RANDOM CHALLENGE GENERATOR

A CREATIVE TOOL FOR EDUCATION

PABLO PORTA

2017

Start reading this book accompanied by a coffee and Alan's Psychedelic Breakfast by Pink Floyd

Hochschule Anhalt
Anhalt University of Applied Sciences

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01

INTRODUCTION

"In 2006, Natural Geographic ran a survey of cultural knowledge in America. Twenty-one percent of young adults aged eighteen to twenty-four could not identify the Pacific Ocean on the map"

(Ken Robinson 2015)

Education is the vehicle to achieve prosperity base of society, but nowadays this doesn't guarantee having a good life. So far the quality education has declined according to current parameters. This has a reason that it can be easy perceived in education. Especially in Costa Rica there's an education cultured oriented to perform exams and memorizing facts instead of learning for life.

This quote about the situation in USA concerning to locate the Pacific Ocean is surprising in terms of a very general fact. However this is in a country that is called developed and invest more or the same that Costa Rica does in education. Even so, is alarming given the fact that according to international rankings like the one defined by The Programme for International Student Assessment (PISA) we perform below.

Based on several authors like Ken Robinson, Linda Elder, and others I will depict the focus of current education system. Comparison with other high ranked countries as well will show that there are a lot of work to do but is possible. This research intends to find reasons why students are not learning how to learn, how students are becoming low-performance machines without develop Critical Thinking and just memorizing impressive amount

of things that they are not sure how to use it for the future, or simply they just quit.

Robinson established in 2013 during a TED Talk the children and teachers are encouraged to follow routine algorithms rather than to excite that power of imagination and curiosity. This is so important given that in the future and even now we need so much innovation, especially social innovation. We need to develop skills to co-exist in a sustainable environment.

But how this will be possible if we don't develop critical thinking to obtain these skills? This research seeks to find the reason or reasons of this. So far we focus on many trivial things and we need to do a transition to fix very important problems as society. By developing intellectual skills we can focus to build a better and collective future.

In following sections will be stated the ways to get to what I consider it can improve this situation. The sections are Research and Discover, Analysis and Key Findings, Concept, Design and finally Conclusions and Recommendations. The result will be obtained by the accumulation of information, comparisons, and questionnaires to analyze and apply possible solutions.

1.1

Motivation

"The need for transformation is, if anything, greater now than ever before. No matter where we look, we see problems that can be solved only through innovation: unaffordable or unavailable health care, billions of people trying to live on just a few dollars a day, energy usage that outpaces the planet's ability to support it, education systems that fail many students, companies whose traditional markets are disrupted by new technologies or demographic shifts. These problems all have people at their heart. They require a human-centered, creative, iterative, and practical approach to finding the best ideas and ultimate solutions."

(Tim Brown, 2008)

This quote from Tim Brown is how everything started. As designers there's a bigger contribution needed. Important topics that go beyond creating products to be consumed; this is the future designers should focus on. Nowadays, there are big crises that need to be tackled. Some more urgent than others. But in my case I believe the most important and the one that can create long lasting solutions for a common future is education.

After reading "Design when everybody designs" from Ezio Manzini I found my self very curious and interested in the fact what we all are part of the problems but also the solutions,

specifically to think and create them. Even though that this is nothing new, what motivated me the most is the fact we as humans have something special and is this power of creation.

"In a world in rapid and profound transformation, we are all designers. Here, "all" obviously includes all of us, individuals but also organizations, businesses public entities, voluntarily associations, and cities, regions, and states. In short, the "all" we are talking about includes every subject, whether individual or collective, who in a world in transformation must determine their own identity and their own life project. This means putting together their design capability into action: a way of thinking and doing things that entitles reflection and strategic sense, that call us to look at ourselves and our context and decide whether and how to improve the state of things."

(Enzio Manzini, 2015)

D***iffuse Designers*** and ***Expert Designers***. Ezio Manzini use these terms to define Designers, where Expert Designers belong to a design community with specific skills and culture. However, with Diffuse Designer he refers to the combination of the human abilities of critical sense, creativity and practical sense (Manzini, 2015, 37). Now, this is something that can be implied as natural and normal in humans but when it comes to the term ***"Critical"*** it's sometimes is word that is missing in lots of people's thinking. And how is this missing? Well education has a huge role in this case. So the start in understanding what Critical is, means the starting point, that way later can be design as well promoted.

In the article, Design X: A Future Path for Design, the author The Design Collaborative emphasizes the need for new models of education, some based on disciplinary skills, and others based upon problem rather disciplines where many backgrounds work together. So, only through can education these future contributions be developed to change realities. My nieces whom I love always ask me about their education. One of them actually told me once she wants to be designer. She doesn't know she is already one, both of them are. They love art, they are both very clever and creative they just need an education that encourages them to become what they want to be. As a designer myself this is something I want to contribute to, for a better future together where we can face our biggest challenges to come.

1.2

Design Challenge

How could we develop Critical Thinking in Costa Rican kids through creativity?

1.2.1 Challenge Context

Costa Rica is a country well known for its efforts in sustainability, health care, and education. The investment in this last aspect is around 10% (government + parents) from the GDP (Gross domestic product)[I]. Education is one of the best in Latin America, third ranked after Chile and Uruguay according to the OECD (The Organization for Economic Co-operation and Development). A high Coverage and a high level in literacy around 98% is something that makes us ***"ticos"*** proud. Public education in Costa Rica is mostly divided in 3 main levels[II] for School: Preschool Education (Preschool), Basic Elementary Education (Elementary School) and Diversified Education (High School). Others than these are education for adults and Special education for students with some special requirement. This 3 levels has each specific characteristics:

Preschool Education:
Ages: 5-7 years old (average).

Focused on developing intellectual, physical, social and psycho motor skills.

Basic Elementary Education:
Ages: 7-12 years old (average).

Education is mandatory and costless.

First two years focused on teaching basic skills like reading, writing and number. Next years advance topics are incorporated like History, Language and so on.

Diversified Education:
Ages: 13-17 years old (average).

First three years correspond to general knowledge and global subjects. After these years the student can decide which kind of education to pursue, Academic, Artistic or Technical. However the average student opts for Academic Education that is focused on Science and Literature approach.

All kinds of education apply to the Bachelor Test. This test is needed in order to go to University.

Our education is good but it doesn't mean that can't improve or doesn't face problems. Differences between urban and rural education is noticeable in access to resources, transport, diversification and teacher's preparation just to name a few examples.

Additionally the kind of education we received during School is the standardized kind where students consume and memorize complex data without understanding why they need it. They are meant to perform tests, more related to low performing machine than intellectual beings.

The critical aspect in students and teachers also is cloudy. The intuition of what ***Critical Thinking*** is, is not well defined and the access to tools is low even in times of the Internet. But as always there's room to improve.

1.3

Goals

Develop critical thinking in Costa Rican kids through creativity.

1.3.1 Research Aims

- Identify the reason of why critical thinking is not been developed in curriculums.
- Analyze the top ranked educative systems according to the PISA test.
- Consider successful case studies where the combination of creativity and critical thinking has impact the education system.

1.4

Hypothesis

Providing a tool for teachers that facilitate the formulation of tasks, they can learn and teach in a more creative way that provides challenges for both audiences and develop critical thinking towards a new way of education that provide students skills to learn how to learn and apply this knowledge during their daily life.

"Most typical classroom structures and practices do not aim at the development of critical thinking skills. As I have mentioned, this is true because most teachers have not been taught critical thinking and consequently do not themselves understand it (...) And most teachers don't identify vehicles for learning critical thinking on their own"

(Linda Elder, 2003)

1.5

Methodology

For the methodology this project follows a linear structure where finding will determine the outcome of the project.

The starting point is to define the design challenge. To do this, is needed to understand the context. Context is important to understand the specifications and individualities that are present in the challenge audience.

In this case, I will divide the process in four sections:

Research and Discovery

Includes the literature review about specific topics. This facilitates the understanding the challenge complexity. Also is important to prevent forgetting key terms that are necessary to continue the next steps.

In this case, the research will include:

1. Concept of education
2. Global education reality
3. Costa Rican education reality
4. Critical Thinking definition
5. The reason why Critical Thinking is not implemented

Analysis and Key Findings

This section is oriented to analyze best practices already applied, such as best education systems analysis and case studies to determine pros and cons of their proposals. Also is planned a questionnaire for teachers and students in Costa Rica in order to corroborate with key findings. The audience in this case is teachers of Senior High School and its students. Is this way because this population is more mature, hence they should be prepared to face decision-making.

Concept

Based on the previous section, the next step is to define the concept aims and what is needed to be the final outcome.

Design

As for the design section, it needs to take in consideration requirements, inspiration, and distribution for the final product. How it's going to be used, why, and who.

Conclusions and Recommendations

Finally in this section, it will be shared the experience of process learning. Difficulties, actions to improve, limitations and recommendations, in case that the project needs to be developed further.

02

RESEARCH AND DISCOVERY

2.1

What Education means?

According to the Oxford Dictionary the word Education have several meanings:

- The process of receiving or giving systematic instruction, especially at a school or university.
- The theory and practice of teaching.
- A body of knowledge acquired while being educated.
- Information about or training in a particular subject.
- An enlightening experience.

What can be perceived about most of these definitions is that education is related to the act of acquiring and providing knowledge. The problem around the term education is that has been confused from acquiring knowledge to memorizing systematic data in most of the countries. The result of this is students learning to perform for tests and often they forget after finishing the exam, hence this become in disposable knowledge.

That the primary root of all educative activity is in the instinctive, impulse attitudes and activities of the child, and not in the presentation and application of external material

(Dewey, 1907)

Education so happens outside of formal education, and this one has been boosted mostly by a specific needs. For example, knowledge transmitted from a source, like a farmer who teaches a son or daughter how to farm and why.

