

_PROJECT BRIEF
_YLEARN

School of Design 2005
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_INTRODUCTION

The current OLI CSR online course is doing a good job in teaching the core of the inquiry process, but our research led us to identify several opportunity areas.

_TO MAKE THE EXPERIENCE FULL, IT SHOULD:

be immediately engaging.

convey the experience of the whole process.

have relevance to students.

be challenging + foster an sense of accomplishment.

_THEREFORE WE HAVE DESIGNED A SIMULATION GAME WHICH:

is fun and engaging.

includes the whole process, from identifying a problem to applying a solution.

builds upon real world examples.

is challenging, yet possible and supportive.

The game is a blended part of the classroom curriculum; students discuss their progress, and get feedback and from their professor and peers in class.

_FUTURE DEVELOPMENT CAN FOCUS ON:

the inquiry component as an inquiry tool that can be used outside the classroom.

the assessment component of the game to give a powerful tool to teachers.

making the game multi-player + multi-level game that will support the learning process.



_PROJECT DEFINITION

To support learning, understanding, and application of causal and statistical reasoning methods through a learner-centered online environment that scaffolds the inquiry process in a simulated 'real-world' context.

_BACKGROUND

_OLI

The Open Learning Initiative (www.cmu.edu/oli) was instituted as an alternative to traditional [classroom-based] education.

It has two main strengths:

1. courses are open to all, enabling everyone to access top quality post-secondary education.
2. uses the internet to expose students to alternative content and learning pedagogies.

« THROUGH THE OPEN LEARNING INITIATIVE, CARNEGIE MELLON IS SEEKING TO MAKE HIGH QUALITY ONLINE EDUCATION WIDELY ACCESSIBLE AND TO CONTRIBUTE TO OUR GROWING UNDERSTANDING OF EFFECTIVE ONLINE LEARNING ENVIRONMENTS »

OLI currently offers seven classes:

_causal and statistical reasoning

_biology

_chemistry

_economics

_logic

_statistics

_physics

_BACKGROUND

_OLI_CSR

« Causal and Statistical Reasoning » is a course that is meant to teach students the process of scientific inquiry, so students will be able to draw causal conclusions from data that is presented to them. The course integrates conventional classroom-instructor interaction, with an online content system, which replaces the textbook.

« THE CARNEGIE MELLON CURRICULUM ON CAUSAL AND STATISTICAL REASONING [CSR] CONCERNS CAUSAL CLAIMS AND THE SCIENTIFIC PROCESS BY WHICH THEY ARE ESTABLISHED, PARTICULARLY WHERE IT INVOLVES THE USE OF STATISTICAL EVIDENCE. »

While aiming to improve real world behavior, students in the class practice only the technical aspects of the inquiry process. For example, the online material states that students «should be able to critically assess a newspaper report of a study that ‘links’ the amount of violence watched on TV with anti-social behavior.» However, the course does not give sufficient tools to perform such a task. While students will be able to evaluate that report at the end of the course, the online material of the course does not encourage them to look for these cases, to gather the data by themselves, and to apply their conclusions.

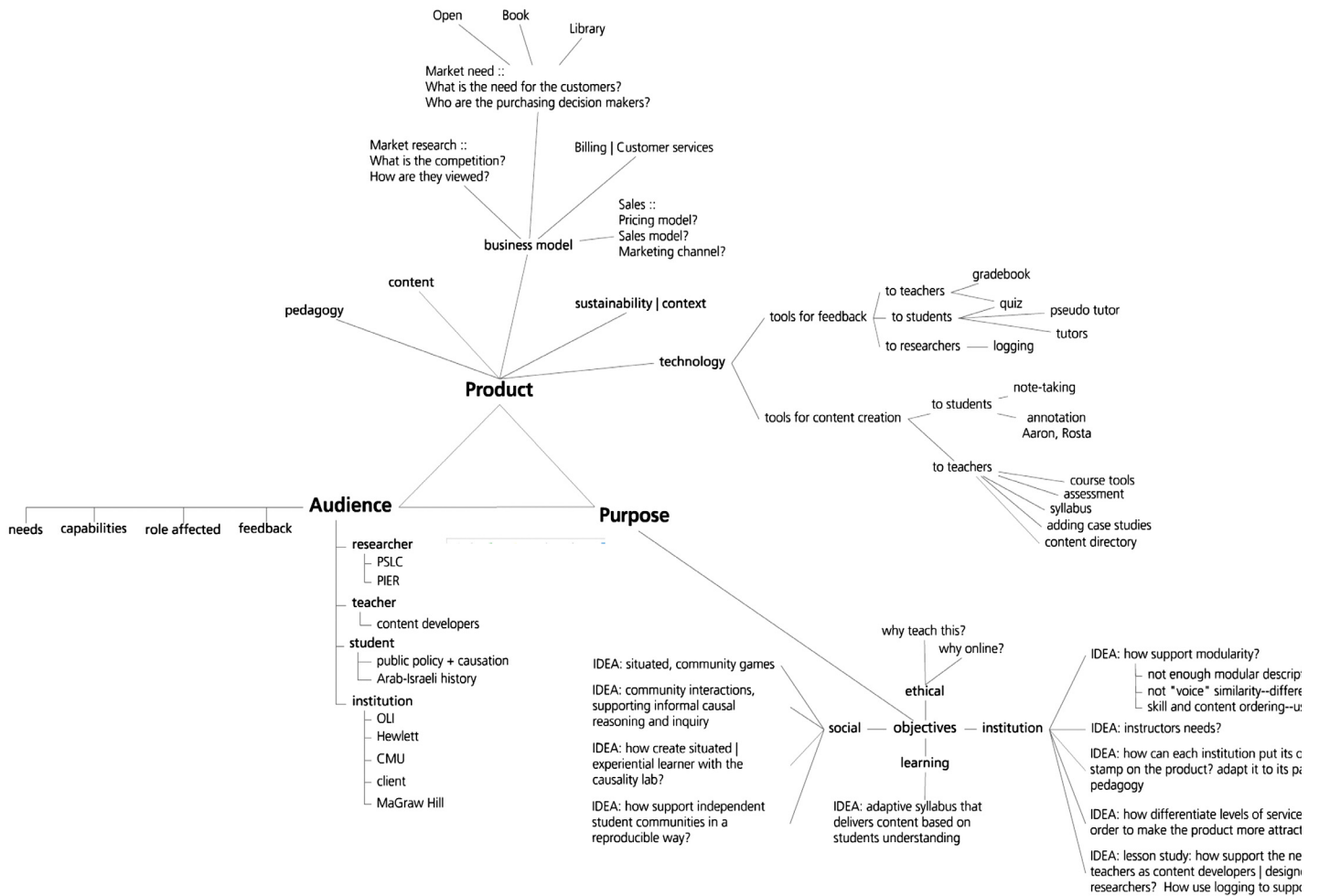
The core of the course is the «causality lab» in which students practice the basics of the scientific inquiry process: raising hypotheses and running experiments to gather data. The rest of the online material is mainly written text, which makes the course less appealing and more frustrating.

