (Bowman et al., 2013).



Digital storytelling

-enhanced SBL

- Scenarios focusing on pure reasoning **without emotional connection** is **unlikely to engage readers** in the long term (Bowman et al., 2013).
- In contrast, using **storytelling skills** can deliver more **compelling scenarios** by tapping user **emotion**, holding students' attention and engagement (Moon & Fowler, 2008).

Digital storytelling

Empathy



It can help create trust and bond with you students

Motivation



Hook your students into the learning content,
deconstructed complex information for better cognitive processing

Personalized



It can makes assessment more grounded to real life situation

[1] Burmark, L. (2004). Visual Presentations that Prompt, Flash & Transform. Media and Methods, 40(6), 4–5.

[2] Ormrod, J. E. (2004). Human learning (4th ed.). Upper Saddle River, NJ: Pearson Educational, Inc.

Three challenges for teachers in designing effective SBL scenarios and tasks

- Difficult in aligning SBL learning tasks with appropriate real - world scenarios (challenge 1).

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- Writing engaging scenarios is a laborious and time- consuming affair (challenge 2)

Three challenges for teachers in designing effective SBL scenarios and tasks

- Difficult in aligning SBL learning tasks with appropriate real - world scenarios (challenge 1).
- Writing engaging scenarios is a laborious and time- consuming affair (challenge 2).
- Not all subject- matter experts are good storytellers , and not all good storytellers are subject- matter experts . Many teachers find it **difficult** to write an **engaging** SBL- related **story** that can reflect the teaching content (challenge 3).

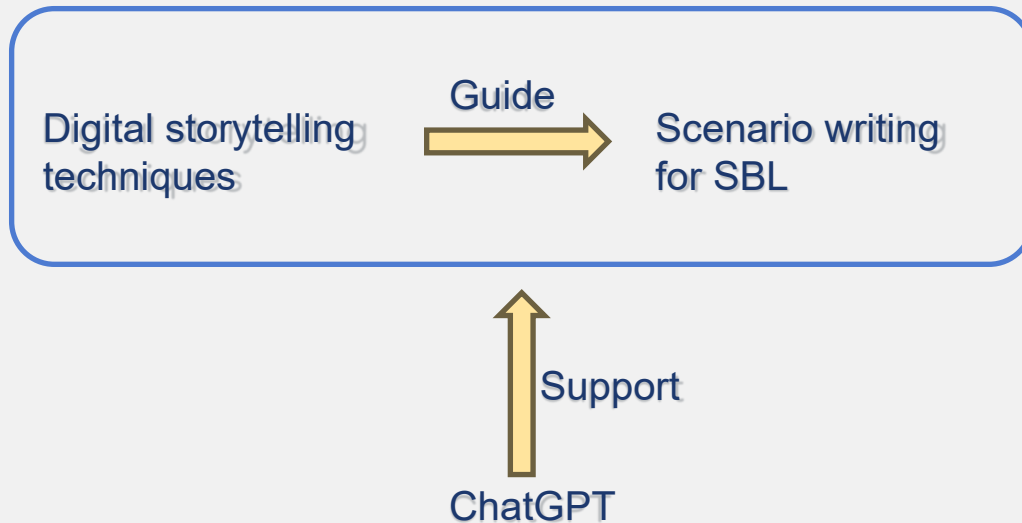
Generative AI in education

- We aim to address these challenges faced by teachers in writing engaging stories with the help of **generative artificial intelligence** (GenAI) technology.

Generative AI in education

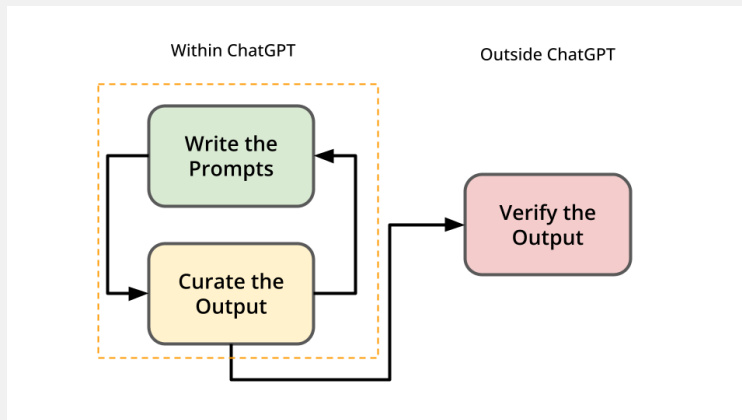
- **Evidence** of the effects of GenAI-created contents on student motivation or learning **has not been well explored**.

Today we will talk about



Today we will talk about

- We used digital storytelling techniques to guide the scenario writing, documenting a teacher's interactions with ChatGPT.
- After a 3- hour interaction, we formulated a 3 - step prompt engineering process using GenAI (i.e., **Write the prompts, Curate the output, and Verify the output; WCV**) that emerged from the practice.



Today we will talk about

- In short, how to use GPT as an instructional designer to write scenarios for scenario - based learning

Research questions

- RQ1. How do teachers **leverage** GenAI to write scenarios for SBL purposes?
- RQ2. What is the **quality** of GenAI-generated SBL scenarios and tasks?
- RQ3. How does GenAI-supported SBL affect students' **motivation**, **learning performance**, and **learning perceptions**?

Methods

A case study

- This method enabled us to conduct an in - depth investigation (Yin, 2018), as few relevant studies on this subject are available.
- The study included **a teacher, the GenAI platform, and 37 student participants** .
 - An **insider's perspective** can be accommodated in a case study research design (Unluer, 2012), as the **teacher - researcher** is situated within the focal context and activity.

Student participants

- In this study, 37 postgraduates (21 females and 16 males) participated in GenAI supported SBL prototype testing (in the spring semester of 2022–2023). Their ages ranged from 22 to 49 ($M = 25.7$, $SD = 4.8$).
- Thirty- two participants were from mainland China, three were from Hong Kong SAR, one was from Italy, and one was from Australia.

Course information

- “Coding and computational thinking” (a master’s - level course at a university in Hong Kong in Spring 2023) as a test- bed to write scenarios using ChatGPT.

Course information

- “Coding and computational thinking” (a master’s - level course at a university in Hong Kong in Spring 2023) as a test- bed to write scenarios using ChatGPT.
- It discusses strategies for learning coding from various perspectives to develop students’ computational thinking skills.