2.2

Global Reality of Education

2.2.1 Why is so important education?

The fundamental purpose of education is to help students learn. Doing that is the role of the teacher. But modern education systems are cluttered with every sort of distraction. There are political agendas, national priorities, union bargaining positions, building codes, job descriptions, parental ambitions, peer pressures. The list goes on. But the heart of education is the relationship between the student and the teacher. Everything else depends on how productive and successful that relationship is.

(Ken Robinson, 2015)

In the book Creative Schools, The Grassroots Revolution that's transforming Education, Ken Robinson exposes the reality of education. First, why is so important education? Basically he defines three main reasons for this:

Economic: education defines economy the same way economy is part of education. Governments need well-educated and trained workers to make a country prosper. As well nowadays education is huge business in many countries like USA.

Robinson mentions how the perception of a college degree used to symbolize a high chance to get a job, especially from the fifty's to the eighty's. However nowadays there isn't any guarantee of this. He adds that education is not matching economy, causing unemployment, frustration and more social problems.

Cultural: education is one of the main ways to transmit and transfer values and traditions to future generations.

Social: Governments use education to promote the kind of citizen needed in Society, what behavior and attitudes are necessary for social stability.

"There is an even-widening skills gap between what schools are teaching and what economy actually needs"

(The Global Achievement Gap: Why even our best schools don't teach the new survival skills our children need – and what we can do about it, 2014 cited in Robinson, 2015, 16)

2.2.2. Standardization

Standardization happens mostly in Formal Public School. This is composed by three different elements: curriculum, teachers and assessments. These elements are well established:

- **Curriculums** are based on the idea of specific subjects.
- **Teachers** provide direct instructions of factual information and skills to large groups rather than group activities where collaboration and discussions could be encouraged.
- **Assessments** are optimized for easy codifying to be processed through written examinations and multiple-choice tests where memory is more important than understand.

Standardization in schools are based in the industrialized market following the same purposes, structures and principles:

Purposes:

Fill the market's demand with products (students).

Structure:

Robinson establishes *"Mass education"* as a pyramid, where the bases are occupied by the compulsory elementary school. In the middle the secondary smaller sector and finally on the top in very reduced numbers the higher education tightly controlled. All these levels are divided and created for specific kind of jobs. Less educated will do the repetitive and exhausting labors (for example factories). The more skilled (technical) will be in positions regarding to engineering and crafts. Finally the professional class will create positions like lawyers, doctors, scientists and academics.

German High School is a great example of structure. ***Hauptschule*** create positions expected for trades. ***Realschule*** white collar jobs. Finally, ***Gymnasium*** the ones who are planning to go to college. Kids the have to face this decision for their futures at very young ages without changes to fail.

Principles:

When thoughts come around the word factory it can be easily translated to standardized education. Robinson names principles that education follows from industrialization:

- To produce identical versions of the same product.
- Processes are linear and sequential to create a product (elementary school, high school, Higher education)
- Students are separated by years of production (batches of similar ages)
- Market adjusts the production to match the demand (STEM disciplines are an example of this)
- High school and higher education organized around division of labor
- High school days are segmented into blocks of time
- Specialization in specific subjects in teachers
- Teachers are measured by the results of students.

Standardization Results

The biggest problem with standardization is that, humans are treated as products. Dehumanization in education causes discouragement, frustration, and hatred. The systematic education is killing that spark that all humans and kids has, which is the desire for discovering and learning.

"The preoccupation with particular subject and types of ability means that students other talents and interests are almost systematically marginalized. Inevitable, many capable of at schools, and their lives may be impoverished as a result"

(Ken Robinson, 2015)

As Robinson mentions humans are not standardized. Content in school is defined by specific subject curriculums and often kids don't understand why this is necessary - the only thing they know is they need to learn it for the test. It's very interesting to think about education in kinder gardens, when kids explore the world by using intuition and learning from experiences and creativity.

Partnership for the 21st Century has established what things kids need to learn for the future:[III]

- **Interdisciplinary themes**
- Global awareness
- Financial, economic, business and entrepreneurial literacy
- Civil literacy
- Health literacy
- Environmental literacy

- **Learning skills**
- Creativity and innovation
- Critical thinking and problem solving
- Communication and collaboration

- **Life and career skills**
- Flexibility and adaptability
- Initiative and self-direction
- Social and cross-cultural skills
- Productivity and accountability
- Leadership and responsibility

2.3

Fifth National State Report

The Fifth National State Report is a system to observe and analyze the Performance of Costa Rican education. The document is a picture of the reality where compiles many factors and studies provided by international institutions like PISA and the OECD. The PISA test is a triennial international survey, which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students.

As with previous comments education is a key factor for national development and a tool for equity. Costa Rica during the decade of the ninety's was one of the most equitable country in Latin America. Today is one of the most unequal along the rest of the countries in Central America. During the last twenty-five years the average education performance has improved however the gap between low and high class hasn't progressed.

The relationship between the parent's income and the level of students echo in disadvantages when compared to poorer and wealthier. As well the level of education compare to the type of jobs is reflected on the payment. This is nothing new and many countries face the same situation, however the education level of low-income people is 70%[iv] less compared to the rest of the population.

Costa Rica is focusing on how to improve several situations in order to achieve a higher performance. In the repetition rate, PISA tests scores, and dropouts. One interesting characteristic of the Costa Rican education system is that students can repeat the same level as many times as they need it in order to continue studying in the same modality. Despite this is something positive compared to other countries, the incidence is high. According to this report, the percentage of kids above average age is around 20%, which means most of them has repeated the level.

The PISA tests have demonstrated that ***ticos*** perform below the average level in public education. There are a few schools that have achieved better results like technical and some public schools as well. The ones that accomplished this have in common some aspects around educators, environment, parental support, attitude from the student and finally access to technology and information. These characteristics are also present when it comes to improving the rate of dropouts.

One of the biggest problems that educators face is the overload with tasks besides teaching hence the time to prepare and educate reduces immensely. The little access

to technology and the remote locations increase the difficulties. It can be added as well that teachers feel frustrated sometimes about the system and the ones who plan the system, usually people from desks in offices.

2.4

What is Critical Thinking?

Critical thinking seeks the analysis of facts to create a judgment.

Critical thinking involves the use of a group of interconnected skills to analyze, creatively integrate, and evaluate what you read and hear. To become a critical thinker you must be able to decide whether an author's opinions are true or false, whether he or she has adequately defended those ideas, whether certain recommendations are practical, as well as whether particular solutions will be effective.

(Bruce R, Reichenbach, 2001)

This discipline pursues to think and prove ideas through empathy and analyzing facts in order to avoid biases, distortion, partial, prejudices. Thinking that everything we do has a goal and consequences. Critical thinking is self-thinking, seeks reasoning. According to Kompf and Bond[v] involves problem solving, decision-making, metacognition, rationality, knowledge, intelligence and reflective thinking.

2.4.1 What is the relationship between Creative Thinking and Critical Thinking?

According to Maizam Alias the two most desired thinking styles by learners are the creative and the critical thinking style. The difference between the two styles refers to the outcome.

"A widely accepted is the one on creative thinking is given by Torrance (1967) where creative thinking is generally considered to be involved with creation or generation of ideas, processes, experiences or objects"

(Understanding the fourth grade slump in creative thinking, 1967, cited in Alias, 2010, 2)

"Critical Thinking is concerned with their evaluation, argument, deducing conclusions from information or data provided, interpreting whether conclusions are warranted on the basis of the data given, and evaluating evidence or authority"

(Relationship between critical and creative thinking, 2001, cited in Alias, 2010, 2)

2.4.1 Six steps of critical Thinking

According to Reichenbach these are the 6 steps to accomplish critical thinking:

Step 1: Knowledge

Knowledge requires the ability to identify what is being said: topic, issue, thesis and main ideas.

Step 2: Comprehension

Is to understand what is being read, heard or seen. By comprehending, new knowledge is created when is related to what is already known.

Step 3: Application

Requires knowledge and comprehension to apply to a specific situation.

Step 4: Analysis

Involves decomposing in parts the ideas in order to understand how to they are ordered, related, or connected to other ideas.

Step 5: Synthesis

Is the ability to put together the parts with other information, creating something original.

Step 6: Evaluation

Refers to how to proceed or act with the information understood and analyzed.

2.5

Why is Critical Thinking not implemented?

In an interview with Linda Elder a prominent authority on critical thinking she explain the reasons why critical thinking is not implemented in school systems. According to a study requested by the California Commission on Teacher Credentialing[VI] only 19% of teachers could articulate what is Critical Thinking. She states two reasons:

1. The faculty who control and teach the curriculum don't understand what is critical thinking.
2. They think they do.

Teachers haven't been taught critical thinking, they teach as they were taught and therefore they confuse learning with memorizing. Consequently students study to perform test pouring what they memorize one the exam or quiz comes. The problem with this is they don't understand, the learning process is not integral and skills for decision-making and problem solving are not being developed. When students rarely learn to face and work through difficulties they don't learn valuable skills such as intellectual humility, intellectual empathy, fair-mindedness, intellectual integrity and intellectual trait.

Rather than learning the skills of disciplined thought, students often learn the skills of 'getting by.' They develop bad learning habits. They come to see learning as doing what the teacher says.

(Linda Elder 2003)

Students learn often from what other people is saying, it could be family, teachers, friends, TV or Internet. They lack knowing how to ask questions, how to learn what they need to clarify what is unclear. Collaboration and cooperation is needed as well to develop reasoning abilities, they need to contrast ideas and being open and willing to help others grow in a mutual nurturing.

In standard educated usage "intelligence" is understood as the ability to learn or understand from experience or to respond successfully to new experiences. It involves the ability to acquire and retain knowledge. It implies the use of reason in solving problems and directing conduct effectively.

(Linda Elder 2003)

However, to accomplish Critical Thinking teachers need to be guided and supported as well. They need to learn first critical thinking skills and abilities. They need to design and test strategies to engage students in intellectual work. By developing insights, deficits and their own intellectual abilities they are creating new ideas.

03

ANALYSIS AND KEYFINDINGS

3.1

What the best education systems are doing right?