_RESEARCH
_TERRITORY MAP

In order to map the relevant components of the task, we created a territory map. The territory map defined all the information to be addressed during the research phase.

We identified three areas of our CSR online environment to research:

- _audience
- _purpose
- _product



_RESEARCH

_TERRITORY_AUDIENCE

_WE STUDIED THE USER OF OUR SYSTEM

[student] a person who uses the online course as part of class or through OLI.

[teacher] a person proficient in CSR who is affiliated with an educational institute.

[researcher] a person who studies the process of teaching CSR.

[organization] an educational institution that uses the system in all its classes.

_FOR EACH OF WHICH, WE CONSIDERED:

_ROLE AFFECTED

how will their role be affected by the new system?

how will it change their everyday practices?

change their goal and role definition?

_NEEDS

what are the needs of each of these people?

what do they need the system to be able to do?

_EXPECTATIONS

why do these people use our system?

what do they expect to gain from it?

_CAPABILITIES

what are the capabilities of these people?

what do they do that can catalyse an interaction with the system?

_FEEDBACK

what feedback do these people need from each other + from the system?

_BELONGING

what is the higher-level organization to each of the people?

how does our system affect this level?

_RESEARCH

_TERRITORY_PRODUCT

_ASPECTS OF OUR PRODUCT

_CONTENT

what should the product teach?

what part of the CSR course do we want to focus on?

_PEDAGOGY

how should the product teach it, to support maximum learning?

how do successful CSR textbooks work?

how do successful e-learning systems for other domains work?

can we combine the two?

_TECHNOLOGY

what does technology enable us?

how should it be used?

how is it currently used to support each of our audience?

_BUSINESS MODEL

what should be done to make a profitable product?

what are the needs of the market?

what are the competitive systems, both online and textbooks?

_CONTEXT + SUSTAINABILITY

how will the product be used?

what will insure its up-to-date-ability?

_RESEARCH

_TERRITORY_PRODUCT_BUSINESS PLAN

_PROBLEM: HOW CAN A SMALL COLLEGE BE COMPETITIVE IN ON-LINE ENVIRONMENT?

large online schools have continually increased enrollment by 20-25% a year (at 3m in 2004), while small colleges face dwindling enrollment, and both small colleges and universities are facing increased costs and enormous budget pressure.

While small colleges and universities have much to gain from the reduced costs and scalability of-line education, in-house technology development is costly out of reach of most institutions, and textbook vendors who provide multimedia content to these universities are often in direct competition with these schools.

_SOLUTION: OLI

OLI allows small colleges and universities reap the benefits of on-line instruction is cost effective, revenue generating, brings innovative technology and content which is increasingly important in more competitive market

OLI offers specialty courses, such as Causal and Statistical Reasoning which small colleges lack the specialized faculty to teach, general courses that reduce the cost of instruction by reducing the number of hours of classroom lectures, and provides scalability since there are essentially no limits to adding students to the online sections.

Small colleges will benefit most from the specialized classes and reduced costs, and Universities most from reduced cost. OLI is most valuable however, to small community colleges which benefit from specialized classes, reduced costs, and scalability.

_PRICING STRATEGY

OLI will pursue a volume discount pricing strategy, with the cost per student being slightly less than a text book. This allows schools to test-drive OLI with little risk, and as they enroll more students in on-line sections, offers them a volume discount.

_PRICING PLANS

single-user (less than 30 students) → \$75 → no rebate

single-section (30-59 students) → \$60 → 2% rebate

multi-section (60-249 students): \$50 → 5% rebate

unlimited (350+ students) → \$50 per student or \$12,000 → 7% rebate

_RESEARCH

_TERRITORY_PURPOSE

_IN DEFINING THE OBJECTIVES OF OUR SYSTEM, WE CONSIDERED:

_ETHICAL

why teach CSR?

why online?

_SOCIAL

what are the roles of the community in the learning process?

how can we situate our system in the real world?

_INSTITUTIONAL

what is the cultural stamp that each institution brings?

_LEARNING

what should the syllabus that includes our system look like?

_RESEARCH
_METHODS_EXPLORATORY

We used exploratory research methods to evaluate what currently exists:

_READ THE LITERATURE

we read literature about e-learning systems, cognitive basis of learning, collaboration theories and design directions and ideas. This survey helped us map the tools that are being currently used.

_INVENTORY WORKSPACES

we surveyed the workspaces of our main audience – students and teachers. Doing this taught us about their culture of studies, and gave us the broader picture in which our system will have to integrate.

_SURVEY INSTRUCTORS

we published an online survey for CSR teachers, to get a more comprehensive understanding of the needs of such teachers, in the different institutions in which CSR is being taught.

_INVESTIGATE THE COMPETITION

we surveyed existing solutions in three dimensions. (i) We looked at existing CSR textbooks, in order to view their approach to teaching this domain. (ii) We looked at successful e-learning systems, to learn how should the medium be used for educational purposes. (iii) we looked at online games and online communities, to gain better understanding of the emotional aspect of our system – fun and interaction with other people.

_MARKET RESEARCH

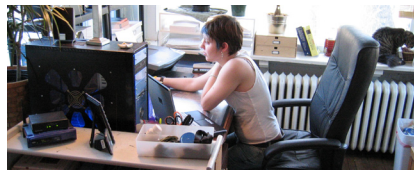
we learned the needs of our markets, to be able to produce a system that will address these needs better than our competitors.

_<<WALK A MILE>>

we went through parts of the current CSR course, in order to experience the difficulties that students face when learning CSR using the current OLI curriculum.

_INTERVIEW THE EXPERT

we interviewed the CSR teacher that designed the current OLI system. This interview revealed us to the demands and requirements from such a system, as the class teacher sees it.



_RESEARCH
_METHODS_GENERATIVE

In addition to the exploratory research, we conducted generative research, in which we collaborated with research participants (from the identified end-user group).

_MAKE/TOOLS

we gave our users the opportunity and elaborate their thoughts about e learning and about causal reasoning. Each user had a large set of meaningful and meaningless images and words that were related to learning, inquiry, experience, interaction, and others. The users created maps of their ideas and thinking process, while we prompt and question them to help them develop their thinking process.