Four story elements

- Setting
- Character
- Plot
- Lesson

Four story elements

- **Setting** : when and where
- **Character** : main character (student role)
- **Plot**: sequence of actions that drive the events
- **Lesson** : lesson the story wishes to convey, the intended learning content

Seven digital storytelling elements

- Point of view
- Dramatic questions
- Emotional content
- Gift of your voice
- Power of soundtrack
- Economy
- Pacing

Seven digital storytelling elements

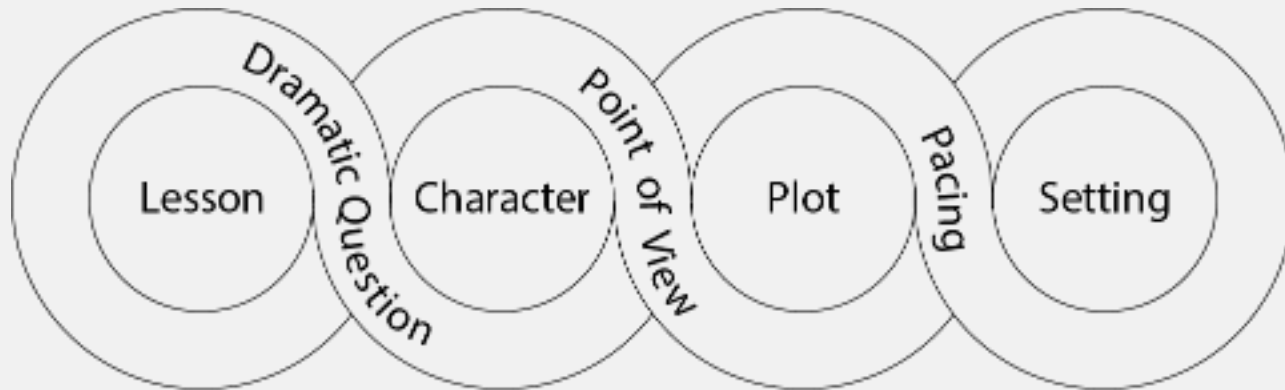
- **Point of view**
- **Dramatic questions**
- Emotional content (plot)
- Gift of your voice (video)
- Power of soundtrack (audio)
- Economy (video/audio)
- **Pacing**

Three digital storytelling elements for image format story

- **Point of view**
- **Dramatic questions**
- **Pacing**
- Emotional content (plot)
- Gift of your voice (video)
- Power of soundtrack (audio)
- Economy (video/audio)

Digital storytelling -driven scenario-based learning design framework

- We integrated the **four - story elements** together with the **three digital storytelling elements** to create an enhanced digital storytelling- driven scenario- based learning design framework





Writing scenarios by prompting ChatGPT 3.5

- “The Startup” is a linear story and has five main plots: Chapter 1: Introduction, Chapter 2: Discovery, Chapter 3: Challenge, Chapter 4: Triumph, and Chapter 5: Conclusion.



Writing scenarios by prompting ChatGPT 3.5

- “The Startup” is a linear story and has five main plots: Chapter 1: Introduction, Chapter 2: Discovery, Chapter 3: Challenge, Chapter 4: Triumph, and Chapter 5: Conclusion.
- We implemented the GenAI-created SBL scenarios and tasks in one session of the course (duration: three hours) to examine their effectiveness.

Structure of building the SBL tasks

1. First of all, an overall outline of the story

1. Story outline (story elements)



write me an outline of a story about computational thinking. The story should consist of five parts with a beginning, climax and ending.



Sure! Here's an outline of a story about computational thinking:

Part 1: Introduction

- Introduce the main character, a young girl named Maya, who loves puzzles and problem-solving.
- Maya is struggling with a difficult math problem and is feeling frustrated.

Part 2: Discovery

- Maya's teacher introduces her to the concept of computational thinking, explaining how it involves breaking down complex problems into smaller, more manageable parts.
- Maya is excited to try out this new approach and starts applying it to her math problem.

Part 3: Challenge

- Maya encounters a new, even more challenging problem - a maze that she needs to navigate.
- She applies her computational thinking skills to break the problem down into smaller steps and create an algorithm for solving it.

Part 4: Triumph

- Maya successfully navigates the maze using her algorithm, feeling a sense of accomplishment and pride.
- She realizes that computational thinking is not just useful for math and science problems, but can be applied to all sorts of challenges.

Part 5: Conclusion

- Maya becomes a computational thinking enthusiast and starts using it to solve problems in all areas of her life.
- The story ends with Maya looking forward to her next challenge, confident in her problem-solving abilities.

That's the outline! You can add more details and flesh out the story as needed.

Find the prompt pattern

SBL components	Prompts used in the Startup	Generic prompts	Patterns and notes
Story outline	Write me an outline of a story about an entrepreneur trying to build an IT startup company. You need to include computational thinking skills in the story. The story should consist of five parts with a beginning, climax, and ending.	Write me an outline of a story about character(s) 1 and main plots 2 provided by the teacher. You need to include lesson(s) 3 in the story. The story should consist of five parts with a beginning, climax and ending.	Pattern: Characters, plots, lesson Teacher-provided: Characters, plots, lesson ChatGPT-provided: Settings

Structure of building the SBL tasks

1. First of all, an overall outline of the story
2. Second, opening conversation for scenario 1

2. Opening conversation for scenario 1



You

Give a short opening for the part 1 introduction. Introduce Tom, and the setting is in a cafe with a friend discussing a new idea about his startup.

< 2 / 2 >



ChatGPT

Tom sat across from his friend, fidgeting with his coffee cup. They were in a bustling cafe, surrounded by the sounds of clinking mugs and murmured conversations. Tom had been excited to share his latest idea with his friend, but now that they were face-to-face, he felt nervous. "I've been thinking about starting a new IT startup," he said finally, his voice low. His friend leaned in, intrigued. "Tell me more," she said. And so, Tom began to explain his vision for a revolutionary new software product.

Find the prompt pattern

Opening conversation	Provide a short opening for the Part 1 introduction. Introduce Tom, who is in the setting of a cafe with a friend discussing new ideas for his startup. Tom talks about using decomposition skills when conceptualizing his new idea for a food delivery app.	Provide a short opening for the part 1 introduction. Introduce the main character1 (student role) as created by ChatGPT from the previous output, and the setting2 and plot3 , which consist of satisfactory outputs from the previous output. The lesson4 is provided by the teacher.	Pattern: Characters, settings, plots, lesson Teacher-provided: Lesson ChatGPT-provided: Characters, setting, plots
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Structure of building the SBL tasks

1. First of all, an overall outline of the story
2. Second, opening conversation for scenario 1
3. Third, SBL tasks for scenario 1



3. SBL tasks for scenario 1



You

Continue the story where tom discusses Implementing quality control measures, such as data cleaning and filtering for ensuring the quality of the dataset. You need to create a follow-up multiple choice question with one correct answer about giving a possible detailed algorithm to do quality control measures. Keep it short. Increase the difficulty level of this question, you cannot find the answer straight from the conversation text, put the question in the scenario.

< 1 / 2 >



ChatGPT

Tom leaned forward, eager to share his knowledge. "One way to ensure the quality of the dataset is to implement quality control measures, such as data cleaning and filtering," he said. "We can use algorithms to identify and remove incomplete, incorrect, or irrelevant data points. For example, we can remove orders with missing delivery addresses or orders placed outside of the app's delivery zone." His friend nodded, impressed by his attention to detail. "What kind of algorithm can we use for data cleaning and filtering?" she asked.

