

Interaction in online teaching

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Learning objectives

After this lesson, you will learn and understand:

- The difference between synchronous and asynchronous learning
- The factors that influence online teaching and learning practices
- Learn a few new ideas / tools that can help adding interaction to your courses

Online Teaching

Synchronous vs Asynchronous

- Interaction with Content
- Interaction with Instructor
- Interaction among Students

The SUNY Learning Network (SLN)

- supports asynchronous online courses for the 64 institutions and 400,000 students of the State University of New York system
- 1406 students returned the survey ~ 38% from students
- 77 courses and 22 design features and course variables in a subset of the courses offered in the spring 1999 semester

Student satisfaction, perceived learning, perceived interaction with the instructor, and perceived interaction with peers—were highly interrelated, but not identical.

No correlations were found between any student perceptions and the use of graphical interfaces or between these and the number of links to external websites

Student–teacher interaction has been shown to significantly affect learning

A strong correlation was found between students' perceptions of their interactions with peers and the actual frequency of interactions between students (see following slides)

TABLE I. Spring 1999 student satisfaction survey

Satisfaction with course	Very satisfied	49
	Satisfied	39
	Not very satisfied	8
	Not satisfied	4
Perceived Learning	More than expected	47
	As much as expected	41
	Less than expected	11
	Nothing	1
Perceived interaction with instructor	A great deal	31
	Sufficient	53
	Insufficient	14
	None	2
Perceived interaction with classmates	A great deal	20
	Sufficient	56
	Insufficient	16
	None	8
Personal activity in course *	Much higher	20
	Higher	25
	About the same	35
	Less	20

Student perceptions data: $n = 1,406$.

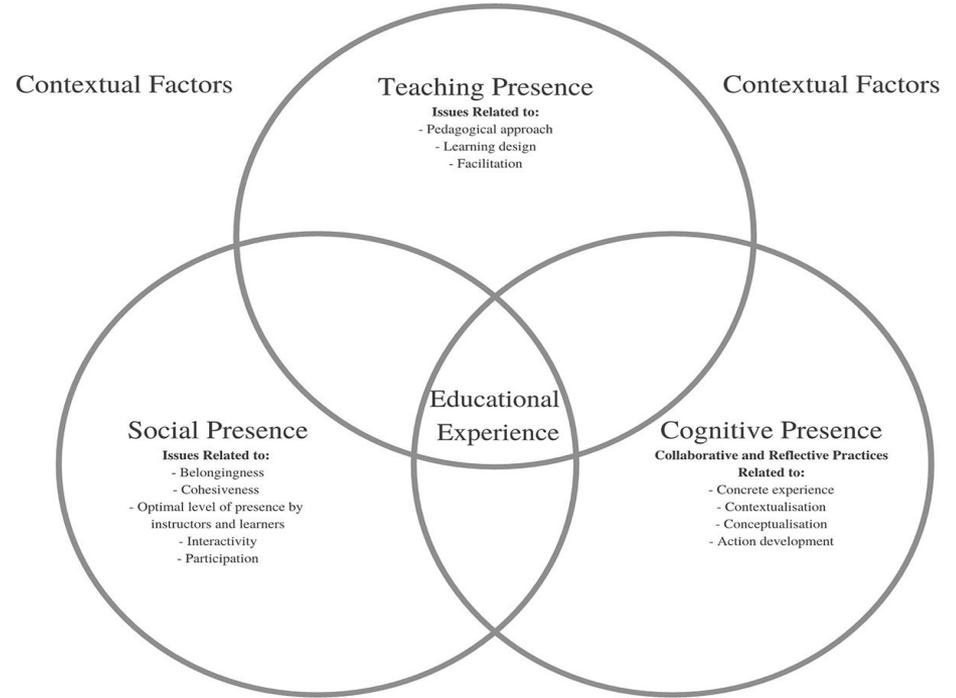
Swan, Karen. "Building learning communities in online courses: The importance of interaction." Education, Communication & Information 2.1 (2002): 23-49.

Factors impacting online teaching and learning practices

Literature on online teaching and learning in the context of teacher education published between January 2020 and April 2020

What are the most recurrent topics explored in the studies on online teaching and learning in teacher education?

What online practices related to social, cognitive and teaching issues have been demonstrated to drive impact on the teaching and learning process in the context of teacher education?



Themes	f	%
Interaction among participants	27	20.1
Online communities	21	15.7
Teacher participation or engagement	15	11.2
Teacher knowledge	11	8.2
Use and effects of video	9	6.7
Feedback or peer assessment activities	8	6
Other themes	43	32.1
Total	134	100

Carrillo, Carmen, and Maria Assunção Flores. "COVID-19 and teacher education: A literature review of online teaching and learning practices." *European Journal of Teacher Education* 43.4 (2020): 466-487.