«IT HAS BECOME INCREASINGLY CLEAR THAT WHEN WE PUT ALL THE MAKE/TOOLS TOGETHER, WE CAN SEE A PARTICIPATORY DESIGN LANGUAGE THAT ENCOURAGES EVERYDAY PEOPLE TO EXPLORE AND EXPRESS THEIR THOUGHTS AND FEELINGS ABOUT THEIR EXPERIENCES (PAST, PRESENT AND FUTURE). THIS LANGUAGE GIVES THEM THE OPPORTUNITY TO CONSTRUCT VERY EARLY AND ROUGH PROTOTYPES OF THEIR DREAMS.» (Sanders, E.B.-N. talks about Sanders, E.B.-N. and William, C.T., Harnessing People's Creativity: Ideation and Expression through Visual Communication, In Langford, J. and McDonagh-Philp, D. (Eds.) Focus Groups: Supporting Effective Product Development, Taylor and Francis, 2001.)

We did this process with three students who have taken a CSR course and three who haven't. This distribution revealed to us both the ideas of the CSR novices, as well as the experts. We did a set of two exercises with each user, each of which included two phases.

_EXERCISE 1: CAUSAL REASONING

_WARM UP

why do you think that prisoners return to crime?

_MAKE/TOOL

how would you teach this process? Visualize how you could reason «better»

_EXERCISE 2: IDEAL LEARNING EXPERIENCE

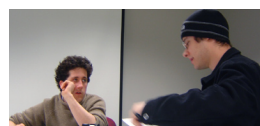
_WARM UP

describe the best learning experience you have had.

_MAKE/TOOL

make a collage to illustrate the parts of the ideal learning experience for you.

The outputs of this exercise were individual posters, on which our users documented their thoughts and dreams regarding the two components of our project – the reasoning and the learning process.



_RESEARCH
_METHODS_EVALUATIVE

We tested a prototype with four users, to have early input on our design direction.

We videotaped their interaction with the prototype, and gave them a questionnaire to evaluate:

_LEVEL OF IMMERSION AND INTEREST IN THE GAME
range from 1-5 on Likert scale

_LEVEL OF CARING FOR JACINTO
3-5 on Likert scale

_EXPECTATIONS FROM THE GAME: WHO DO YOU THINK IS THE TARGET AUDIENCE?
6th grade
teens? younger?
like a 14 year-old boy, girl
middle school aged students

_ART AND SCRIPT DIRECTION: WHAT DID YOU MOST LIKE?
drawing style
jacinto's mouth moving
the office lady, the donkey...
mouth moving all the time, head bobbing

_ART AND SCRIPT DIRECTION: WHAT WOULD YOU CHANGE?
too much speech, not enough interaction
bobbing head is really weird
better sound quality

_DESCRIBE THE ANIMATION...
funny
fun to watch
cute



_SYNTHESIS
_INQUIRY_FRAMEWORK

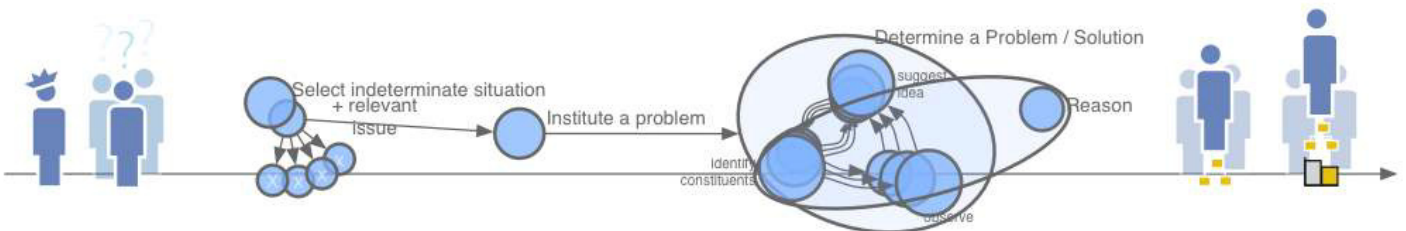
We mapped the inquiry process to identify the framework for our environment.

_THE INQUIRY PROCESS BEGINS WITH IDENTIFYING A PROBLEM

_THEN AN ITERATIVE PROCESS BEGINS WITH
possible explanations
trying it out
collecting evidence
refining the explanation

AND ENDS WITH AN EXPLANATION THAT IS SUPPORTED BY THE DATA

FINALLY, A SOLUTION IS DESIGNED AND IMPLEMENTED TO SOLVE THE PROBLEM



_SYNTHESIS
_FINDINGS

Our research showed us that there are two groups of needs. While the group of students and group of teachers interact with each other, the needs and opportunities of each of these groups are very distinctive.

_SYNTHESIS

_FINDINGS_STUDENTS

A system for the students should be:

_KNOWLEDGE CENTERED

it should make the students think.
it should provide knowledge resources and teach inquiry.
it should build upon prior knowledge and intuition.

_LEARNER CENTERED

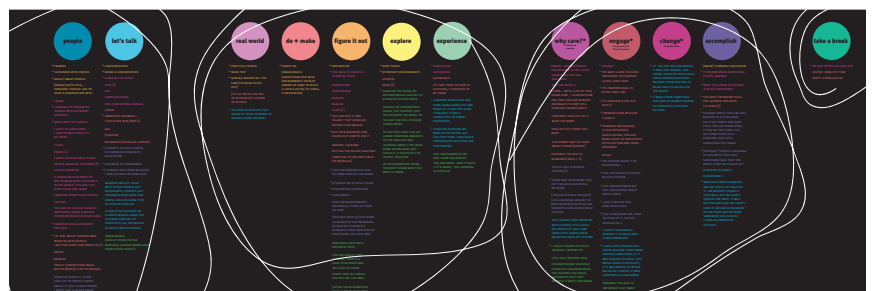
it should be entertaining and interesting.
it should be relevant, concrete, and useful.
it should support the emotional state of learning.

_ASSESSMENT CENTERED

it should evaluate the knowledge level of the student.
it should supply students with appropriate, constructive and frequent feedback.
it should give the students the opportunity to evaluate their own knowledge.

_COMMUNITY CENTERED

it should promote collaboration.
it should create a sense of community, within the classroom and outside school.
it should encourage peer teaching.



_SYNTHESIS

_FINDINGS_TEACHERS

We identified the following requirements from a system that would serve teachers:

_ASSESS

allow teachers to assess their students' knowledge level frequently and reliably. Teacher should be able to map the understanding level of their students in a small grain size, for specific sub-domains and concepts.