Multiple Choice Question:

Which of the following algorithms could be used to perform data cleaning and filtering on a dataset for an AI-driven food delivery app that manages order requests for a population in Hong Kong?

- A) K-means clustering algorithm
- B) Principal Component Analysis (PCA) algorithm
- C) Random Forest algorithm
- D) Support Vector Machines (SVM) algorithm

Correct Answer: C) Random Forest algorithm.



Find the prompt pattern

Multiple-choice
question

Continue the story where Tom discusses implementing quality control measures, such as data cleaning and filtering to ensure the quality of the dataset. You need to create a follow-up multiple-choice question with one correct answer about suggesting a general algorithm for quality control. The answer cannot be obtained directly from the conversation text, so you should put the question in the scenario.

Continue the story, in which the main **character1** (student role) appears in a specific scenario from the previous output. You need to create a follow-up multiple-choice question with one correct answer about the **lesson2** while fitting in a given **setting3** and **plot4** from the previous output. The answer cannot be obtained directly from the conversation text, so you should put the question in the scenario.

Pattern: Characters, settings,
plots, lesson

Teacher-provided: Lesson

ChatGPT-provided: Characters,
setting, plots

Structure of building the SBL tasks

1. First of all, an overall outline of the story
2. Second, opening conversation for scenario 1
3. Third, SBL tasks for scenario 1
4. Fourth, ending conversation for scenario 1



4. Ending conversation for scenario 1



You

Continue the story where investor is happy about Tom insightful idea and well prepared research. but the Investors are hesitant to invest in a new, unproven product. Give a mini-ending that the investor needs to learn more about this app. Keep it a conversation mode. keep in short.

< 3 / 3 >



ChatGPT

Tom: "I understand your concern, and I appreciate your time and attention. If you have any questions or need further information, please don't hesitate to reach out to me. I am confident that this app will revolutionize the food delivery industry in Hong Kong, and I believe it has great potential for success."

Investor: "Thank you for presenting this exciting opportunity to us. I would like to learn more about the app's development process, timeline, and team. We will review your proposal and get back to you soon."

Tom: "Thank you very much. I look forward to hearing from you soon."

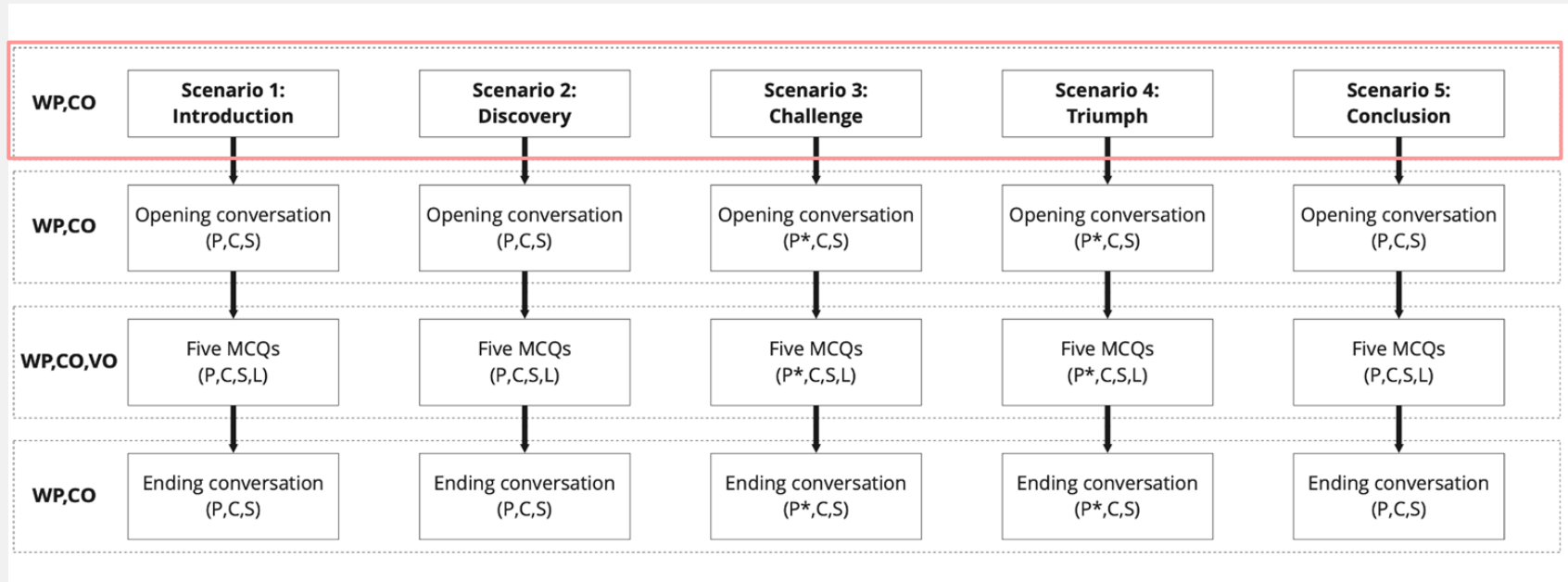


Find the prompt pattern

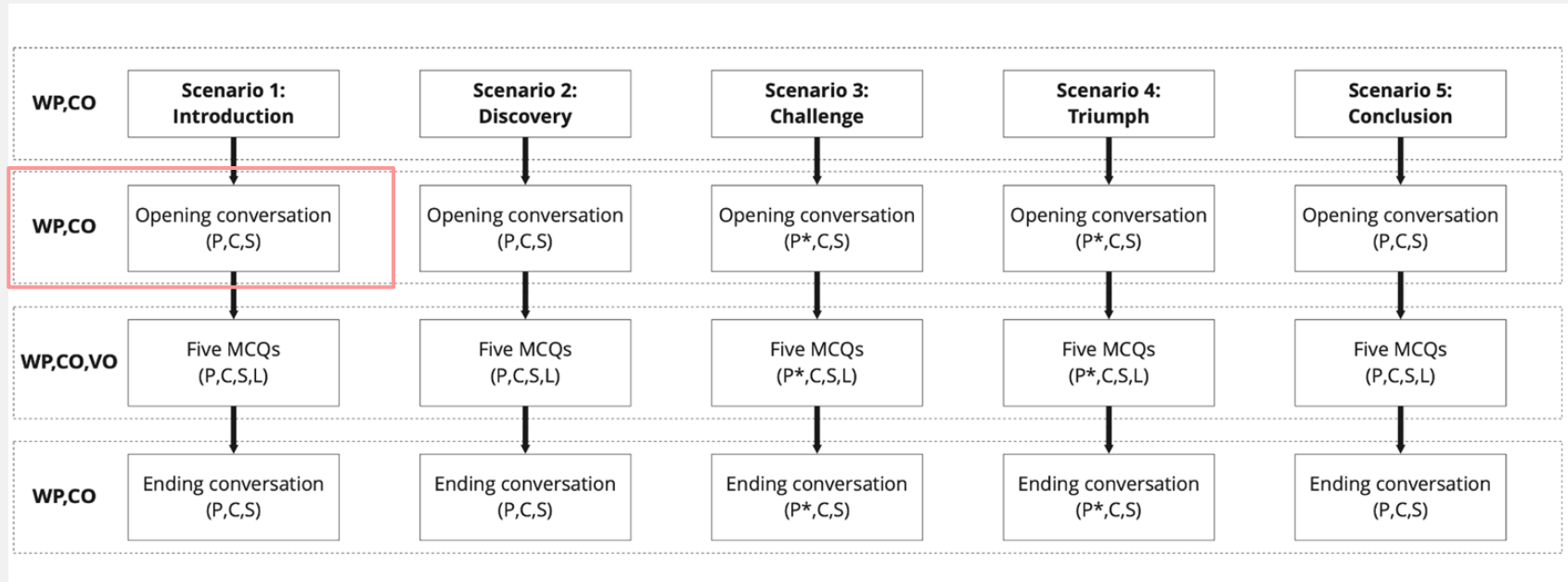
Ending conversation	Give a short ending for the part 1 introduction. The main plot and setting are that Tom and his friends finished their coffee and parted ways. Tom felt energized by their discussion. The lesson is that Tom knew that he had the computational thinking skills and knowledge necessary to build a successful startup company.	Give a short ending for the part 1 introduction. Include the main characters 1, plot 2, and setting 3 from the previous output. The lesson4 is provided by the teacher.	Pattern: Characters, settings, plots, lesson Teacher-provided: Lesson ChatGPT-provided: Characters, setting, plots
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Here comes the patterns