Practical Quantum Computing - Course Description

Advanced Bachelor, Master level course. No prerequisites, except very basic elements about linear algebra and classical circuits.

Structure: 14 lecture units + 14 tutorial units. The materials focus on hands on exercises with state of the art software tools, such as Google Cirq, IBM QisKit.

Objectives: Introduce the theory and practice necessary for answering:

- What is quantum computing and what are quantum computers?
- What is quantum supremacy, or when will quantum computers become more powerful/relevant than classical ones?
- What can be computed with the currently available quantum chips (NISQ)?
- How does one use the current available quantum chips?
- How is arithmetic performed on a quantum computer?
- What is the surface code? What is braiding? Lattice surgery?

Practical Quantum Computing - Details

Based on a series of bootcamps organised for Google

- international and diverse audience
- physical presence, face-to-face (pre pandemic)
- condensed in 12 hours of intense teaching and practice

Offered 2020 for the first time at the University of Transilvania Brasov, Romania

- three groups of approx. 25 students
- teaching online using Big Blue Button, MS Paint for whiteboard using a graphical tablet, Google Colab for practical examples and coding
- one lecture for all groups, and a laboratory for each of the groups

$Z|0\rangle = |0\rangle$
 $Z|1\rangle = -|1\rangle$

$(-1)^0(-1)^1 = (-1)$
 $(-1)^1(-1)^1 = (1)$

$Z_1 Z_2 |11\rangle = (-1)(-1)|11\rangle$
 $Z_1 Z_2 = Z_1 \otimes Z_2$
 $|1\rangle_2 |00\rangle = |00\rangle$

Pauli matrix:

$$\begin{pmatrix}
 1 & 0 & 0 & 0 \\
 0 & -1 & 0 & 0 \\
 0 & 0 & 1 & 0 \\
 0 & 0 & 0 & -1
 \end{pmatrix}$$

$C(z) = 3z_1 z_2 - z_2 z_3 + z_4$

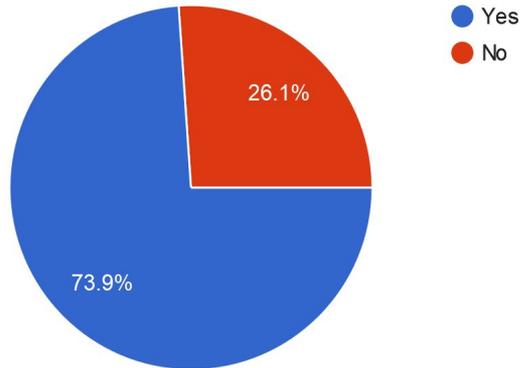
Diagrams showing qubit interactions and gates:

- Qubit lines 1, 2, 3, 4 with gates Z_1 , Z_2 , Z_3 .
- Controlled operations between qubits 1-2 and 2-3.
- Ansatz $e^{i\theta Z_1 Z_2}$ (Pauli matrix).
- Measurement S and P gates.
- Labels: "gishit", "Ansatz", "mixer (heuristic)".

Responses to a short survey (1)

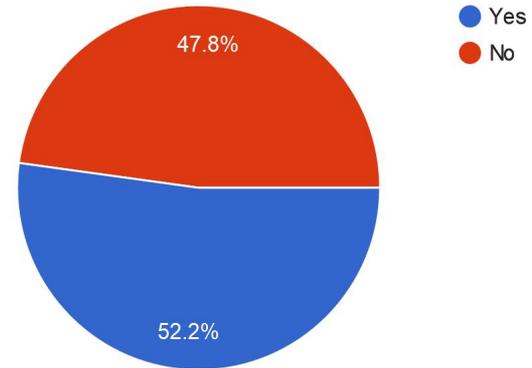
The PQP course was interactive

23 responses



Do you consider that PQP could have been more interactive if face-to-face and not online?