Global Ranking education is based on the PISA tests. This tool has been used to decide the best performance in countries. This evaluation is based in Math, Reading and Science. Often Asian countries are on top, countries such as Finland, Estonia, Canada and Ireland[7] are the ones non-Asian. So far according to the ranking Singapore is on top with huge efforts inventing on teachers preparation. However, Asian countries present similar characteristics on their approach to STEM subjects and examinations. The countries picked to analyze are South Korea, Hong Kong and Finland, countries the top of the ranking during 2012 evaluations but with very different styles of educating.

The aspects to develop in this analysis[VIII] are:

- Education Culture
- Way of work
- Classroom aspects
- Teachers
- Focus on subjects

Education Culture

HONG KONG	SOUTH KOREA	FINLAND
• Very strong culture based on discipline and rigor in all elements of the education's structure • Parents invest in Children's education as way to retire (Elderly parent tax) • Pressure from parents (Concept of Tiger mum)	• Hard work, no excuse for failure. • Use of competitive public examinations using education as a vehicle for social mobility. • Culture adapt to examinations, even traffic adapts noise in time of national examinations. • Promotion of Creativity and individual identity is nulled.	• Social system supported on every individual. • Low stress culture. • Education needs to be taught for life not for school. • Value learning experiences, learning happens outside the classroom too. • Children are granted authority and accountability for learning.

Work orientation

HONG KONG	SOUTH KOREA	FINLAND
• Strongly oriented towards examinations • Learning for exams • Very rigorous and standardized system	• Curriculum is defined by examinations • Education focused on perform tests • Hard work and strong pressure from society and parents • Private tutors are regular in families who can afford it • Combination of education at school and home pressure kids with long studying days • Children see school as a horrible to pass in life • The normal children feels stressed, unhappy and bored	• No national examinations, students can decide which matriculation exam they are going to take • Schools that perform deficient they are provide with more resources to improve • Intrinsic motivation • Rigor and flexibility • Education is about creating identity (pursuit of personal interest)

Classroom aspects

HONG KONG	SOUTH KOREA	FINLAND
• Highly crowded classrooms with sizes up to 42 students • Teachers need use of microphone to impart lessons	• Highly crowded classrooms with sizes from 35 to 40 students	• Classroom are very interactive with sizes from 15 to 25

Teachers

HONG KONG	SOUTH KOREA	FINLAND
• Lecture mode (Teachers as masters) • Discussions are discouraged • Curriculums and decisions are made by executives not teachers	• Lecture mode (Teachers as masters) • Curriculums and decisions are made by executives not teachers	• Lots of freedom and responsibility (not paying to do lip service or following a script) • Teachers and highly valuated and respected • Master degree required to be teacher • Lots of time for professional development (yearly teaching around 600 hours while USA 1100[ix])

Focus on subjects

HONG KONG	SOUTH KOREA	FINLAND
• Math, Chinese and English are the one priority. • Sensorial and stimulation subjects are on the bottom of priorities (2 hours or less per week) • When test time comes these subjects are removed	• Main subjects are Math, Science and Languages (STEM and PISA tests) • Critical Thinking included in the curriculum • Kids learn how to learn, how to work and how to persist after failure	• Main subjects are Math, Science and Languages (STEM and PISA tests) • Mix of core with other subject such as: Arts, Physical Education, woodwork, etc (these subjects are considered very important as well) • Extracurricular choice represents a third of the classes • Education enhanced for developing of skills fir the 21st Century like collaboration, social interaction, problem-solving and life-long learning

It can be understood that the quality in education is more than high scores in tests when kids are learning to perform only tests. As well it can be seen that the role of educators is highly important to achieve integral education. They need to be creative and challenged every day.

3.2

Case Studies

"The point is that education is not a mechanical system. It's a human system. It's about people, people who either do want to learn or don't want to learn. Every student who drops out of school has a reason for it which is rooted in their own biography. They may find it boring. They may find it irrelevant. They may find that it's at odds with the life they're living outside of school.

(Ken Robinson, 2013)

The Case Studies it's going to be mentioned are based on the idea "Alternative Education". This are initiatives that seeks to encourage and motivate students to learn. Robinson mentioned in 2013 in his TED Talk | How to escape education's Death Valley | how exist alternatives to education exist which is different from the regular standardized systems.

He mentions how these programs have common features. Among these features are that they're very personalized. They support teachers, they have close links with community and a broad and diverse curriculum. Often the programs, which involve students outside school as well as inside school, are very successful.

Now, while it is true that these programs are not teaching Critical Thinking strictly, they do through more holistic ways. Many of them are based on how to learn for life, to learn new skills they will need for the future. So far there are many different methods of education such as Construtivism, and others. In the end, all of them seek students creating knowledge, understand it, analyze it, and applying it to their daily lives and their future.

"It's a story of public education and of rural communities and of what design might do to improve both."

(Emilly Pilloton, 2010)

3.2.1 Bertie County, Studio H.

This is how Emilly Pilloton starts her lecture in a TED talk. Bertie county is a little town in North Carolina, USA. Lots of characteristics of Bertie County are very similar to a lot of places in Costa Rica. Counties with less than 20,000 people, becoming ghost towns where all of the most educated and qualified leave and never come back and the rest with a secondary education tops. Dependence on farm subsidies and under-performing schools and higher poverty rates, no shared collective investment in the future, and the poorest county in the state where the economy is mostly agricultural, this was the picture of Bertie county.

The proposal to improve the education system was to bring a design perspective to the repair of the school district. Design with, not for, a humanitarian-focused design. It's about designing with people, and letting them appropriate from the emerging solutions. The goal is to apply design within education, making education a vehicle for community development.

Three different approaches was applied to achieve the goal:

Design for education

The creation and improvement of spaces and materials for teaches and students where educators participate in the conception.

Redesigning education

Create conditions that change when it's possible and the incentive to want to make change.

Design as education

Teaches design in public schools, and not design-based learning but actually by learning design thinking combined with real construction and fabrication skills towards a local community development.

"So over the course of two semesters, the Fall and the Spring, the students spend three hours a day every single day in our 4,500 square foot studio/shop space. And during that time, they're doing everything from going out and doing ethnographic research and doing the need-finding, coming back into the studio, doing the brainstorming and design visualization to come up with concepts that might work, and then moving into the shop and actually testing them, building them, prototyping them, figuring out if they are going to work and refining that. And then over the summer, they're offered a summer job. They're paid as employees of Project H to be the construction crew with us to build these projects in the community."

(Emilly Pilloton, 2010)

With this statement the success of the project can be perceived where there is a tangible mindset in students according to co-design and collaborate in their respective communities.

3.2.2 Project Zero Classroom

"When they bring together concepts, methods, or languages from two or more disciplines or established areas of expertise in order to explain a phenomenon, solve a problem, create a product, or raise a new question is ways that would have been unlikely through single disciplinary means"

(Interdisciplinary Education in the United States: Past, Present and Future. Issues in Integrative Studies, 2011, cited in Boss, 2011)

In the article Integrated Studies: A Short History, venerable educators from john Dewey to Howard Gardner have extolled the virtues of studying subjects in a holistic, contextual way rather than in a vacuum by Suzie Boss she mentions the example of Project Zero Classroom.

Project Zero is part of the Harvard Graduate School of Education created to guide and collaborate with education. Project Zero's research agenda focuses on arts, nature of intelligence, understanding, thinking, creativity, cross-disciplinary and cross-cultural thinking, and ethics.

Boss mentions that integrated studies involves bringing together subjects often disconnected in an order students can understand is a way more meaningful and authentic. She also emphasizes that interdisciplinary doesn't mean, "mixing in a smidgen of art or music to liven up a math

or science lesson. This intends that when there's a decision of integrate subjects needs to be well thought and not forced, those that fit naturally and worth of integrate.

Boss mentions a good example of integration. A class of ninth-grade students works on 3 different subjects and a related topic. In math class, the task is to analyze a variety of graphs to look for trends in American's eating habits and public health patterns. In social studies, they do a field investigation to compare the fresh produce selections at local grocers catering to different demographics. Finally, in English class, they design advocacy campaigns to promote better nutrition in their low-income community, where diabetes affect many families.

This is a very interesting example, though students are doing an integral research about eating habits, they analyze and collaborate with the community. In this example says Boss, teachers have teamed up to design an integrated study of where food comes from. The concepts students learned were from math, geography, social science, health, economics and English.

According to Project Zero these five fundamental aspects of quality interdisciplinary instruction:

- Frame topics that are worth of teaching in an interdisciplinary way
- Identify disciplinary tools that will enable students to understand such topics
- Integrate disciplines productively
- Contain a sequence of learning experiences
- Assesse student's interdisciplinary work

3.2.3 Finland will become the first country in the world to get rid of all school subjects

How many times have you wondered if you were going to need subjects you were made to learn because the curriculum said so?

(Simon Segal, 2017)

Nowadays, Finland is recognized as one of best education systems in the world. Their role for education is very ambitious and a plan to innovate beyond what they have is already on tracks. The plan is called Phenomenon Based Learning (PhenoBL). So far Finnish education has performed very well with a downside in the last PISA tests. However their education system is oriented to learn for life instead of learning factual knowledge for high school.

By 2020 a new way of learning based on phenomenon learning will replace the subject-based system. Subjects like math, history, etc. as people know them is an old concept. As a new approach to life through education, students will collaborate with peers and teachers over knowledge sharing in order to explore, create, implement and learn. However it doesn't mean that the content of these subjects won't exist anymore, the difference lies in that parts of these will be studied through an interdisciplinary approach contributing to understand in an integral way the content.

These are a few characteristics of the proposal:

- Face-to-face support + use of technology like online sessions
- Inquiry-based learning, problem-solving approach leaning in collaborative setting
- Practical implementation
- Co-teaching with input from more than one subject specialist

- Teacher freedom and collaborative planning

For teachers is challenging and require and intense training in how to integrate the subjects. However this is a program that promotes creativity and encourages teachers to think beyond the current system.

