Forming groups of students best suited to work together on a sustainability issue

EPFL | HUM-471 "Economic growth and sustainability"

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EPFL Teaching Sustainability Think Tank
Virtual event: Supporting EPFL students to develop sustainability mindsets
23 November 2020

HUM-471 "Economic Growth & Sustainability"

Audience

The elective humanities course attracts a very international set of students from all EPFL disciplinary backgrounds: sciences, engineering and architecture

Main Objective of Fall Term

Introduce graduate students to global environmental issues from an economic perspective, and to provoke them to reflect on trade-offs, options and possible policy measures
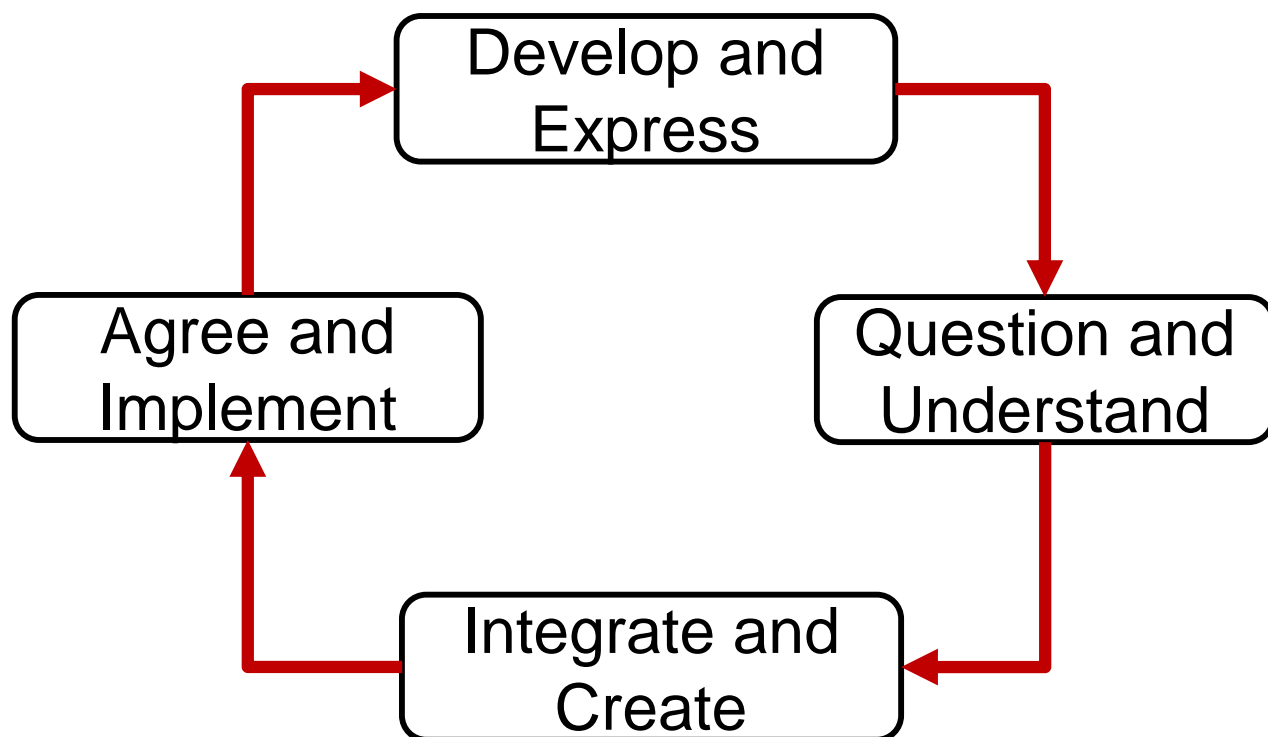
Main Deliverable in Spring Term

Semester-long group project, addressing a specific issue of their choice

Additional Aim

Stimulate political discourse amongst students or **'Constructive Controversy'**

What is Constructive Controversy?

A method to teach citizens how to engage in political discourse

EPFL

Philippe Thalmann

LEURE

Develop and Express

Question and Understand

Integrate and Create

Agree and Implement

Introduced by David W. Johnson, the method *demonstrated the benefits of intellectual conflict for creative decision making and problem solving*

In the context of education:
Creating a learning environment that adapts to student's individual interests, while accounting for heterogeneity of beliefs, although challenging in practice (Hidi and Harackiewicz 2000) may further prove beneficial for developing critical thinking skills, key for students to learn how to challenge their own beliefs and those of their peers