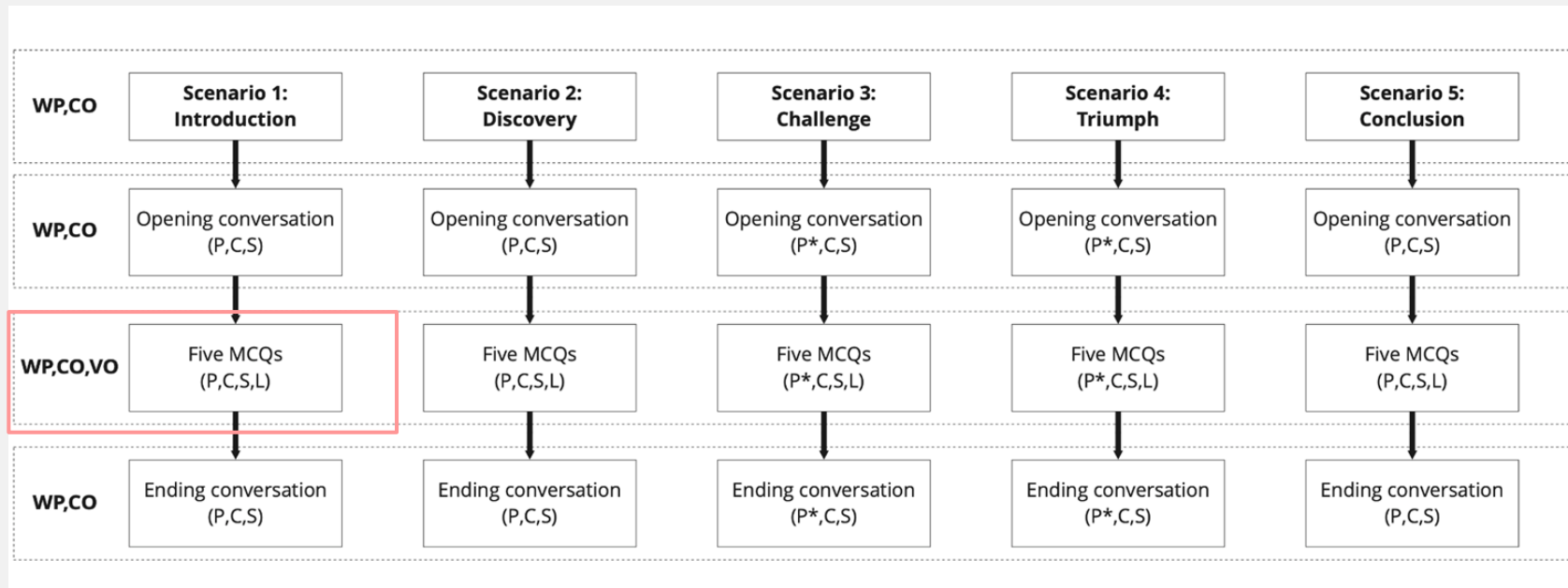
Step 1: overall story outline



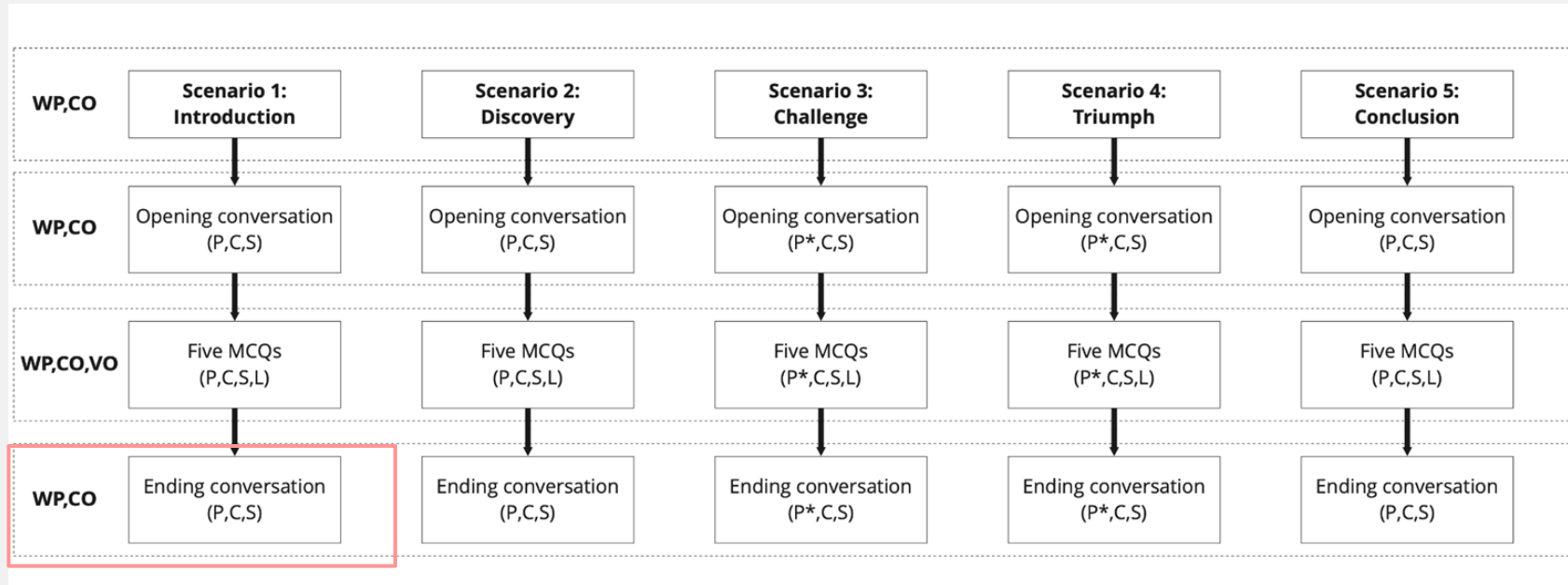
Step 2: Opening conversation for scenario 1