3.3

Questionnaire

The goal of the questionnaire is to corroborate Findings with students and teachers thoughts.

3.3.1 Questions directed to Teachers

The answers of these questions comes from educators teaching 10th and 11th grades. Fifteen asnwers were obtained through an online survey from teachers located in rural and urban cities in Costa Rica.

Do you think the content you teach matches the Global reality (global warming, gender rights, wealth distribution, etc)

Yes	43%
No	21%
Partially	36%

Does Critical and Creative Thinking being encouraged in your classes?

Yes	57%
No	21%
Sometimes	7%
Don't know	14%

Is your subject integrated to other classes?

Yes	36%
No	21%
Sometimes	36%
Don't know	7%

Are Individual skills being encouraged in class?

Yes	57%
No	29%
Sometimes	14%

Does the content class adapt according to the needs of the group?

Yes	57%
No	29%
Sometimes	14%

Do you think you have access to enough resources to teach properly?

Yes	21%
No	79%

Which resources are you missing?

Internet	64%
Supplies	47%
Training	20%

Do you think you have enough time to teach?

Yes	33%
No	47%
Sometimes	20%

3.3.2 Questions directed to Students

The answers of this questions comes from students in ages between 15-20. Ten asnwers were obtained through an online survey from students located in rural and urban cities in Costa Rica.

How often do you apply what you learn in class to situations outside school?	
Always	40%
Never	40%
Sometimes	20%

Do you think your education encourages you to be Analytical and Critical towards reality?	
Yes	30%
No	50%
Sometimes	10%
Don't know	10%

Do you learn about topics of Global reality like Climate Change?	
Yes	30%
No	40%
Sometimes	20%

Do you think you have enough tools to learn?

Always	44%
Never	44%
Sometimes	11%

Which resources are you missing?

Technology	57%
Didactics	43%

When you don't know something what source of information do you use?

Internet	100%

Do you think your talents and skills are being encouraged during your classes?

Always	44%
Never	54%

Do you know your talents and skills??

Yes	67%
No	33%

Do you feel motivated to in class?

Yes	50%
No	38%
Sometimes	13%

3.4

Key Findings

3.4.1 Reality of Education

Standardization

- The goal of standardized system is to produce identical versions of the same product.
- Dehumanization in education causes discouragement, frustration, and hatred in kids as educators as well.
- Curriculums are based on the idea of specific subjects.
- Teachers provide direct instructions of factual information and skills to large groups rather than group activities where collaboration and discussions could be encouraged.
- Assessments are optimized for easy codifying to be processed through written examinations and multiple-choice tests where memory is more important than understanding.
- Teachers are measured by the results of students.

Critical Thinking

- Pursues to think and prove ideas through empathy and analyzing facts in order to avoid biases, distortion, partial, and prejudices.
- Involves problem solving, decision-making, metacognition, rationality, knowledge, intelligence and reflective thinking.
- Is not implemented because the faculty who control and teach the curriculum don't understand what is critical thinking and they think they do.

Student Performance

- The relationship between the parent's income and the level of students echo in disadvantages when compared to poorer and wealthier.
- Students learn often from what other people is saying, it could be family, teachers, friends, TV or Internet.
- The ones that accomplished success have in common some aspects around educators, environment, parental support, attitude from the student and finally access to technology and information.
- Kids explore the world by using intuition and learning from experiences and creativity.

Educators

- Teaching methods as they were taught and therefore they confuse learning with memorizing.
- Necessity of learning first what critical thinking is, critical thinking skills and abilities. They need to design and test strategies to engage students in intellectual work.
- Teachers need to be guided and supported
- Teachers are overload with tasks besides educating therefore less time to prepare lessons and teaching.
- Deficit in resources like technology, didactic material and Internet access difficult the teaching experience and performance.

Focus of education

- Orientation to new skills for the future such as creativity, innovation, critical thinking, collaboration and problem solving
- Integrated studies that involves bringing together subjects often disconnected in an order students can understand is a way more meaningful and authentic.
- Creation and improvement of spaces and materials for teaches and students where educators participate in the conception.
- Focus on learning for life instead of learning factual knowledge for school.
- Creation of conditions that change when it's possible and the incentive to want to make change.

Tools

- Face-to-face support + use of technology like online sessions
- Practical implementation
- Co-teaching with input from more than one subject specialist
- Teacher freedom and collaborative planning

04

CONCEPT

4.1

Aims

Identify creative patterns and thinking towards facing challenges.

Enable the collaborative creation of tasks that relates to life learning experiences.

Involve teachers and students into the planning and proposing of their education.

4.2 What to create?

For this project is needed to design a tool that can teach first to educators what critical thinking is, so it can be translated it to students. Also the intention of this tool is not to be imposed. On the contrary, seeks that revolution and change in education could be from the inside empowering teachers and students. Sadly, throughout the document is more than established that education follows rigid standard structures. The project is not focused on changing the structure as a total. The project is focused on providing teachers and students tools to learn and develop critical thinking and creativity. Topics such as examinations and structure correspond to a collective effort that involves society and government.

Through the tool docents need to be challenged to create new ways of teaching engaging students who are learning content. The content needs to be attractive, related to learning experiences and applied in standardized public educational systems without marginalizing economical status or differences between students.

To create the tool the idea is based on the principle of Randomness to encourage the creation of challenges in both teachers and students. As well, the idea is to integrate several factors such as subjects (according each teacher context), suggestion of tasks (traditional tasks in the academic environment), time unit and cooperative mode.

05

DESIGN

5.1

Requirements

- Stimulate critical thinking, creativity and collaboration
- Challenging
- Easy to use
- Affordable
- Light to carry
- Can work without Internet
- Easy to replace
- Anybody can ensemble it

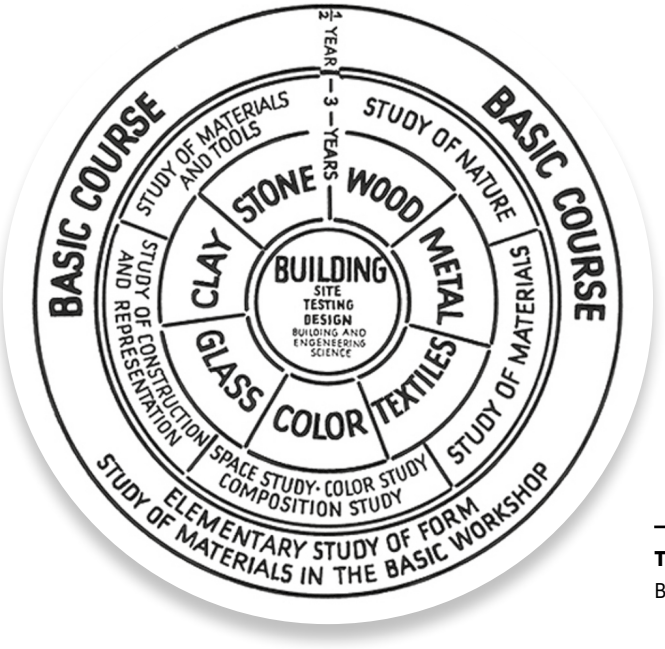
5.2

Inspiration

I choose 3 designs that fit the idea of my concept according to my research. These three are the *Bauhaus Wheel Diagram, 3 fators.org and Finally The Creative Loop.*

Bauhaus Wheel

This diagram was developed by Walter Gropius in 1922. This is the curriculum proposed for the school in those days. From building as core it gets wide integrating diverse materials and classes.

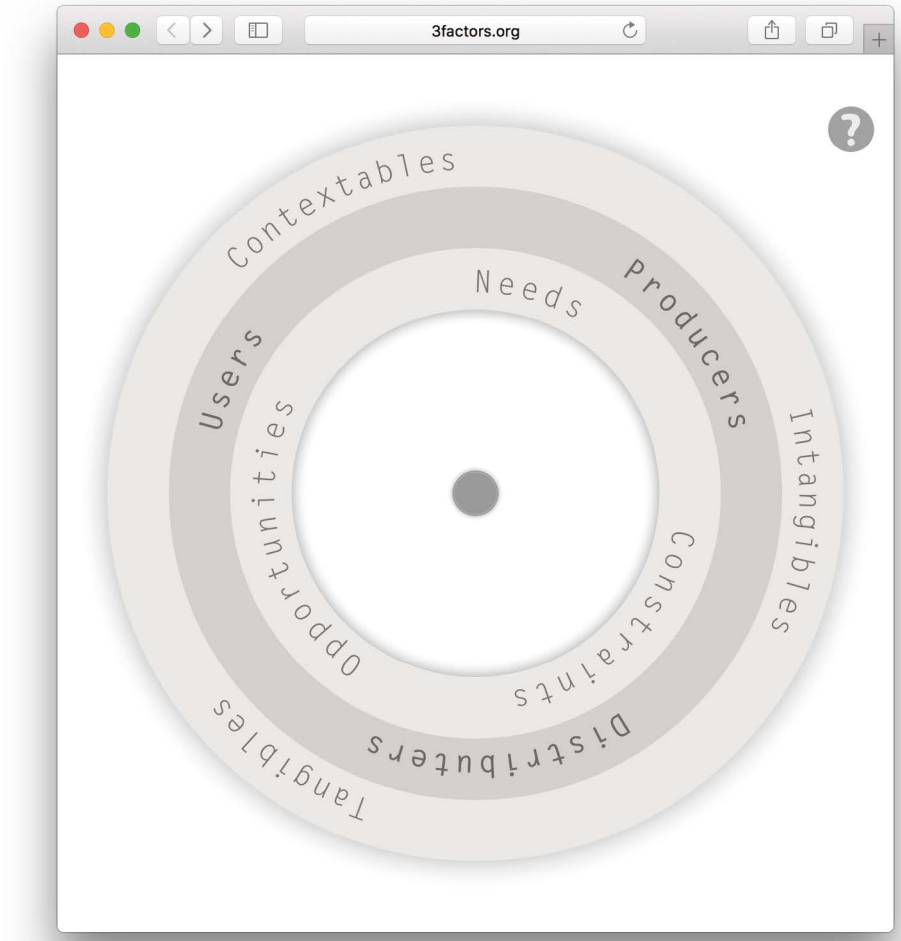


The Preliminary Course
Bauhaus

3 factors

3 – Factors is a website based on interactive explorations following three steps:

Triangulation, Permutation and Identification. This website works as tool to access information and create variables according to many different topics.