_EVALUATE

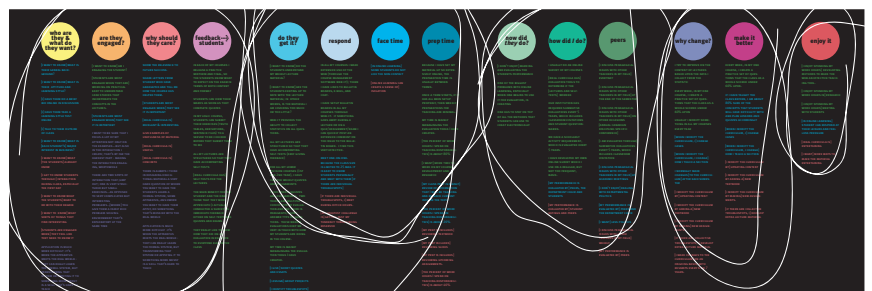
use the mapping of the students' knowledge level to evaluate the effectiveness of different units in the curriculum and the instruction.

_CONNECT

allow teachers to interact with each other, and exchange knowledge, experiences, and ideas.

_MODIFY

assist teachers in identifying and improving pieces of their instruction that require the most update.



_SYNTHESIS

_FINDINGS_FRAMEWORK

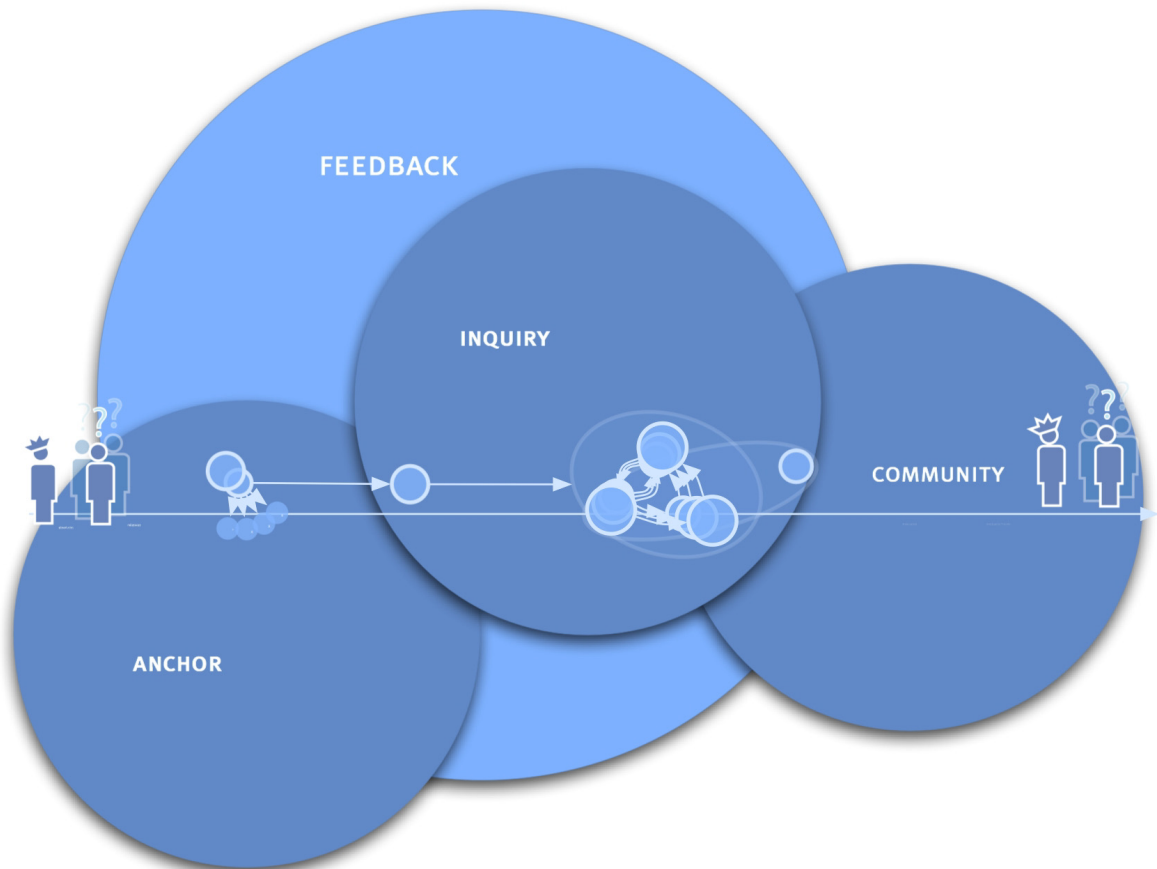
_THIS FRAMEWORK PRESENTS THE CENTERS OF NEEDS AS IDENTIFIED IN THE RESEARCH PHASE

+ an emphasis on anchoring the problem should be made, especially when introducing the domain and focusing on problems within it.

+ the core of the inquiry process, in which the students learn how to identify well defined causes, has a solution within the current OLI-CSR course.

+ community is especially important for applying the solutions. [Analogously, the community of educators applies changes to the curriculum based on conclusions from an analytical process]

+ relevant feedback should be given along all this process.



_DESIGN OPPORTUNITIES

While some of the requirements from the tool are similar between teachers and students, (for example, the need for support for the community, or a robust tool that suits real world application), there is a major difference in the functionality of the tool, since the requirements of a community of teachers are different than the requirements of a community of students.

An online CSR course should focus on one aspect of the needs, while trying to address other needs as well. For example, a student-centered system should still give sufficient opportunities for assessment for the teacher.

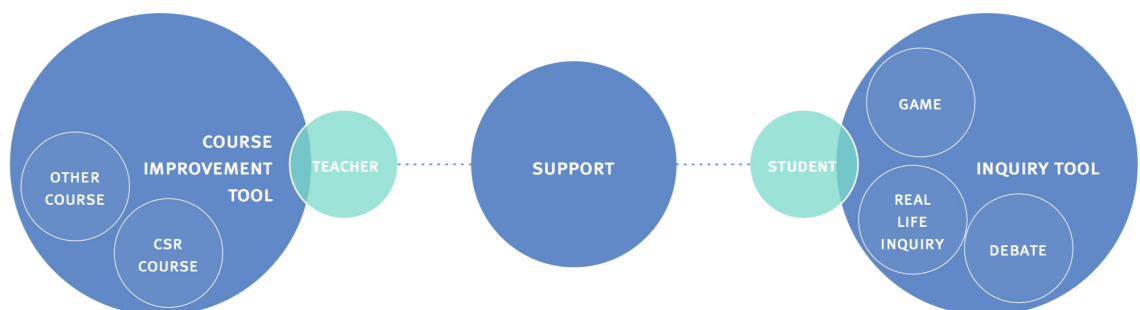
The following diagram includes the following approaches:

_STUDENT CENTERED

an important need of the students is a robust inquiry tool, which will help them conduct the inquiry process in real world problems. This tool can be part of a game, a real world inquiry system, or a semester-long curriculum based on debates.