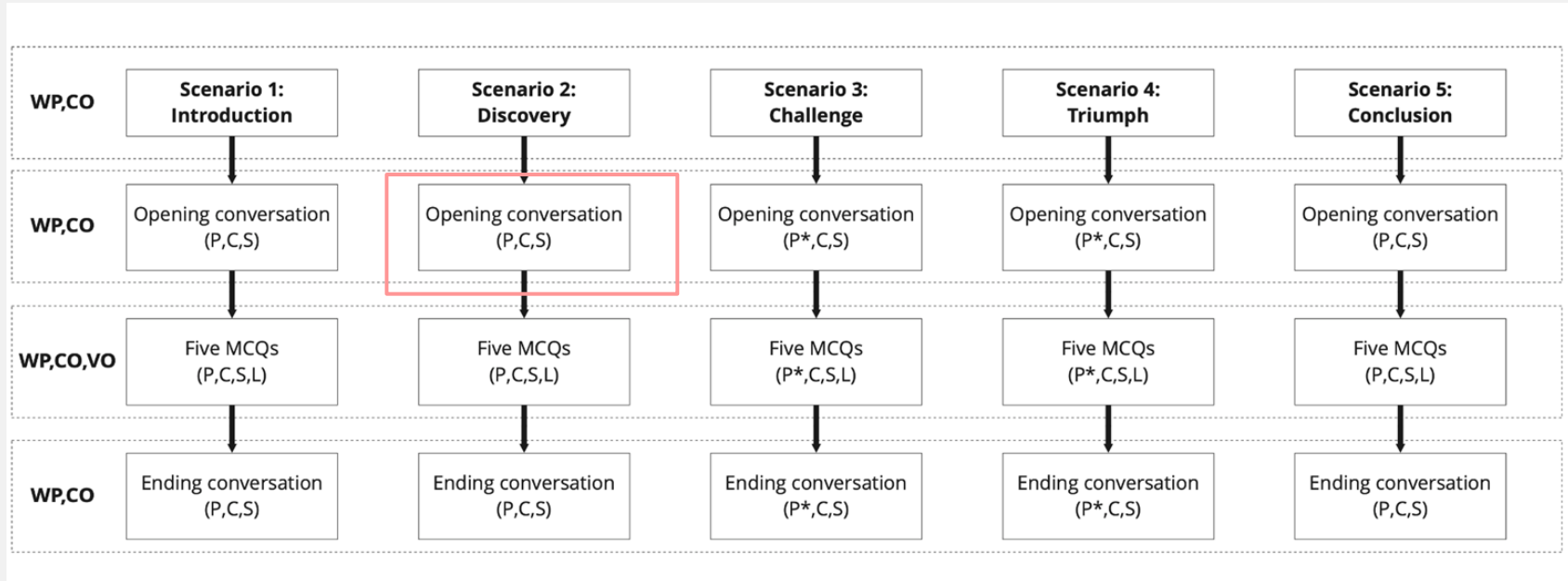
Step 3: SBL tasks for scenario 1



Step 4: ending conversation for scenario 1



Step 5: repeat scenario 1 generation procedures for the rest of scenarios



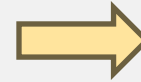
Learning apps used



Generate
learning content



Turn content into
comic strips



Present the final
product
(with unlocking
scheme)

Final product in a learning
management system, Moodle

Chapter 1: Introduction

Scenario Background:

Tom sat across from his friend, fidgeting with his coffee cup. They were in a bustling cafe, surrounded by the sounds of clinking mugs and murmured conversations. Tom had been excited to share his latest idea with his friend, but now that they were face-to-face, he felt nervous.

Students read
the scenario
background
first



Attempts allowed: 3

Grading method: Highest grade

Then complete the multiple- choice questions

Tom leaned in, his eyes alight with excitement. "So let's say we want to build the recommendation engine for our app. We could use decomposition to break that down into smaller problems, like how to analyze user data and how to match that data with relevant menu options." His friend nodded thoughtfully. "But how do you recognize patterns in the user data?" she asked.

Q2: Which of the following best describes a technique for recognizing patterns in user data for an AI-driven food delivery app?

- ☐ a. Keyword-based analysis of menu items and user preferences.
- ☐ b. Random selection of menu items to recommend to users.
- ☐ c. Machine learning algorithms that analyze user behavior and preferences.

Submit all task
attempts and
unlock next
scenario

The Startup

Restricted Available from 20 March 2023, 6:30 PM

 Chapter 1: Introduction

 Chapter 2: Discovery

Restricted Not available unless: The activity **Chapter 1: Introduction** is complete and passed

 Chapter 3: Challenge

Restricted Not available unless: The activity **Chapter 2: Discovery** is complete and passed

 Chapter 4: Triumph

Restricted Not available unless: The activity **Chapter 3: Challenge** is complete and passed

Measures

- Quality of the **SBL tasks**:
 - Self-developed rubrics for SBL tasks

	Excellent (4.3-3.7 score)	Good (3.0-3.6 score)	Satisfactory (2.3-2.9 score)	Pass (1.6-2.2 score)	Fail (<1.6 score)
Quality of MCQs	The project includes well-crafted MCQs that effectively assess the student's understanding. The questions are clear, concise, and relevant to the narrative. They provide plausible answer options with distractors that challenge critical thinking. Critical or actionable feedback is always provided.	The project includes good MCQs that assess the student's understanding. The questions are generally clear and relevant to the narrative. They provide reasonable answer options, with some challenging distractors. Critical or actionable feedback is always provided.	The project includes adequate MCQs, but they may lack clarity or relevance to the narrative. The answer options may be somewhat predictable and distractors may not effectively challenge critical thinking. Some actionable feedback is provided.	The project includes weak MCQs that do not effectively assess students' understanding. The questions may be unclear or irrelevant to the narrative. The answer options lack variety or fail to challenge critical thinking. Some actionable feedback is provided.	The project lacks <u>MCQs</u> are poorly crafted and do not assess the student's understanding. The questions are confusing, irrelevant, or have incorrect answer options with minimal feedback.
Feedback	One clear-cut correct answer for each question is provided with a reasonable explanation. The correct answer will be used to lead the next question in the following-up conversation smoothly.	One clear-cut correct answer for each question is provided with a reasonable explanation. The correct answer will be used to lead the next question in the following-up conversation smoothly.	One correct answer for each question is provided with an explanation. The correct answer will be used to lead the next question in the following-up conversation.	One correct answer for each question is provided. The correct answer will be used to lead the next question in the following-up conversation.	No correct answer for each question is provided.