Home Page
3factors.org

The Creative Loop

This is a project made by Alexandra Martini. In her paper ***Teaching design, learning design: tools, goals and the creative long-term perspective*** her goal is to teach design through combining units such as exercise or experiment, time unit, the preferred team constellation, a general functional and material haptic-design factors.

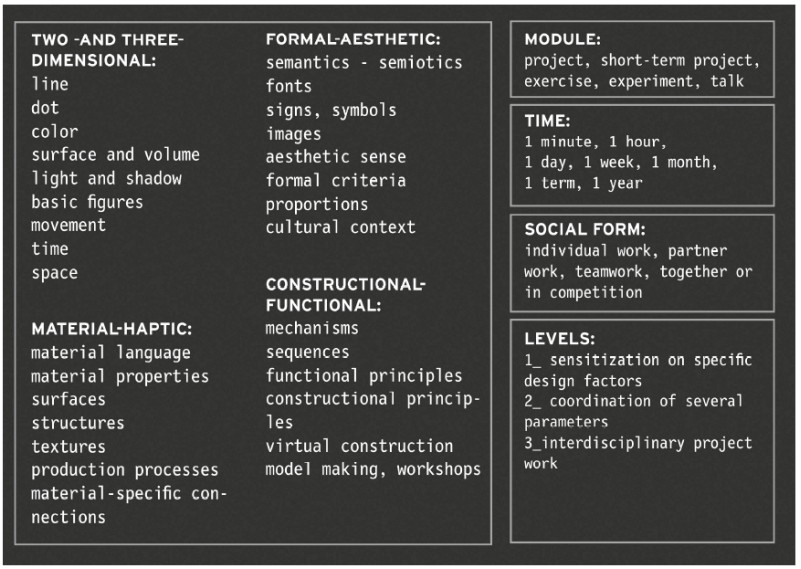


Image 02: overview modules parameter project

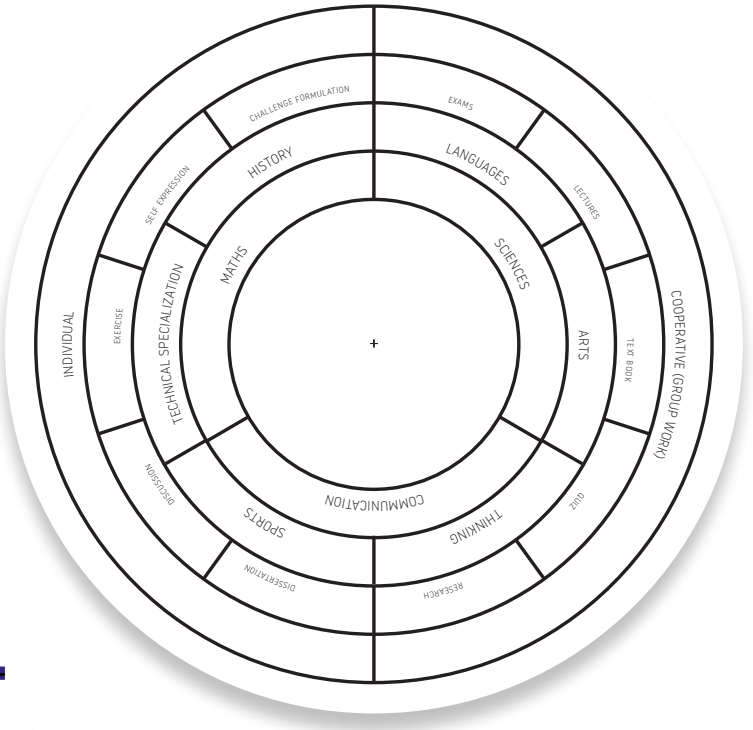
Teaching Design, Learning Design: Tools, Goals and The Creative Longterm Perspective
Alexandra Martini
Overview modules parameter project

5.3

Proposal

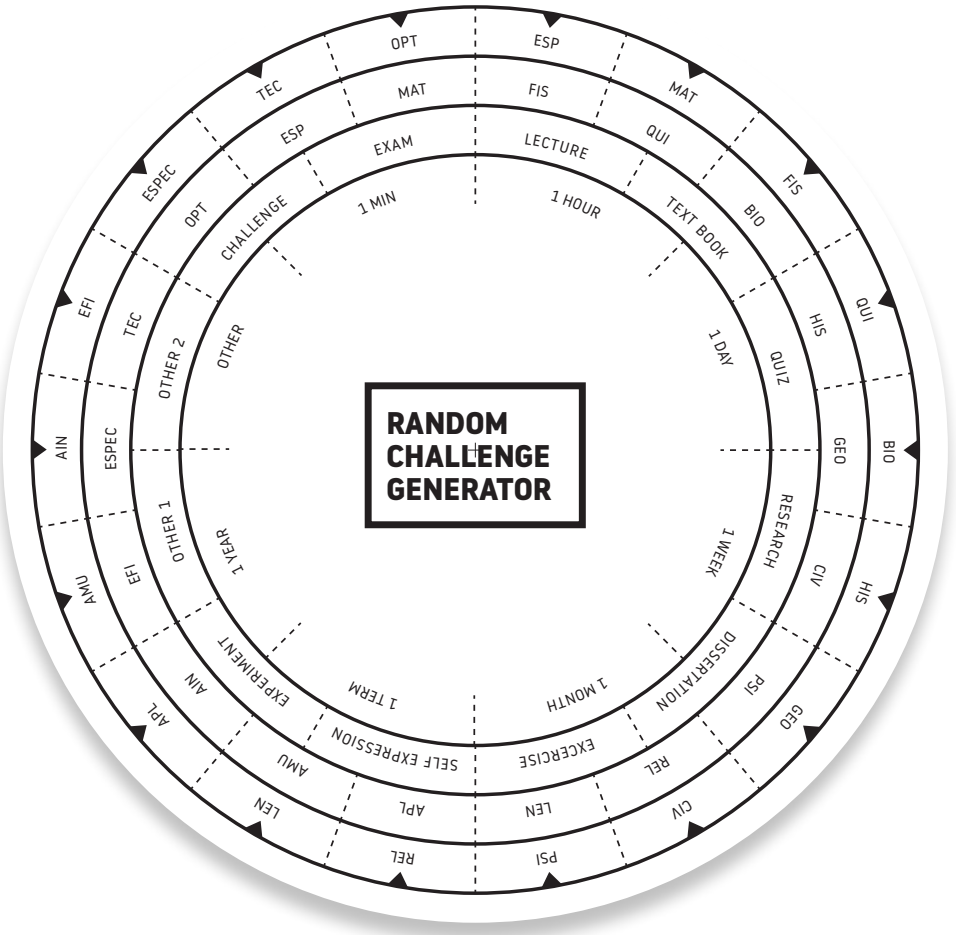
The Random Challenge generator is a set of concentric rings that includes information to connect and generate challenges that teachers can use as a way to create interdisciplinary tasks for students.

The proposal have been in a evolution process adapting needs in order to perform naturally.



1

Proposal
(STEM subjects as core).

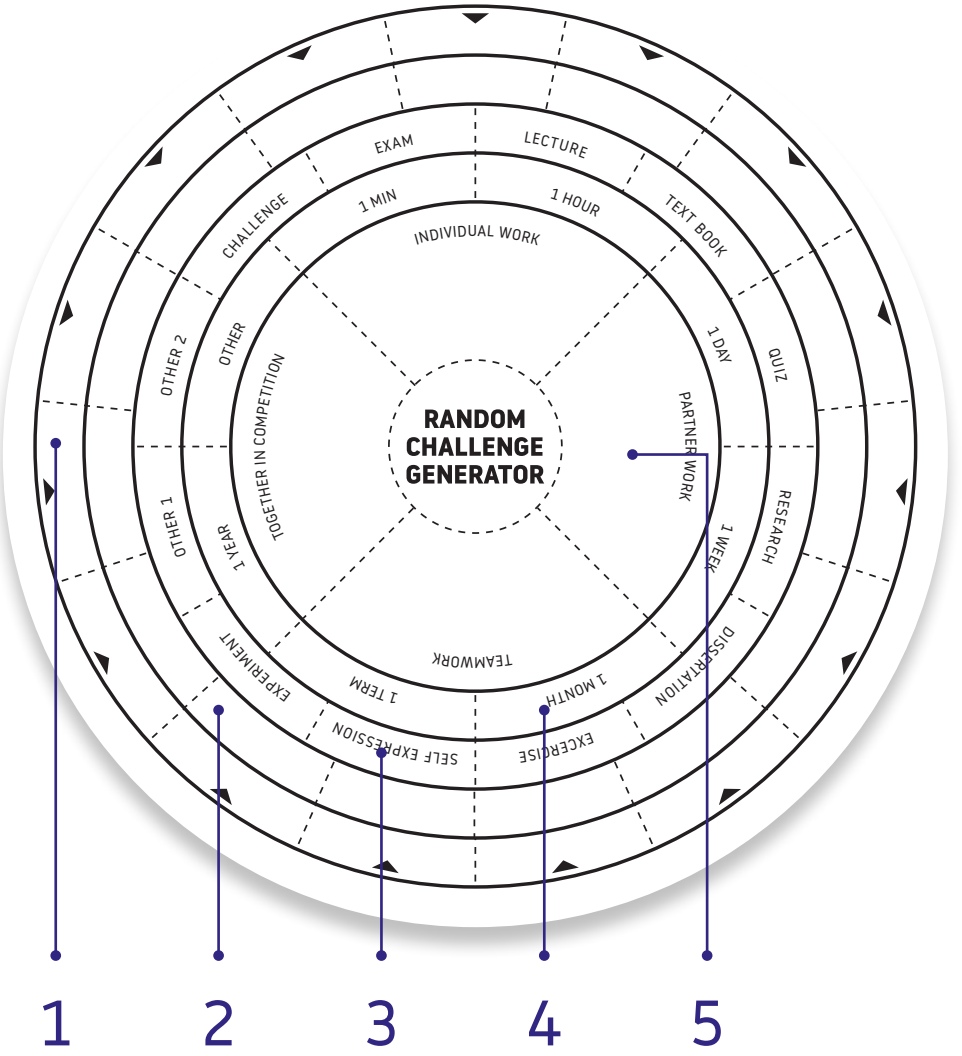


2

Proposal

All cells blank. This idea was discarded. There was an innecesary increment of complexity at the moment of use.