_TEACHER CENTERED

an important need of the teachers is the course improvement tool, which assists teachers to improve their instruction. This can be done specifically for the CSR course, or in a more robust way across courses.



_DESIGN DIRECTIONS

_ITERATIONS_STUDENT-CENTERED GAME

A game is a great opportunity to practice real-world inquiry process. It is natural and engaging, and can be continuous (project-like). In addition, it has basic familiar mechanisms of community, achievement, progress and collaboration.

Among such possible games are:

_CAUSAL DETECTIVE

A role-playing game, in which the player is an investigator that solves mysteries using his scientific reasoning skills. A scientist helps the player to conduct the inquiry process.

_CAUSE CITY (THE MAYOR)

A «Sim City» type game, only in the real world. In this game the player is a mayor of a city, and needs to deal with the city growth problems (such as transportation, pollution, etc). these problems can be solved by applying scientific reasoning processes. A group of advisors helps the player in his first moves as a mayor.

_THE LAWYER

A role-playing game in which the player is a lawyer that tried to defend his client. The lawyer tries to find the real causes of events by applying causal reasoning to the known facts, and by gathering additional facts to support his case.

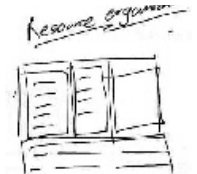
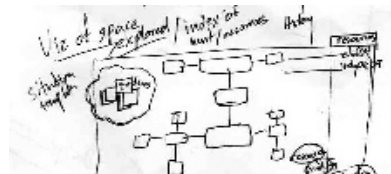
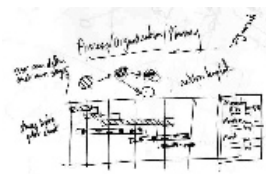
DESIGN DIRECTIONS

ITERATIONS_STUDENT CENTERED_REAL-LIFE INQUIRY

The system can serve as the bridge between the curriculum and real-world examples, and between school and life outside it. This can be done by building an inquiry tool that supports the independent inquiry process of the user.

The user, which in this case continues to use the system after the class, can add problems, variables and real data to the system, in order to draw valid conclusions.

Such a tool can be used to analyze information for a class project, a debate, or to form an opinion on a matter of interest.



_DESIGN DIRECTIONS

_ITERATIONS_STUDENT CENTERED_DEBATE SCHOOL

This idea has a different time line – it is a semester long curriculum which evolves around an array of debates.

In this class students are conducting multiple debates, and learning methods of causal reasoning through preparing their arguments.



_DESIGN DIRECTIONS

_ITERATIONS_TEACHER CENTERED_LESION STUDY

The lesson-study idea focuses around the need to evaluate + improve classes from year to year.

It assists teachers to bring their experiences and ideas together, in order to improve the most needed units of the class. This is done in several stages:

_ASSESSMENT

of students and mapping of their knowledge

_IDENTIFICATION

of clusters of misunderstanding, in which large group of students has similar gaps, which suggests lack of adequate instruction.

_EXCHANGE

of the knowledge between teachers in the community in order to compare situation.

_PROPOSAL

of alternative pedagogies to improve units that are identified as requiring a change.

The process is iterative and each year a different unit is improved.

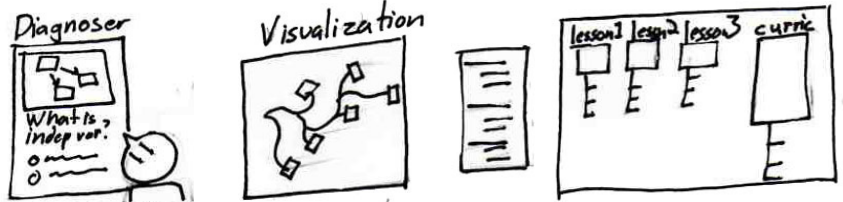
This idea can be developed in two directions:

_ACROSS CLASS

a robust tool that will enable teachers in every domain to improve their classes.

_A CSR FOCUSED PROCESS

since the process of identifying the instructional gaps is an inquiry one, connections can be drawn from this process to the inquiry process that is taught in class.



_DESIGN DIRECTIONS
PROPOSAL <<JACINTO>>

We chose to develop a game in which the player is a consultant to a non-governmental organisation in a developing country.

During the game, the player is revealed to different pseudo-real world problems, studies them, gathers data, analyzes it, comes up with intervention, and applies his or her solution to improve the situation.

The game is incorporated into the classroom instruction, and the player alternates between class discussions and individual progress in the game.

This approach deals with the first two of the four groups of needs identified before:

_ANCHOR

the game draws from real world stories in order to come up with tasks. This gives the player an example of how the process that is learned in class is relevant to everyday life.

_INQUIRY

the heart of the game is the inquiry process, which the player uses to solve the mysteries that are presented to him or her.

_COMMUNITY

classroom discussion and feedback contributes to the sense of community in the game. A multi-player version enables students to play with each other and exchange ideas.

_FEEDBACK

the actions of the player in the game are a structures opportunity for the teacher to trace individual students in a comprehensive way, and to give the students tailored feedback.

In addition, being a game, the system is engaging and motivating, and thus improves the pleasure and motivation in learning CSR.