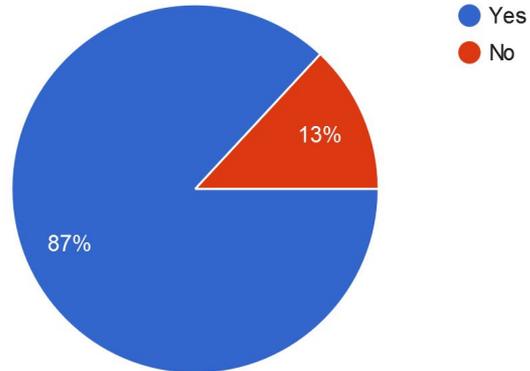
23 responses



Responses to a short survey (2)

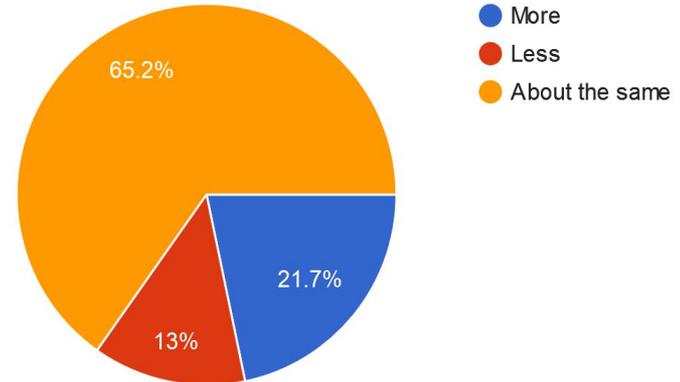
Were the practice sessions (labs) more interactive than the course?

23 responses



In its current, online form is PQP more or less interactive compared to th... you have been attending?

23 responses



Responses to a short survey (3)

Would have evaluated the level of interaction as very low

Surprise result: interaction seems to have been satisfactory

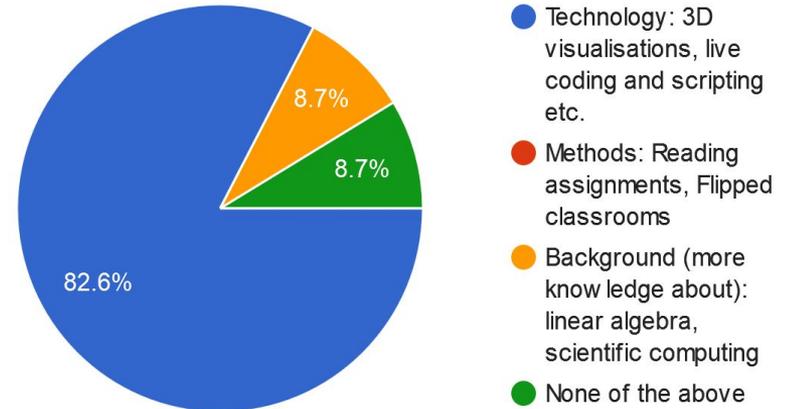
It is not certain if it is possible to further increase it -- see comparison to other courses

Group activities such as live coding encourage interaction

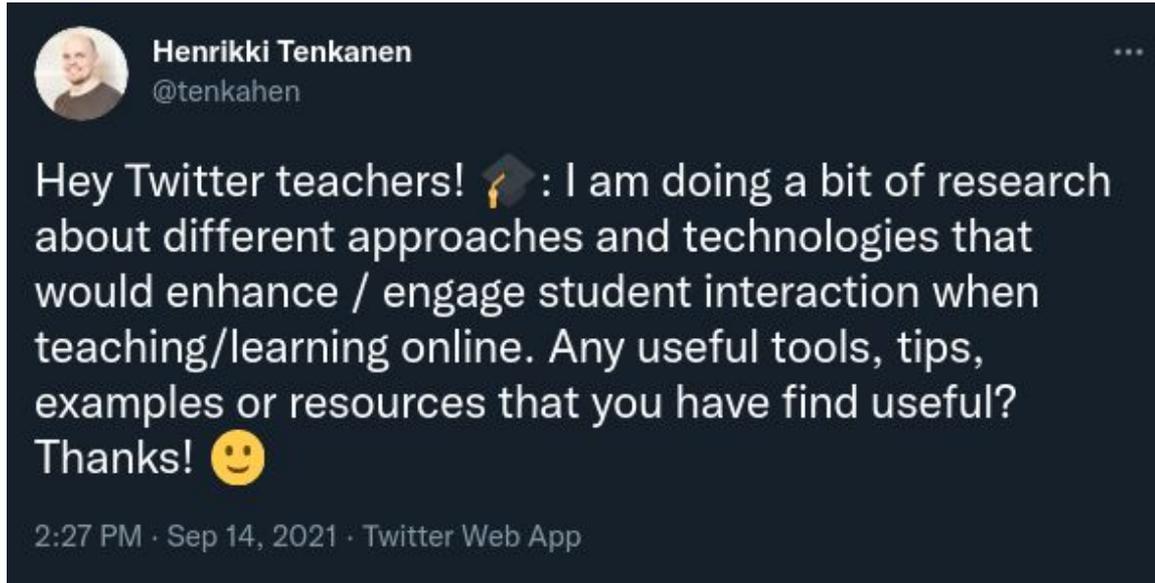
Relation between grades and interaction: although a majority of the respondents found the course interactive and praised it in the comments section of the survey -- the grades were not high

Which of the following would have improved the interaction?