Check Video online



Final

Proposal

Download Random Challenge Generator

Five rings in the tool:

Ring 1:

Subject unit 1, (outer ring) this ring needs to be filled (teachers fill it) with all the variety of subjects according to educative system and the level that the educator teaches. These subjects could be math, science, history, etc.

Ring 2:

*Subject unit 2,*also contains subject unit with the variety of subjects.

Ring 3:

Task unit, this ring is already filled with usual tasks in classrooms. The variety includes challenge, exam, quiz, research, dissertation, exercise, self-expression, experiment.

Ring 4:

Time unit, this ring is already filled as well with proposals of timework. The list is 1 min, 1 hour, 1 day, 1 week, 1 month, 1 term, 1 year, other in case the educator need an optional. This and ring is incorporated or/ enhanced taking in consideration *The Creative Loop proposal*.

Ring 5:

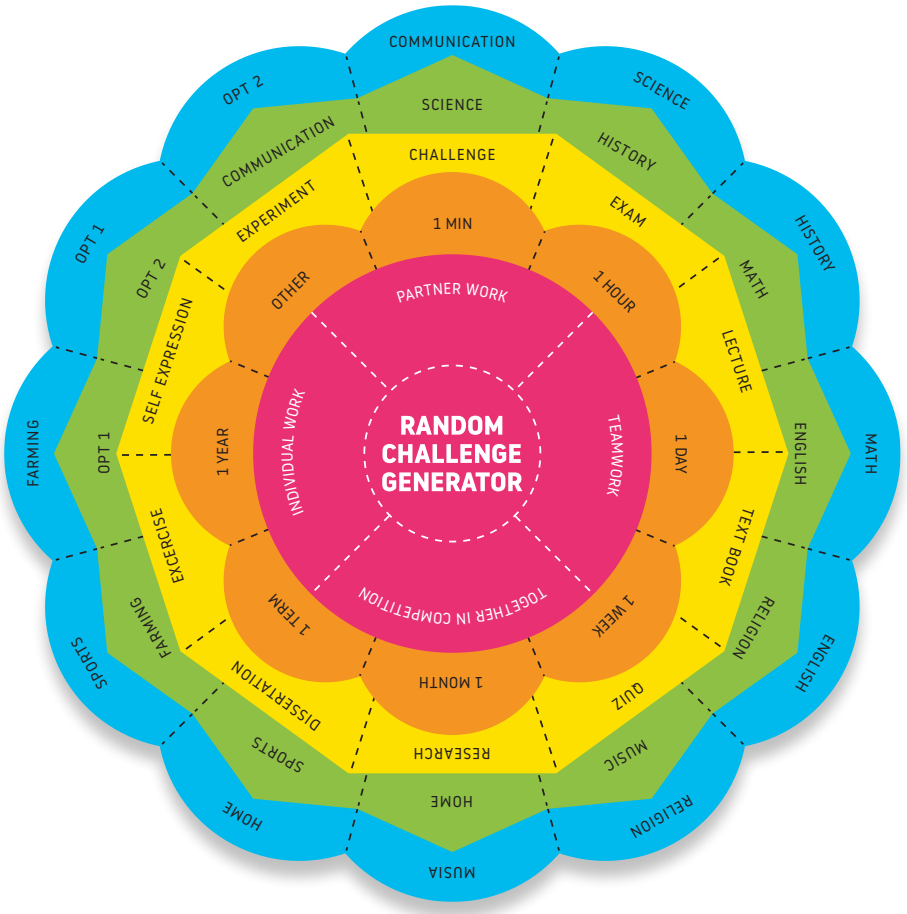
Team unit, in this ring are the options for teamwork such as individual work, partner work, teamwork and finally, together in competition.

5.4

Levels

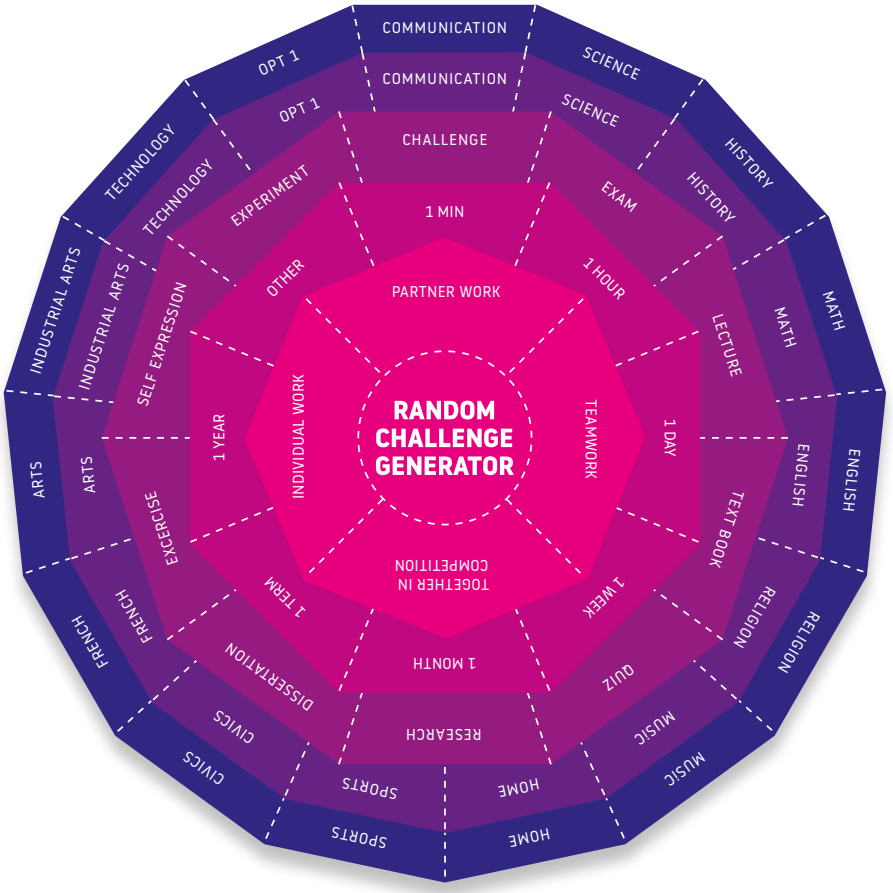
The three different levels are design on the need for each of the three systems. The difference lies in the shape and the number of cells to fill. ***Elementary School Level*** is based on a flower concept and has the less cells to be filled. ***High School Level*** (middle) evolves from the concept of the flower to a complex geometric shape; the number of cells in this level is larger. Finally, ***Senior High School Level*** transforms into a circle, with a number of cells equal to the previous level. The intention is to differentiate the three levels and to depict the evolution of the student.

Color palette is proposed suggestion and example of how educators can customize their tool. This tool is originally designed in black outline so teachers can select the color paper they feel comfortable or the one they have access to.



Elementary School

Downloadable Version



High School (middle)

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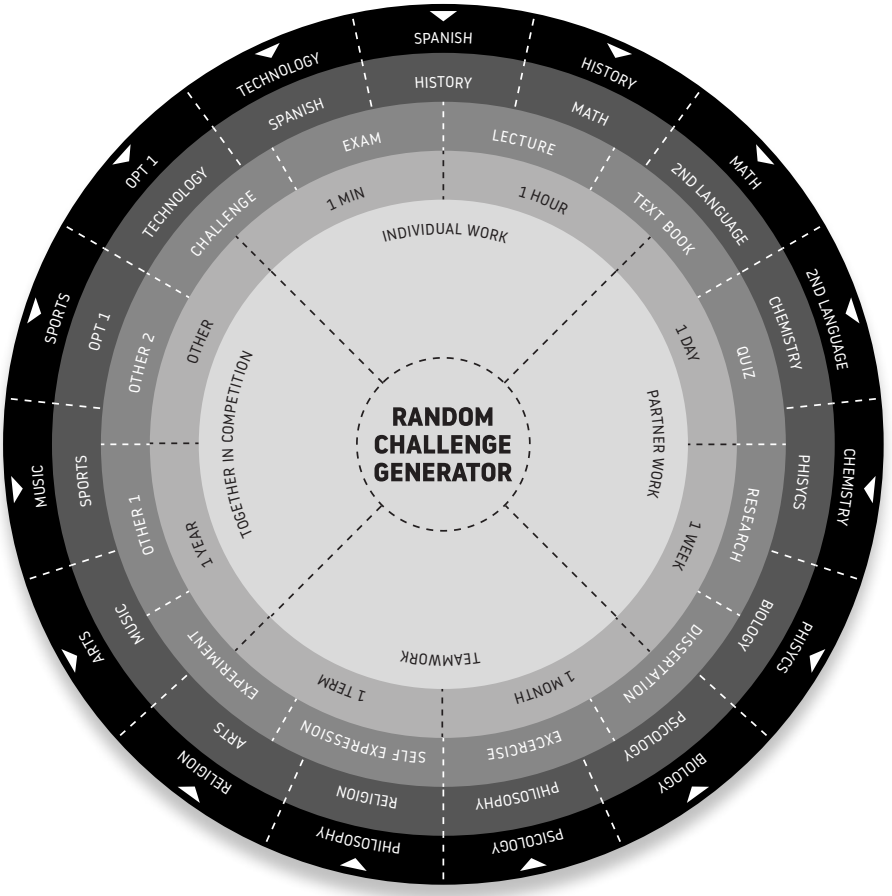
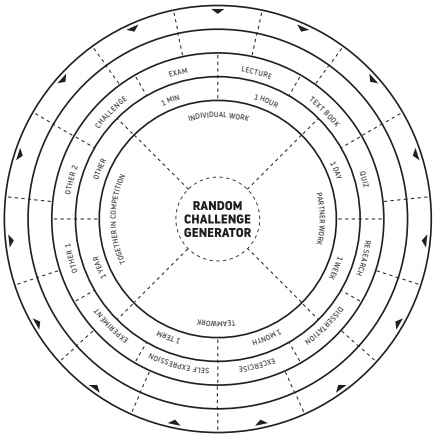


High School (Senior)



Downloadable Version

5.5

Usage

After assembling the tool, the first interaction is intended randomly. However, the intention is that educators move the different ring in a consciously thinking on possible connections according to their programs as a way to prepare lessons. Also other way of use is together with students as a way to create collective challenges for both.