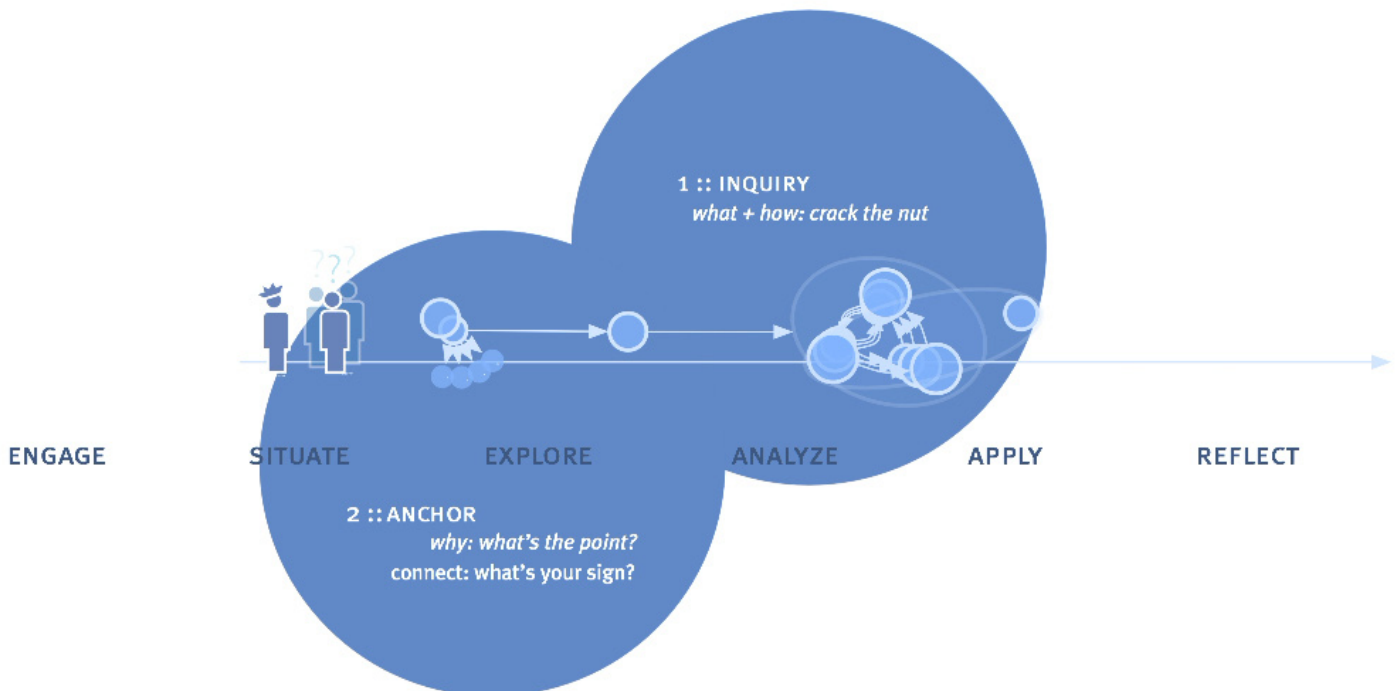
_DESIGN LANGUAGE

_01

From the moment students walk in the door, we want them to experience the challenge and excitement of doing science, and start teaching them to reason like scientists. To meet this goal, we've designed a "serious" game, whose purpose is partially to entertain, and primarily to teach. We describe our solution in terms of a "design language," which Rheinfrank and Evenson define as consisting of:

«...AN UNDERLYING SET OF ASSUMPTIONS AND DESIGN PRINCIPLES, INTERFACE DESIGN ELEMENTS, GUIDELINES FOR THE COMBINATION OF THE ELEMENTS, AND EXAMPLES SHOWING HOW THE PRINCIPLES, ELEMENTS AND GUIDELINES CAN BE APPLIED AND USED.»

In other words, our design language describes the pattern of a set of games one could design for teaching scientific inquiry. We have tried to describe our pattern in enough detail so that other designers and developers could create different games that serve the same purpose. The diagram below shows the components of our design language mapped to areas of our conceptual framework (anchoring + inquiry) that are addressed by our design. Note that because we're trying to teach scientific inquiry, our design language also considers issues of teaching and learning that are not strictly necessary for those only practicing inquiry.



_DESIGN LANGUAGE

_O2

In more detail, our design language consists of the following elements, (or rather events, since we are designing interactions), that occur in roughly the following sequence:

_ENGAGE

pose a problem that is interesting to the student, related to their current goals and the related to the goals of the course that we hope students will take as their own.

_SITUATE

give students a challenging, concrete, real-world problem/goal that can be understood through a specific instance. Students learn better when they start by understanding specific examples before moving to abstractions and generalizations.

_EXPLORE

arouse curiosity by giving students a chance to try to solve the problem and discover its complexities. Since the design creates a learning opportunity through a situation in which the student's expectations do not match reality (creating failure) the environment should be emotionally forgiving.

_ANALYZE

once the student have been given a problem that they want to solve but cannot, they are then ready to learn. At this point, the design should present or review the core knowledge, skills and principles needed to solve the problem without providing the answer.

_APPLY

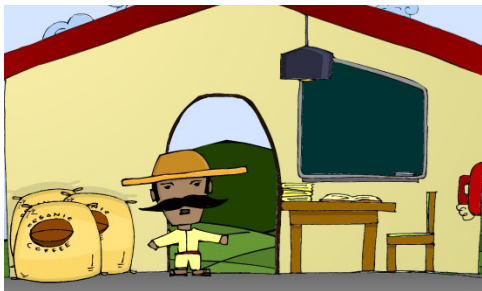
after learning the core knowledge and skills, students must have a chance to apply their knowledge in new situations. Applying the principles to differing situations facilitates learning.

_REFLECT

since students' will not necessarily be able to explicitly identify the steps of the inquiry process they have just experienced, it is important for them to discuss and reflect upon their experience so that they can conduct their own inquiries in the future.

_MONITOR + ASSESS

while not the focus of our design, the design should facilitate the teacher's monitoring and assessment of students' understanding throughout the in-query process to inform classroom instruction.



_ORDERING TUTORIAL

« So, I usually start with a guess of around 20 bags to roast every week. [demo here to teach how to order...hints on screen: (1) there is a delay, so orders take two weeks to get here (***) what's the rationale for this?) + (2) each surplus coffee bag I have costs me 1 peso to store, and each bag I am short on costs me 2 – so I try to keep my inventory low – as close to zero as I can] Then Senor Martinez calls me with his order, and it's either dead on, in which case I do a little dance and give Rosita a carrot, [animation: demo] or he wants way more or way less than I have, in which case: no dance. No carrot. So give it a shot! »



_NATALIA GIVES IT A TRY...

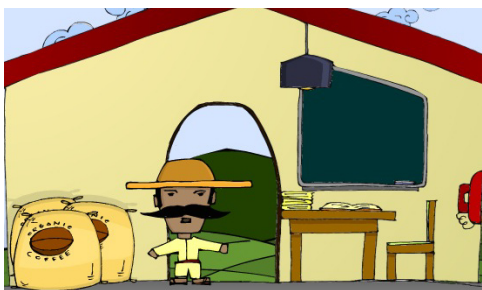
Natalia chooses how much coffee to order each week.



_ROUND ONE

[Music plays, Jacinto says some of the following depending on Natalia's performance]

- Um, so are you *trying* to ruin me?
- + Yeah baby! Now we're talkin!
- Ouch! That hurt!
- Maybe we should ask Rosita...



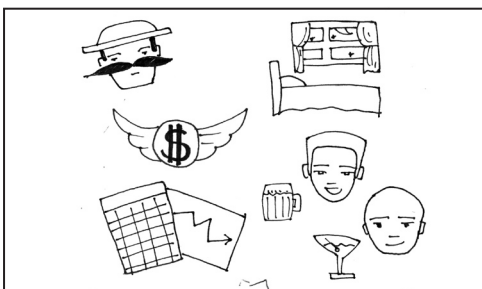
_A SAD DAY FOR JACINTO

« Thanks. Thanks a lot. It's really fine. I mean to see EVERYTHING I'VE WORKED MY WHOLE LIFE FOR become totally worthless is just great. Really. I mean that. I'm not bitter. I mean, what would I have to be bitter about? »



_WHAT HAPPENED?