Measures

- Quality of the **SBL tasks**:
 - Self-developed rubrics for SBL tasks
 - The difficulty index from the classic test theory (0.15 - 0.85 is acceptable)
 - the discrimination index the classic test theory (0.2 - 0.4 is acceptable)

[1] De Champlain, A. F. (2010). A primer on classical test theory and item response theory for assessments in medical education. *Medical Education*, 44(1), 109–117.

[2] Haladyna, T. (2004). *Developing and validating multiple-choice test items* (3rd Edition). Routledge.

[3] Azevedo, J. M., Oliveira, E. P., & Beites, P. D. (2019). Using Learning Analytics to evaluate the quality of multiple-choice questions: A perspective with Classical Test Theory and Item Response Theory. *International Journal of Information and Learning Technology*, 36(4)

Measures

- Quality of the **SBL scenario**:
 - Self-developed rubrics



	(4.3-3.7 score)	(3.0-3.6 score)	(2.3-2.9 score)	(1.6-2.2 score)	(<1.6 score)
Creativity & computational thinking	Demonstrate heightened awareness of decomposition, pattern recognition, abstraction and <u>algorithms</u> .	Demonstrate adequate awareness of decomposition, pattern recognition, abstraction <u>and</u> algorithms.	Demonstrate two aspects of decomposition, pattern recognition, abstraction <u>and</u> algorithms.	Demonstrate one aspect of decomposition, pattern recognition, abstraction <u>and</u> algorithms.	Demonstrate no awareness of decomposition, pattern recognition, abstraction <u>and</u> algorithms.
Story elements	Present all four story elements in the scenario in a good coherence: i.e., character(s), setting, plot, moral in conversation format	Present all four story elements in the scenario in <u>a</u> coherence: i.e., character(s), setting, plot, <u>moral</u> in conversation format	Present all four story elements in the scenario: i.e., character(s), setting, plot, <u>moral</u> in conversation format	Present some of <u>the</u> four story elements in the scenario: i.e., character(s), setting, plot, <u>moral</u> in conversation format	Present no story elements in the scenario: i.e., character(s), setting, plot, moral in conversation format
Content	The scenario content fully reflects the real-world case of applying computational thinking skills. The content fits the adult learners' cognitive level.	The scenario content partially reflects the real-world case of applying computational thinking skills. The content fits the adult learners' cognitive level.	The scenario content partially reflects the real-world case of applying computational thinking skills. The content fits the adult learners' cognitive level <u>in</u> some extent.	The scenario content partially reflects the real-world case of applying computational thinking skills. The <u>content</u> does not fit the adult learners' cognitive level <u>in</u>	The scenario content does not <u>reflects</u> the real-world case of applying computational thinking skills. The content does not fit the adult learners' cognitive level <u>in</u> some extent.

Measures

- **Student intrinsic motivation** : Intrinsic Motivation Inventory survey (Ryan, 1982)
- **Learning performance** : self- developed performance test (pre - and post - tests)
- **Learning perceptions** : self- developed open- ended survey



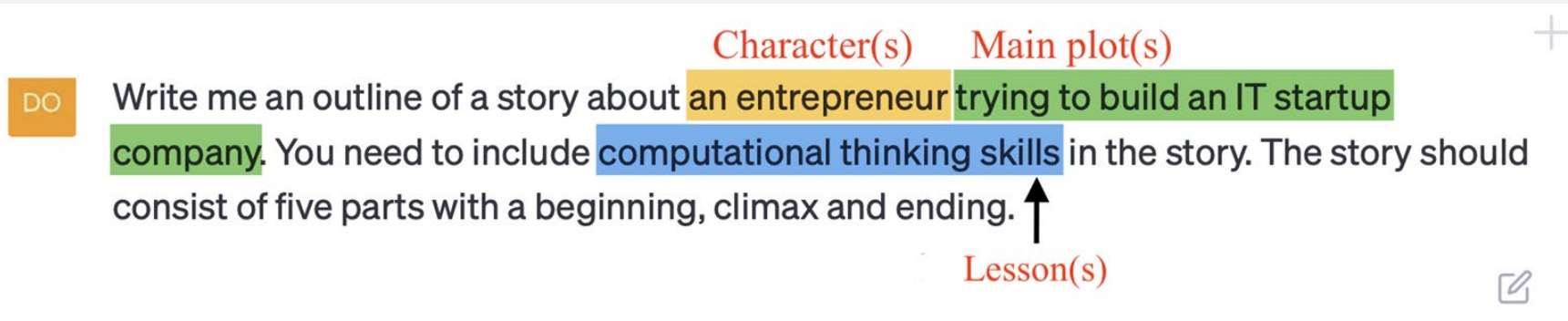
Results

RQ1. How do teachers leverage GenAI to write scenarios for SBL purposes

- 1) **Write the Prompts:** the entries that users provide as inputs into the GenAI tool that elicit the intended output.

RQ1. How do teachers leverage GenAI to write scenarios for SBL purposes

- 1) **Write the Prompts:** the entries that users provide as inputs into the GenAI tool that elicit the intended output.



The screenshot shows a text input field with the following text: "Write me an outline of a story about an entrepreneur trying to build an IT startup company. You need to include computational thinking skills in the story. The story should consist of five parts with a beginning, climax and ending." Above the text, there are four colored boxes with labels: "Character(s)" (orange) above "an entrepreneur", "Main plot(s)" (green) above "trying to build an IT startup company", "Lesson(s)" (blue) above "computational thinking skills", and "Lesson(s)" (red) below "computational thinking skills". An arrow points from the "Lesson(s)" label below to the text "computational thinking skills". There is a plus sign in the top right corner and a pencil icon in the bottom right corner of the input field.

Character(s) Main plot(s)

DO Write me an outline of a story about an entrepreneur trying to build an IT startup company. You need to include computational thinking skills in the story. The story should consist of five parts with a beginning, climax and ending.