5.5. 1 How is it achieving Critical Thinking?

The wheel follows the six steps of Critical Thinking method (see page 28).

1. **Knowledge:** by filling the cells educator will be creating immediately connection between topics on the program and it it's possible to integrate it with other class.
2. **Comprehension:** Understanding and checking the content and ways to use it.
3. **Application:** create the task.
4. **Analysis:** Observe if kids understood the task and content.
5. **Synthesis:** Diagnosis where kids explain what they learned and how they relate the content.
6. **Take action:** Define actions to take based on the results of the task.

5.5.2 Why to use it?

The most important reason is because education is not accomplishing its purpose. Second, to promote Critical Thinking aspects. These are very important to develop tools for the future. Also kids and educators get bored and frustrated every day.

Consequence of this, a negative connotation towards education grow every day causing many problems education-related like dropouts, unemployment, consumerism, corruption, lack of tolerance and so many more social problems. Challenging kids and educators, both are been engaged to enjoy the experience of learning.

5.6

Scenarios Integration

By creating possible integration tasks will be clear what could be a possible a possible outcome in order to learn integral knowledge.

5.6.1 Scenario 1

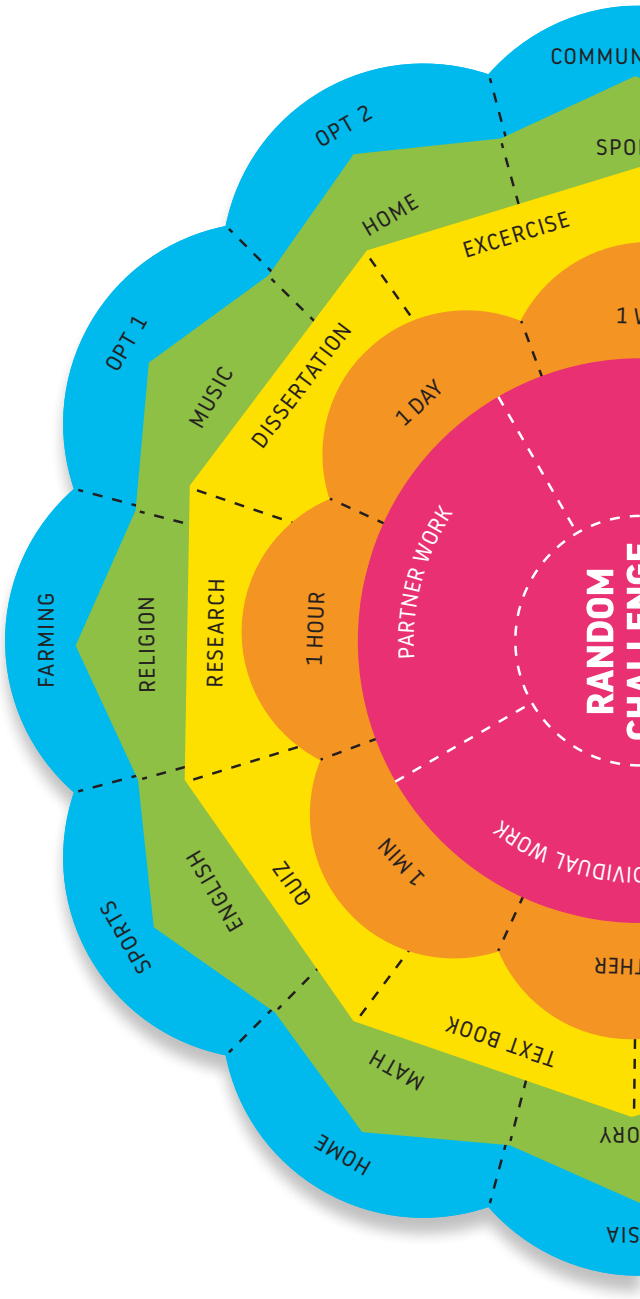
Level: Elementary School
Subject combinations:
Farming + Religion
Task unit: Research
Time unit: 1 hour
Team unit: Partner work

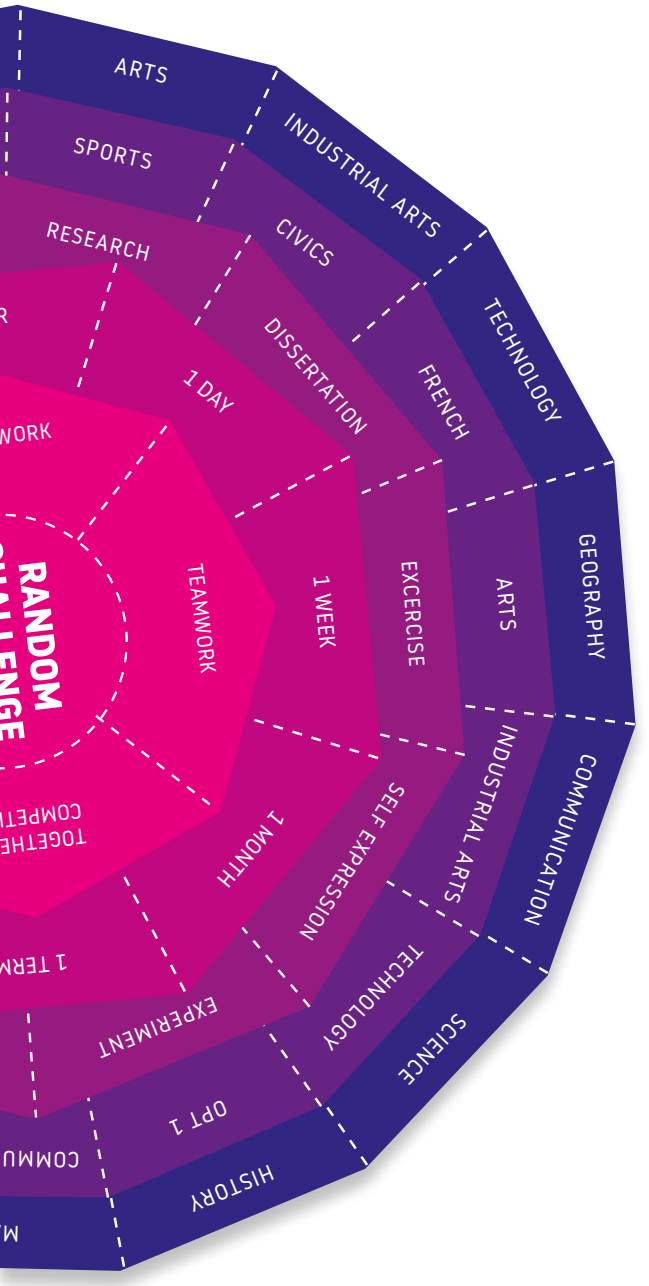
Outcome

A little research on differences and similitudes in Food Habits according to Religion.

Goal

Identify usual patterns in food habits that accompany society since ancient years to create tolerance to others beliefs.





5.6.2 Scenario 2

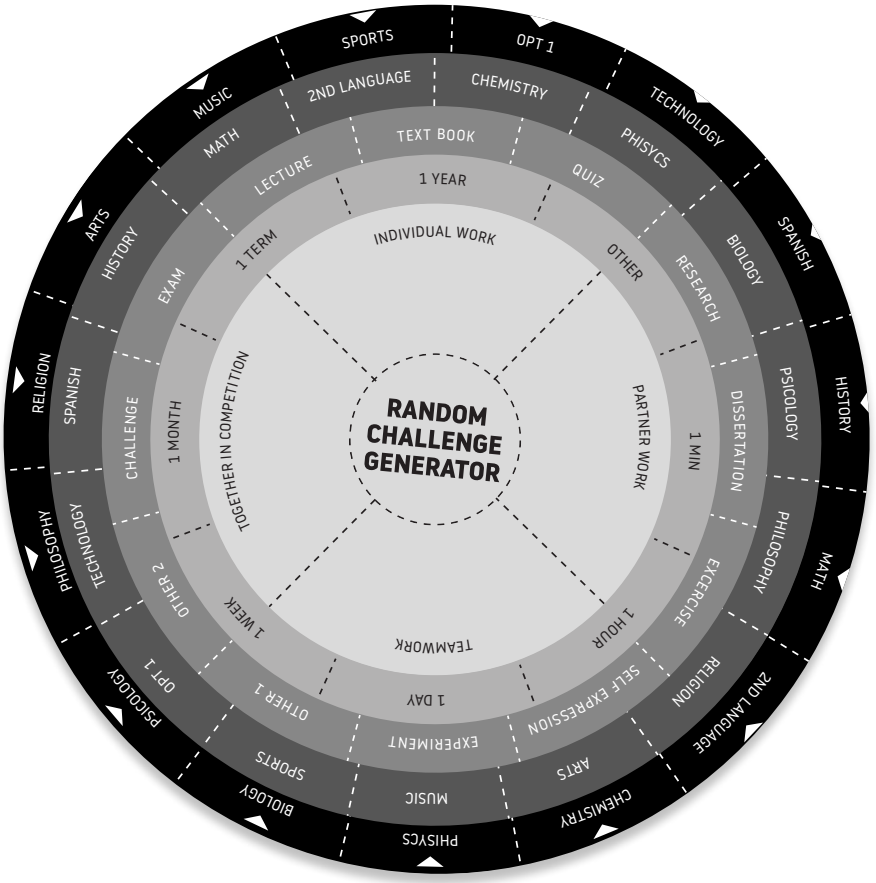
Level: High School (middle)
Subject combinations:
Geography + Arts
Task unit: Exercise
Time unit: 1 week
Team unit: teamwork of 3

Outcome

Find out how maps were made during the XIX century, in based on this creates a map on the surroundings of the school.