At this point, the simulation does not match with Natalia's expectations creating a "cognitive conflict". In other words, she has a problem she wants to solve and is ready to learn.



_WHAT NOW?

Natalia chooses one of several directions to go in, looking at data, exploring the town, partying (for comic relief).



Field Report

1. How did you feel running the chain?

2. What do you think about how people ordered? Did they order skillfully? Did they have your best interests at heart?

3. What was happening with your orders and inventory during the first few weeks?

Submit



1. Learn about the supply chain

	Inventory	Orders	Revenue	Cost	Profit	Inventory	Orders	Revenue	Cost	Profit
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0

_REASSURANCE FROM MARIANA @HEADQUARTERS

« Listen Natalia - going out in the field can be a big pain because you have no idea what the problem even is, I know – so don't worry too much. But hopefully you made some observations. That's the big starting point. Okay, the observations are the starting point, but this is the...thing that comes after that. »

_DEBRIEF MARIANA

«So there's another form to fill out – I know, it's a total bureaucracy – but would you rather be doing a workbook? That can be arranged you know. I'll call your teacher right now if you want. »

[The players fill out assessments that are embedded in the game. Since it flows naturally from the players activity, it doesn't feel like a test.]

_ASSESSMENT I

Professor Hoffmann receives the debriefings from Natalia and her classmates, so he has a pretty good idea of where the class is at [in real time!].

_MARIANA'S PROMPT: LOOK FOR CLUES

« Hey – I looked at the report and, ah, yeah. Let's just move on shall we? Why don't you check out the rest of the town. See what people know... »

[Natalia chooses which people to talk to from the town.]

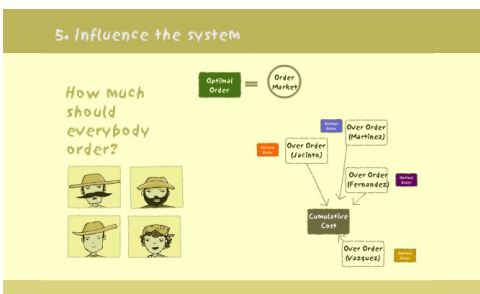
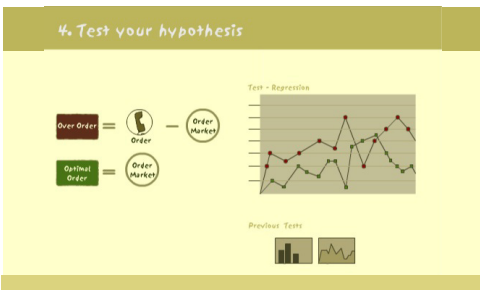
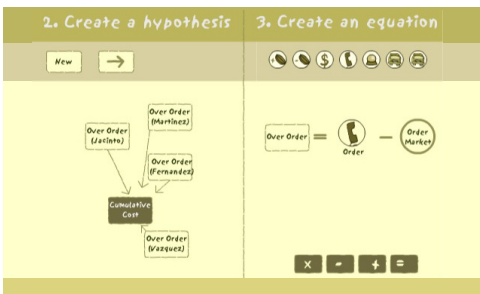
_MEET MARIA

« I'm Maria Fernanda Delgado, and I run Café Los Tres Rios. Obviously I need coffee to sell to my customers, but sometimes the wholesaler is short, which is a huge nightmare for me. Is it the weather? A bug eating the crops? Does it 'fall of the back of a truck' somewhere?! I don't know. All I know is that when someone walks through the door and asks for coffee, I've got to have some-thing to pour into a cup. »

_WHAT DO I DO WITH ALL THIS INFORMATION?

When Natalia returns to the lab, she sees data for variables that she's encountered through ordering coffee for Jacinto, and from talking to people in the town. At this point in the causal and statis-tical reasoning course, she will have some idea of what to do with the data, but may be uncertain of exactly how to proceed.

: : MONITOR + ASSESS :: MONITOR + ASSESS :: MONITOR + ASSESS :: MONITOR + ASSESS ::



_READY TO LEARN

Now that the students have a problem they want to solve and a reason to use the data, the teacher reviews the core principles covered in the class to help the students formulate a plan for using the data to win the game.

_NATALIA GETS AN IDEA

Now that Natalia has a good idea of what to do, she starts to use the skills in the game.

_HYPOTHESISE

Natalia creates a hypothesis by proposing variables and causal connections between the variables. For every variable she creates, she must write an equation for the variable in terms of variables/data observed in the game. This is a very educationally important aspect of the game because it allows Natalia to practice the difficult skill of operationalizing variables.

_VERIFY HYPOTHESIS

Once Natalia has created a hypothesis, she can check the validity of her causal connections by creating histograms and regression plots of correlations between variables, just like in the causality lab.

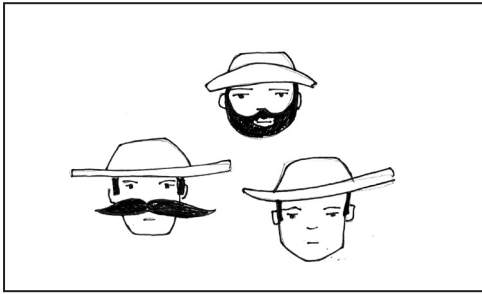
_PLAN INTERVENTION

Once Natalia feels that she has a good hypothesis, she plans an intervention by writing equations for how each person in the supply chain should order. The equations are written like scripts in Apple's "Automator" or in the "Alice" programming language editor (i.e. it can be done by high-school students and novices).

_WATCH RESULTS

Natalia gets to watch the results of her intervention play out as the people in the town order coffee according to her instructions.

:: ANALYSE :: :: ANALYSE :: :: ANALYSE :: :: ANALYSE :: :: ANALYSE ::



_THE THRILL OF VICTORY...EVENTUALLY

If Natalia's instructions to the townspeople are effective and the supply chain operates at a low cost, the townspeople celebrate, otherwise, they complain and send Natalia back to the office to try again.



_SUCCESS!

Natalia wins the game.

Field Report

1. How did you feel running the chain?

2. What do you think about how people ordered? Did they order skillfully? Did they have your best interests at heart?

3. What was happening with your orders and inventory during the first few weeks?

Submit



_FIELD REPORT

Mariana prompts natalia to submit a final field report [i.e.a post-test].



_ASSESSMENT II

Professor Hoffman automatically receives the students' post-tests and a visualization of how the class did as a whole. This helps him plan the next session when the class will reflect on the inquiry process they've just been through.