Lesson(s)

A story outline writing prompt

Use 4 story elements to write SBL component

SBL components	Prompts used in the Startup	Generic prompts	Patterns and notes
Story outline	Write me an outline of a story about an entrepreneur trying to build an IT startup company. You need to include computational thinking skills in the story. The story should consist of five parts with a beginning, climax, and ending.	Write me an outline of a story about character(s) 1 and main plots 2 provided by the teacher. You need to include lesson(s) 3 in the story. The story should consist of five parts with a beginning, climax and ending.	Pattern: Characters, plots, lesson Teacher-provided: Characters, plots, lesson ChatGPT-provided: Settings
Opening conversation	Provide a short opening for the Part 1 introduction. Introduce Tom, who is in the setting of a cafe with a friend discussing new ideas for his startup. Tom talks about using decomposition skills when conceptualizing his new idea for a food delivery app.	Provide a short opening for the part 1 introduction. Introduce the main character 1 (student role) as created by ChatGPT from the previous output, and the setting 2 and plot 3, which consist of satisfactory outputs from the previous output. The lesson 4 is provided by the teacher.	Pattern: Characters, settings, plots, lesson Teacher-provided: Lesson ChatGPT-provided: Characters, setting, plots

Use 4 story elements to write SBL component

Multiple-choice question	Continue the story where Tom discusses implementing quality control measures, such as data cleaning and filtering to ensure the quality of the dataset. You need to create a follow-up multiple-choice question with one correct answer about suggesting a general algorithm for quality control. The answer cannot be obtained directly from the conversation text, so you should put the question in the scenario.	Continue the story, in which the main character1 (student role) appears in a specific scenario from the previous output. You need to create a follow-up multiple-choice question with one correct answer about the lesson2 while fitting in a given setting3 and plot4 from the previous output. The answer cannot be obtained directly from the conversation text, so you should put the question in the scenario.	Pattern: Characters, settings, plots, lesson Teacher-provided: Lesson ChatGPT-provided: Characters, setting, plots
Ending conversation	Give a short ending for the part 1 introduction. The main plot and setting are that Tom and his friends finished their coffee and parted ways. Tom felt energized by their discussion. The lesson is that Tom knew that he had the computational thinking skills and knowledge necessary to build a successful startup company.	Give a short ending for the part 1 introduction. Include the main characters1 , plot2 , and setting3 from the previous output. The lesson4 is provided by the teacher.	Pattern: Characters, settings, plots, lesson Teacher-provided: Lesson ChatGPT-provided: Characters, setting, plots

RQ1. How do teachers leverage GenAI to write scenarios for SBL purposes

- 2) **Curate the output:** the user's selection of the satisfactory output provided by the GenAI tool previously.
 - a) Unsatisfactory output
 - b) Need- to - be- improved output
 - c) Satisfactory output

RQ1. How do teachers leverage GenAI to write scenarios for SBL purposes

- 2) **Curate the output:** the user's selection of the satisfactory output provided by the GenAI tool previously.
 - a) Unsatisfactory output
 - b) **Need- to- be- improved output**
 - c) Satisfactory output

RQ1. How do teachers leverage GenAI to write scenarios for SBL purposes

Need- to- be- improved output:

- The user will “keep (partial output) and change (the next prompt).”
The user needs to determine which part of the output is useful and will be included in the next prompt.

Curate the output

Old prompt:

Continue the story where Tom did extensive research into the potential rate of return on investment in the food delivery app market in Hong Kong. You need to create a multiple - choice question with one correct answer about a computational skill called decomposition. Keep it short.

Extended prompt :

Continue ...Increase the difficulty level of this question. The answer cannot be directly found in the conversation text, so put the question in the scenario. Tom is reporting the findings to a potential investor. Keep it a conversation mode (new addition).



< 1/2 >



Continue the story where Tom did massive research on potential rate of return on investment on food delivery app market in Hong Kong. You need to create a multiple-choice question with one correct answer about computational skill called decomposition. Keep it short.



Tom spent countless hours analyzing the potential rate of return on investment for a food delivery app in Hong Kong. As he delved deeper into his research, he began to break down the different components of the market, from customer behavior to the economics of the food industry.

Multiple Choice Question:

What computational skill did Tom use to analyze the potential rate of return on investment for a food delivery app in Hong Kong?

- A) Decomposition
- B) Abstraction
- C) Algorithmic thinking
- D) Data analysis

Correct Answer: A) Decomposition

Old prompt

< 2/2 >



Continue the story where Tom did massive research on potential rate of return on investment on food delivery app market in Hong Kong. You need to create a multiple-choice question with one correct answer about computational skill called decomposition. Keep it short. Increase the difficulty level of this question. You cannot find the answer straight from the conversation text, put the question in the scenario. Tom is reporting the findings with one potential investor. Keep it a conversation mode.



Tom: "Based on my research, the food delivery app market in Hong Kong is expected to grow by 12% annually over the next five years. This growth rate is driven by an increase in demand for convenience and a shift towards online ordering. By decomposing the market trends, we can see that there's a significant opportunity for our AI-driven food delivery app to capture a substantial market share."

Investor: "Interesting. How do you plan on using this information to ensure the success of your product?"

Tom: "We plan on leveraging machine learning algorithms to analyze user behavior and preferences to provide a personalized ordering experience. This will help us stand out from our competitors and capture a larger market share."

Which of the following computational thinking skills did Tom use to analyze the food delivery app market trends?

- A) Abstraction
- B) Algorithmic thinking
- C) Decomposition
- D) Pattern recognition

Correct Answer: C) Decomposition.

New prompt

RQ1. How do teachers leverage GenAI to write scenarios for SBL purposes

- 3) **Verify the output:** verification of the authenticity and accuracy of the GenAI output.
 - Consulting subject matter experts or obtaining reliable evidence to verify the output;
 - Legislative records, trustworthy media outlets, and social media

RQ2. What is the quality of GenAI - generated SBL scenarios and tasks?

- **SBL tasks:**
 - The difficulty index of the 25 tasks was $M = 0.58$, $SD = 0.2$.
 - The discrimination index of the AI-supported SBL test was $M = 0.35$, $SD = 0.22$.
 - Manual marking: an overall $M = 3.44$, $SD = 0.34$ (full score was 4.3)

TABLE II
DIFFICULTY AND DISCRIMINATION INDICES OF AI-
SUPPORTED 25 TASKS

n	Test	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
33	Dif	0.82	0.56	0.67	0.54	0.21	0.33	0.31	0.28	0.59	0.36	0.62	0.69	0.23
	Dis	0.14	0.55	0.2	0.86	0.05	0.21	0.67	0.21	0.71	0.24	0.77	0.35	0.11
n	Test	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	
33	Dif	0.77	0.56	0.69	0.67	0.74	0.74	0.79	0.33	0.31	0.56	0.62	0.57	
	Dis	0.29	0.63	0.26	0.26	0.43	0.43	0	0.21	0.67	0.55	0.47	0.5	

Notes. n = number of participants, Dif = difficulty index, Dis = discrimination index. Four students did not answer the test as this test was a voluntary activity.

TABLE III
SCORES OF AI-SUPPORTED 25 TASKS ASSESSED BY TWO
MARKERS

Marker	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Marker 1	4.30	4.15	3.25	3.33	3.78	3.33	3.40	3.25	3.50	3.25	3.25	3.93	3.30
Marker 2	3.25	4.00	4.00	3.90	3.92	3.90	3.70	3.70	3.70	3.60	3.60	3.60	3.60
Test	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	
Marker 1	3.00	3.15	2.93	3.18	3.58	2.85	2.93	3.18	3.23	3.25	3.50	3.25	
Marker 2	3.60	3.50	3.40	3.40	3.40	3.40	2.9	3.10	3.10	3.2	3.00	3.60	

Notes. Full mark is 4.3.