Goal

Provide students with spatial understanding and how to interpret it.



5.6.3 Scenario 3

Level:
Senior High School
Subject combinations:
Physics + Music
Task unit: Experiment
Time unit: 1 day
Team unit:
teamwork
(class + teacher)

Outcome:

Understand how to determine the speed of sound in a vibrating guitar cord.

Goal:

Learn with a practical example how to apply formulas to a very complex problem.

5.6.4 Evaluation

This tool encourages leaning to problem-solving-integrative-collaborative-learning-experience-projects. The core of education should focus on truly learning and not exam-based education that's why is recommended to use more tasks and less high valued exams during the semester.

Even though, exams are necessary and they work as a way of diagnosis, given that they need to corroborate if the methodology and the tool is achieving integral learning. The use of experience learning will create a better understand of how to apply the acquired knowledge hence students should be able to perform better in diagnosis tests. Finally, teachers are experts and their opinion is important to improve education. Education as it can be seen, depends on the relationship between the student and the educator.

5.7

Distribution

The tool's distribution is planned to be through two channels.

5.7.1 Workshop

Workshop name:

Developing Critical Thinking through Creativity.

Facilitator:

Pablo Porta.

Background:

Pablo Porta is a designer from Costa Rica; he has been studying in Germany for the past 2 years. His emphasis is in Graphic Design, however he is experienced in creating solutions and tools easy-to-apply to problems.

Audience:

Teachers from Urban and Rural locations in Costa Rica.

Location:

Varies from school location.

Length:

30 min.

Date:

Undefined.

Supplies:

Handout of Random Challenge Generator, pens.

Goal:

By using the tool teacher will be familiarized with 6 steps of Critical Thinking to later apply it to integrated tasks. This way they can engage students to learn in an multi-disciplinary mode, where integral knowledge is been created.

Team setting:

Groups of 3.

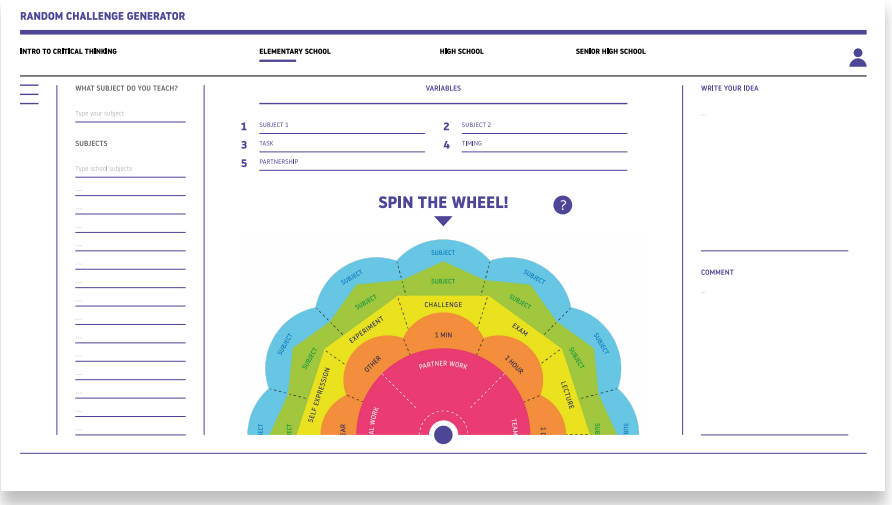
Activities:

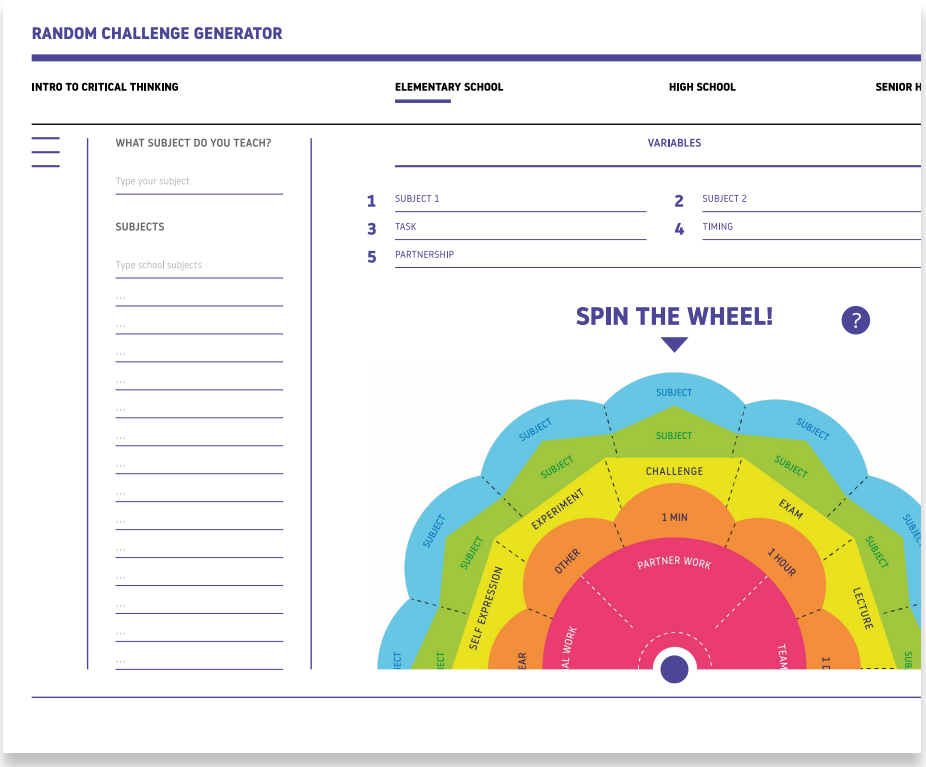
1. Create the groups.
2. Present facilitator background and what he has been working on.
3. Delivery tool, 1 set per group.
4. Participants fill information in the tool, they discuss about it.
5. Ask for connections, what comes to mind immediately when you combine two subjects?
6. Explain 6 steps of Critical Thinking.
7. Redefine task with help of educator's knowledge integrating tasks and hopefully creating collaborative tasks and methods to teach.

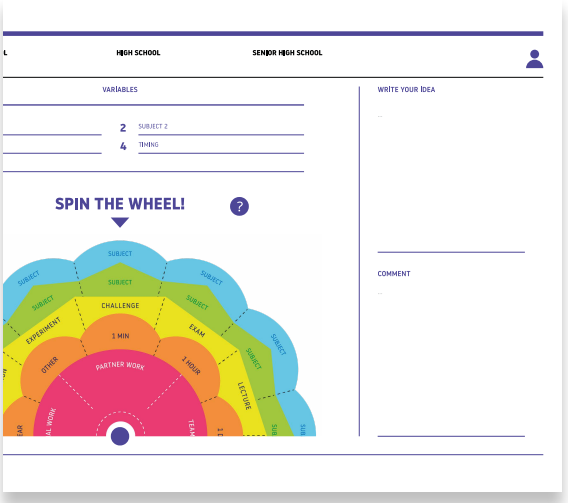
5.7.2 Digital Platform

For the digital platform, the idea is to be something similar to 3factors.org. This website will work as a platform to connect ideas and collaborate between educators or other professionals who wants to learn about. However, the digital platform is not the core of the tool but a way to expand knowledge-sharing experience. It also works as a hub to hold files and resources to be downloaded directly and use it offline. Is worth to mention that there are some platforms that already achieve the function of distributing material and connect educators. Even platforms such as Linkedin, Google docs and Facebook, etc. could work to achieve this.

This tool is designed with the most elemental features, focusing mostly on the interaction of the ***Random Challenge Generator*** as a way to be guided in needed case. As well includes a section on how the wheel works, an introduction to Critical Thinking and its steps, sharing ideas section and comments.







Same principle of interaction. Fill with subjects and chose which subjects to integrate.

06

CONCLUSIONS

Throughout this project there has been lots a feelings and experiences. I don't consider myself a teacher or anything close. However I loved this experience because I know is one step forward to a better future.

Education is important and we as human beings our biggest skill is intellection. Through intellectual skills as society we have achieved great things, although we have lost our direction. We have lost empathy for our brothers and sisters around the world, we have disconnected from Nature and its needs, we have a wrong idea of what means being successful. This comes mostly from the XX Century, when production shifted to consumerism and product-oriented happiness.

I recommend that this project go further. It requires more testing to identify weather educators feel motivated and challenged with the tool. In my findings from the research, I know I created the solution taking in consideration analysis and literature. However this is a tool that requires months to determine if it achieves everything what is being desired.

What I have learned during this process is that we need more innovation in our future, not innovation to design new models of cellphones but social innovation. The only way to achieve this, is educating new generations with this idea in mind. Provide them with skills to foresee problems and collaborate to succeed them. Current education is a deficient system that is meant to fill the Industry. We need to empower teachers for having a new education according to the times we live, they are fighting already for the future we need.

Notes

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