23 responses



What do teachers use for online interaction?



We conducted a small questionnaire on Twitter to find out interesting approaches people have used to enhance student interaction (not very scientific / thorough but still something ..)

Commonly used by most of us nowadays

Interaction with teacher?
Interaction among students?
Interaction with content?



Group discussions



Polls / Quizzes

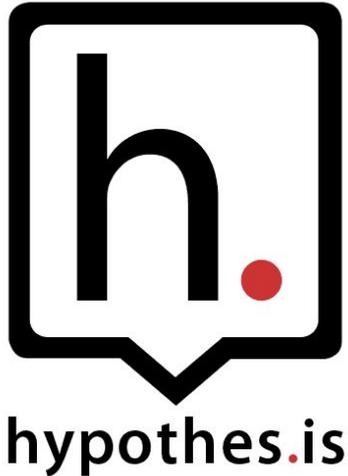


Collaborative content creation (boards)



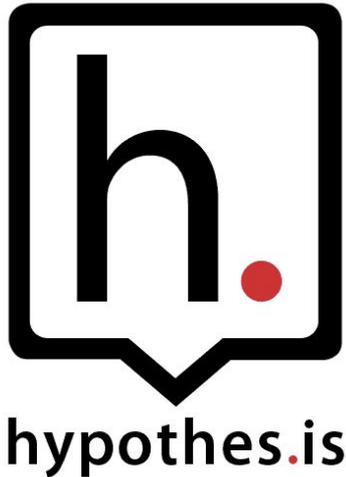
Some interesting / innovative approaches

Interaction with teacher?
Interaction among students?
Interaction with content?



- **Hypothes.is** is an easy to use pedagogical tool that enables students and teachers to have conversations in the margins of digital texts.
- Supports “**social annotation**”:
 - Students can annotate online materials (in groups or individually) and have discussions directly on the web page.
 - Can be used on any web page (Chrome extension) and works also with PDFs (when opened in a browser)
 - Can deepen the engagement with the reading material and supports learning from each other.

Some interesting / innovative approaches



Welcome to the **Introduction to Spatial Analytics** online course that provides the theories, tools, and methods a modern spatial data scientist and an engineer needs to meet the challenges of contemporary data science applied to geographic problems and data.

Learning goals

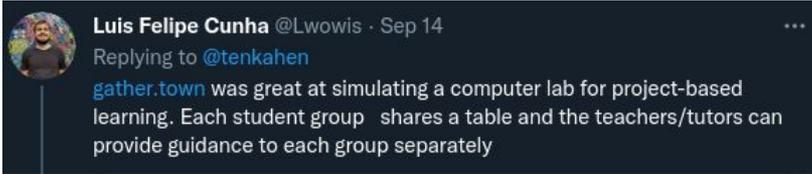
After finishing this course, you should:

- understand the theories and foundations for various spatial methods that are at the core of spatial science
- understand the unique characteristics and challenges of doing analysis with spatial data
- have the technical skills to apply spatial analytics to real-world problems using Python programming and open source libraries (no proprietary libraries are used)
- know how to conduct reproducible science using modern technologies (e.g. using GitHub and Jupyter Notebooks)
- know how to do collaborative coding with class mates (using version control + GitHub)

Discussion happens in the “margins”

A screenshot of the Hypothes.is interface showing annotations on the 'Introduction to Spatial Analytics' page. The interface includes a search bar, a 'Public' dropdown, and a list of annotations. The first annotation is from 'htenkanen' (Public) posted 4 mins ago, with the text 'Welcome to the Introduction to Spatial Analytics online course that provides the theories, tools, and methods that...'. The second annotation is also from 'htenkanen' (Public) posted 2 mins ago, with the text 'understand the unique characteristics and challenges of doing analysis with spatial data'. Below this is a question: 'What are some of the challenges that arise from using spatial data?'. The third annotation is from 'htenkanen' (Public) posted 38 secs ago, with the text 'I think spatial autocorrelation is at least one of them due to the first law of geography, which causes that the observations that are near to each other are not independent.' A red arrow points from the text 'Discussion happens in the “margins”' to the top of the annotations panel.