RQ2. What is the quality of GenAI generated SBL scenarios and tasks?

- **SBL scenarios:**
 - Manual marking: $M = 3.63$, $SD = 0.35$ (full score was 4.3)

TABLE IV
SCORES OF AI-SUPPORTED TEN OPENING AND ENDING
CONVERSATIONS ASSESSED BY TWO MARKERS

Marker	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	OC	EC	OC	EC	OC	EC	OC	EC	OC	EC
Marker 1	3.65	3.8	4.3	4	3.8	3.7	3.65	3.5	3	3.3
Marker 2	3.6	3.7	4.3	3.8	3.7	3.6	3.68	3.3	2.9	3.25

RQ3. How does GenAI-supported SBL affect students' motivation, learning performance, and learning perceptions?

- **Intrinsic motivation:**
 - The results indicated that 27 out of 37 students (response rate: 73%) reported a **significantly higher level** of intrinsic motivation for engaging in the SBL activities at the post-activity stage ($M_d = 5.57$, $n = 27$) compared with the pre-activity stage ($M_d = 4.70$, $n = 27$); $Z = -3.09$, $p = .002$.

RQ3. How does GenAI-supported SBL affect students' motivation, learning performance, and learning perceptions?

- **Learning performance:**
 - students achieved significantly higher performance scores after doing the GenAI-supported SBL tasks ($M = 77.8$, $SD = 5.94$ for post-test, $M = 5.26$, $SD = 5.08$ for pre-test, full mark is 100); $t(65) = -90.33$, $p < .001$.

RQ3. How does GenAI-supported SBL affect students' motivation, learning performance, and learning perceptions?

- **Learning perceptions:**
 - Twenty-four students (response rate: 65%).
 - Three themes:
 - Learning tasks were delivered in well-written and realistic scenarios (n = 15);
 - They helped me review learning content and identify the knowledge gap (n = 8);
 - I could put myself in the shoes of the fictitious character Tom (student role) in the story (n = 5).

RQ3. How does GenAI-supported SBL affect students' motivation, learning performance, and learning perceptions?

- **Learning perceptions:**
 - The four most common suggestions for improving the SBL tasks design:
 - The storyline can be more complex and have more twists (n = 6);
 - The association between the story and tasks needs to be further enhanced (n = 5);
 - Analyses of wrong answers need to be included (n = 3);
 - The use of multimedia (audio, video) in presenting the scenarios is preferable (n = 2).



Discussion

Write the prompts

- It is helpful to include **the number of story parts** (i.e., the story should consist of five parts with a beginning, climax, and ending).

Write the prompts

- It is helpful to include the number of story parts (i.e., the story should consist of five parts with a beginning, climax, and ending).
- Prompts must be provided for the opening/ending conversation creation.
 - E.g., Our prompt for one opening conversation was ‘ *Give a short opening for the part 1 introduction. Introduce Tom, and the setting is in a cafe with a friend where they discuss a new idea for a startup. Tom discusses how to use decomposition skills in conceptualizing his new idea about a food delivery app* ’
 - This prompt output will provide the main character, setting, and plot, which were generated from the previous output. Here, the teacher only needed to provide the “ **lesson** ” information.

Write the prompts

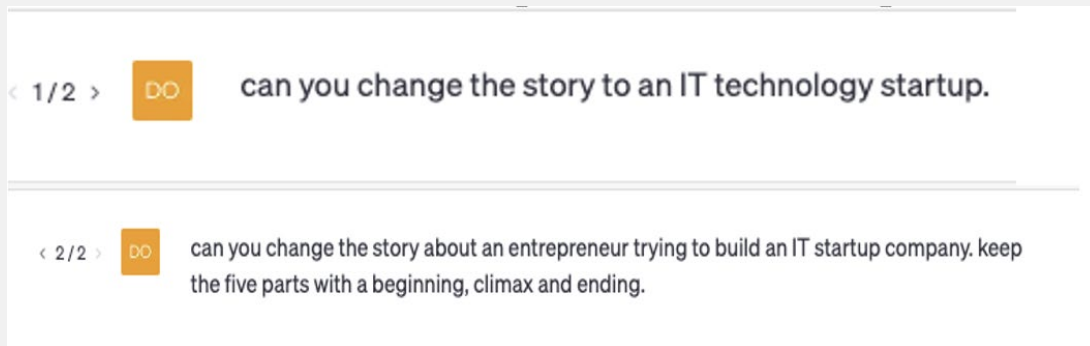
- It is helpful to include the number of story parts (i.e., the story should consist of five parts with a beginning, climax, and ending).
- Prompts must be provided for the opening/ending conversation creation.
- SBL task creation prompts require **output verification** .

Curate the output

- After obtaining the first round of generated output, users may feel conflicted. Some parts of the output are good, while others need improvement.
- White et al. (2023) have suggested using alternative approaches to improve prompt writing.
 - For example, in our SBL task design, the teacher could ask ChatGPT to provide a **different arrangement of four - story elements** (i.e., character, setting, plot, and lesson). If some of the generated output is satisfactory, the teacher can write follow-up prompts to expand those aspects and obtain more details.

Curate the output

- White et al. (2023) have suggested using alternative approaches to improve prompt writing.
 - If the generated output does not meet the teacher's expectations, the teacher can revise the old prompt to retain a neater interaction string with ChatGPT. This editing approach can also benefit the teacher when writing branching scenarios.



Impact on intrinsic motivation to learn

- **Task value** (as one motivational construct of digital storytelling):
 - incorporated into **authentic** scenario - based learning tasks, further enhancing the task value, leading to a higher student learning motivation level (Yang and Wu, 2012)

Impact on learning performance

- **Well-structured scenarios** help make connections between theory and practice (Mamakli et al., 2023).

Impact on learning performance

- **Well-structured scenarios** help make connections between theory and practice
- Requires careful design such as structuring the course around a relevant and **authentic situation**
- **Visual alternatives to texts**
- **Collect information intuitively**

Impact on learning experience

- Most students reported their appreciation of the well - written and realistic scenarios. It provided evidence for teachers to leverage the power of GenAI to create SBL scenarios and tasks.

Impact on learning experience

- Students appreciated the **plot twists** in between the main plots.
- Students were engaged in **role-play** experiences, immersing themselves in fictional characters' **first-person perspectives**. It can positively influence their **self-identification**.
- Our **SBL tasks** were designed with **different difficulty** or challenge levels (e.g., easy and difficult mode tasks).
 - The challenges in our study were communicated clearly to the students in the learning scenarios to ignite students' desire to complete them.

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- Encourage future research to apply the WCV prompting process to other educational contexts.
- **Call for collective efforts to build a resource hub for designing SBL tasks or other instructional strategies.**



Thanks

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