_YOUR NEXT MISSION...

« Okay, don't get too excited. Things look pretty good in el Cerito—at the moment. But hey, who's to say you won't figure out all the big problems in the world? I mean, now that I think about it, you probably will. Woo-hoo! No more poverty! No more childhood obesity! I guess I'll just go play mah-jong with Jacinto... »



_DISCUSS

Professor Hofmann reviews the inquiry process with the class so that they will be prepared to handle the next, more challenging inquiry problem with more independence.

_VISION

_DESIGN OPPORTUNITIES

The game can be further developed along three dimensions which echo the opportunities that were identified earlier in the development process.

_TEACH

the support of the game in the CSR teaching process can be improved.

- to achieve this, the game can:
 - be multilevel
 - be multiplayer
 - rely on detailed cognitive modelling of inquiry

_EVALUATE

the game can serve as a better tool for teachers, giving them opportunities to:
evaluate: students while playing the game.

create: a community of teachers to exchange ideas, practices and opinions.

engage: the teachers in a constant process of improvement of the game.

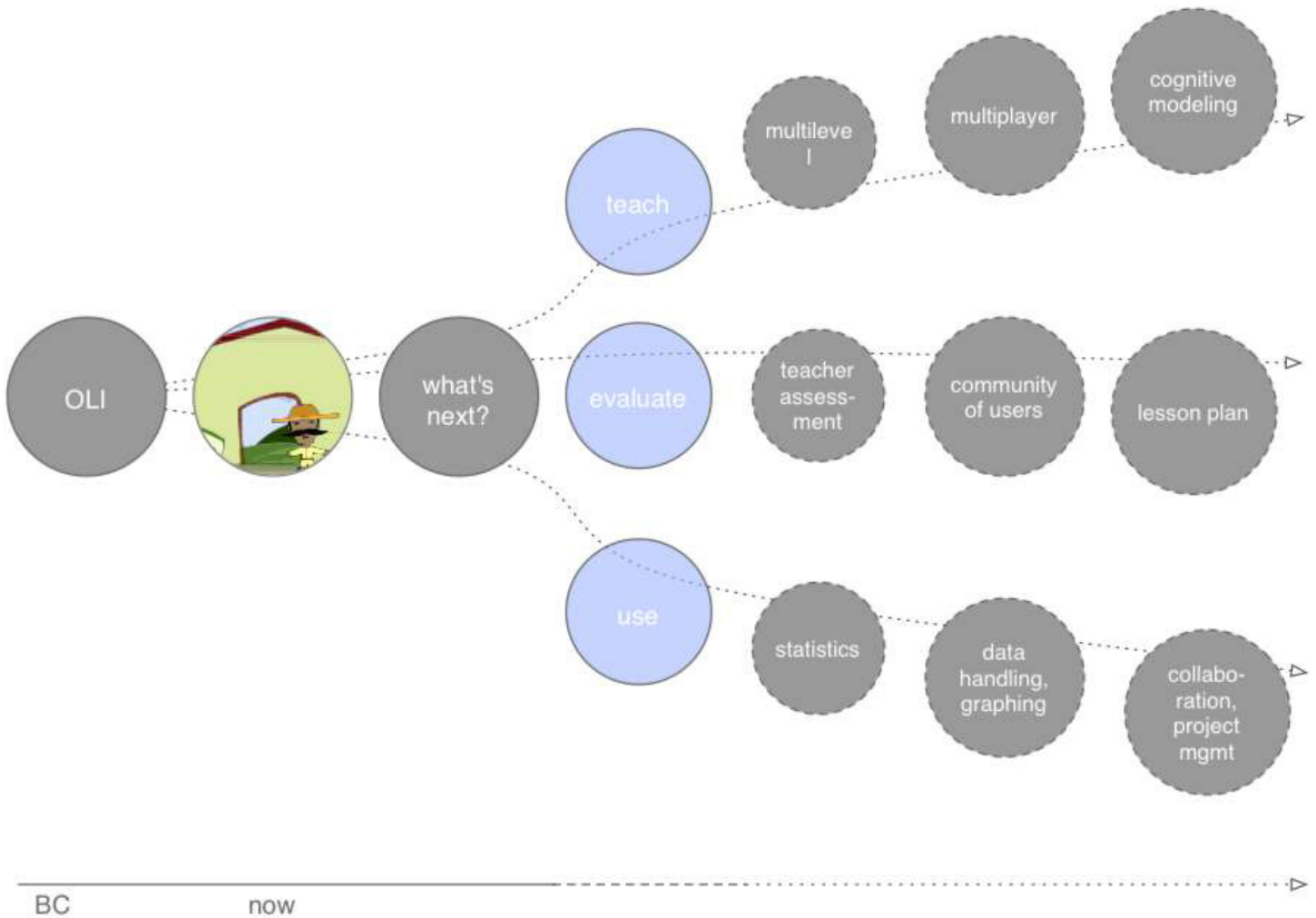
_USE

the game can be used as an independent inquiry tool, by giving it the capabilities to:

analyze and manage data, including data that originates in the real world

graph the data and plot hypothesis

create a management tool for the inquiry process.



_CONCLUSION

Because of economic, demographic and social changes, online education is becoming more important because it offers universities an opportunity of providing quality education with a relatively low cost.

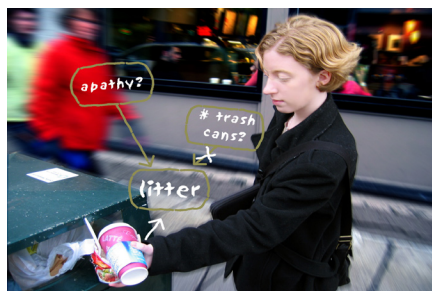
The need to provide quality interactions is more evident, in particular through courses such as CSR where the main objective is to teach a way of thinking and the scientific methods that can aid in this thinking process.

The aim of this project was to apply design research methods to guide and discover areas of opportunity for improvement. The team focused on understanding the online & asynchronous teacher-student interaction process to unveil its advantages and disadvantages when compared to traditional face-to-face teaching. As stated in the design opportunities, the final result is part of a set of opportunities that later developed into a product.

We feel that the Causal Game solution [Jacinto] was the right way to go because it links to the emotional part of the audience but still shows a «real life» perspective. In using a game to explain the problem, the solution also benefits from all the knowledge and previous success of the computer games industry.

A causal reasoning game can improve the current OLI-CSR course in several dimensions:

- _ANCHORED IN THE REAL WORLD
- _DEAL WITH THE WHOLE PROCESS OF INQUIRY
- _MOTIVATE AND ENGAGE
- _CHALLENGE YET POSSIBLE



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