Some interesting / innovative approaches



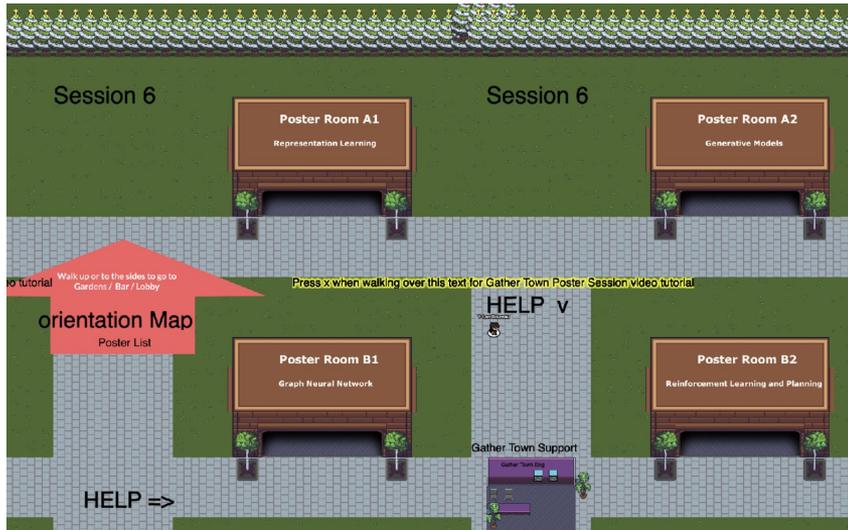
Interaction with teacher?
Interaction among students?
Interaction with content?

- **Gather.town** simulates a real classroom or conference environment in a “digital world” that the organizer / teacher creates for the course / event.
- Participants have avatars and they can move freely inside the environment and discuss/interact with each other on video or via chat



Some interesting / innovative approaches

 **Gather** is excellent for:



Online poster sessions where students can check posters and give presentations to listeners (like in real life).



Whiteboards

Shared documents

Games

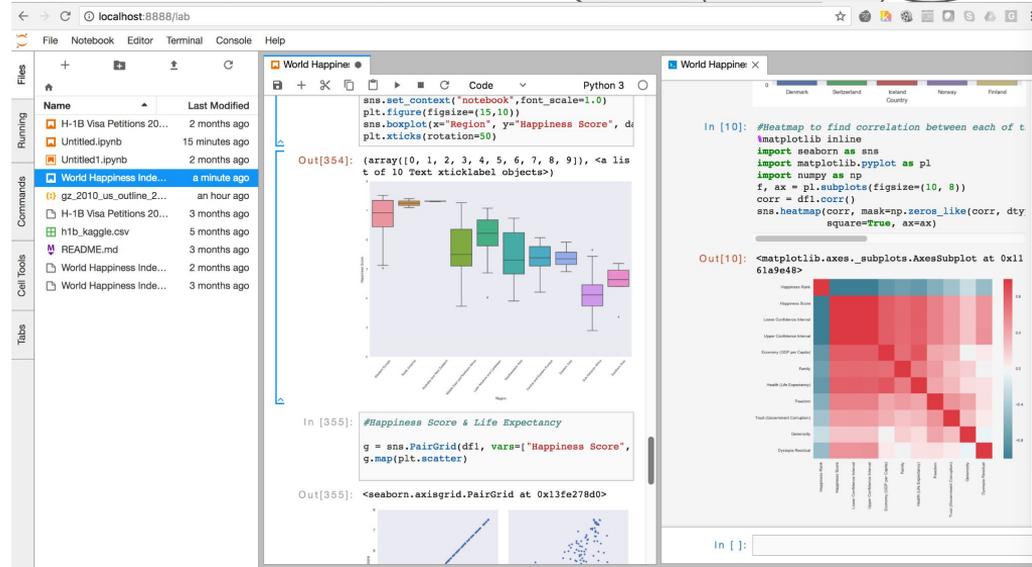
Videos and livestreams

Group work around a table where all participants who are close to the table will see the shared documents (like in real life)

Some interesting / innovative approaches

Interaction with teacher?
Interaction among students?
Interaction with content?

- **JupyterLab** is an online IDE for programming widely used e.g. in data science. Enables doing programming directly in the browser without the need to install anything.
- JupyterLab supports **real time collaboration and sharing the notebooks** with other students or with teachers
- Deepens collaboration between students and allows getting help / comments from the teacher directly into the Notebook in online environment
- If combined e.g. with Hypothes.is and Zoom provides a highly interactive and interesting approach for learning in collaborative manner



Real time collaboration /
programming with JupyterLab

Also Google Colab





Have you used some technology/tool to add interaction to your course when teaching online?

Add your answer here: <https://presemo.aalto.fi/sds/>