Stimulating Political Discourse in EGS
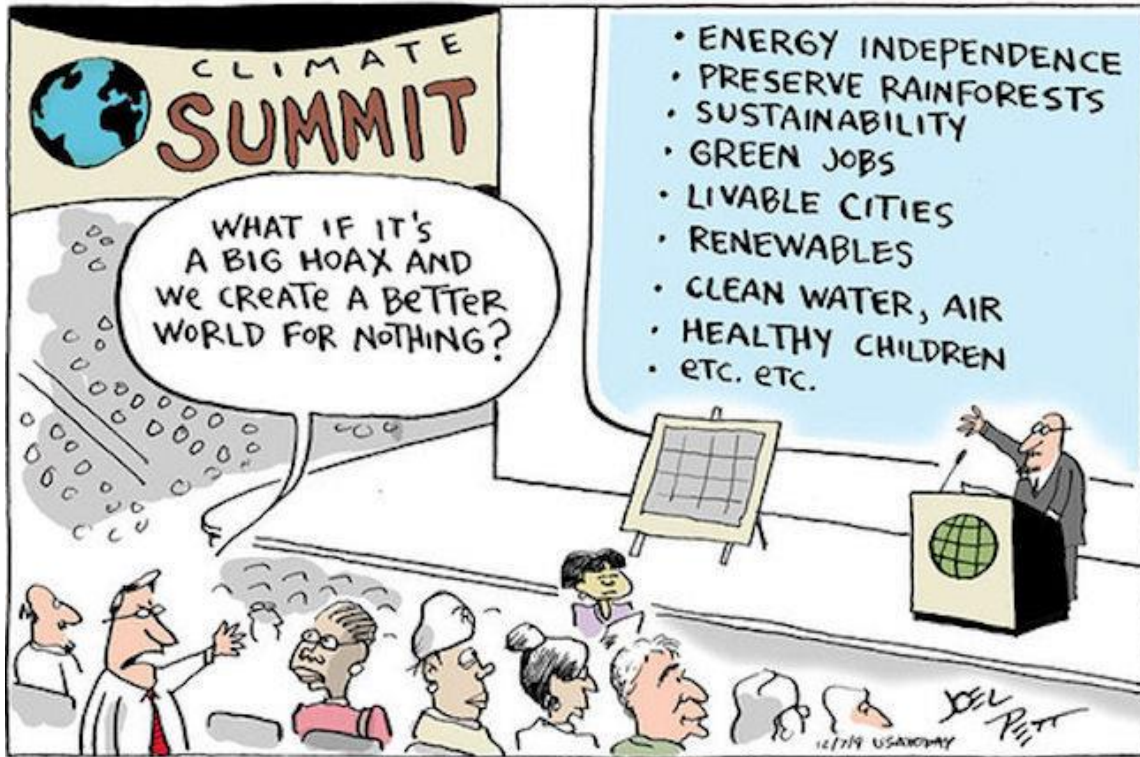
Given that environmental strategies remain controversial and lack policy-action consensus (Drews and van den Bergh 2016), **this course constitutes an ideal case study to explore a practical implementation of scientific conflict generation in the context of group work**

Challenge for group formation

How to stimulate Constructive Controversy within project groups?

Randomized

Students may not agree on a topic they all are interested in

Self-Organized

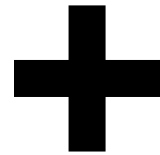They may share the same views and beliefs

NEED FOR:

A workflow that generates a set of student-groupings based on two key objectives:

- **SHARED INTEREST**
- **OPPOSING VIEWS/BELIEFS**

Workflow we tested in Spring 2020

26 Question Survey

- Gauge interest in sustainable development topics

- Views on commonly held beliefs related to economic growth & sustainability

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Group Formation

Simulate 3-person groups using scoring functions that assess the levels of

- topic preference

- "political" difference

Survey Questionnaire

#	Beliefs toward Economic Growth & Sustainability	#	Topics in Sustainable Development
B 1	The political institutions of a country such as Switzerland are perfectly capable of addressing climate change	T 1	Preservation of parts of Nature such as forests, ecosystems, species
B 2	International institutions should be strengthened to protect the planet and its resources	T 2	Minerals
B 3	International firms should be made responsible for social and environmental damages they or their supply chain cause everywhere in the world	T 3	Energy
B 4	We as consumers have an important role to play in making sure that consumer goods are produced in a sustainable fashion	T 4	Economic activity, economic growth and how it can be made more sustainable
B 5	It is possible to bring consumers and firms to take the environmental impacts of their choices into account through price signals (taxes, subsidies, tradable permits); there is no need for stricter regulation (standards, bans)	T 5	Impacts of economic activities, pollution, climate change impact
B 6	Western European countries are already doing enough to preserve the planet, now it is up to the large emerging economies to do their part	T 6	Building resilience, adaptation to climate change or to resource scarcity, e.g. water
B 7	Developing economies should be allowed to grow before being expected to contribute to environmental protection	T 7	Technological innovation and its role in preserving resources
B 8	Progress of humanity requires economic growth to continue indefinitely	T 8	Population growth
B 9	Better technology can decouple growth from energy use, therefore effectively eliminating limits to growt	T 9	Inequality, poverty, justice
B 10	Becoming truly sustainable, i.e. living within planetary boundaries, will strongly limit our ability to satisfy human needs: we might survive, but not lead a good life	T 10	Happiness and welfare
B 11	Today's implicit system goal, continued economic growth, cannot be changed because the world's financial market would collapse without such growth	T 11	Lifestyles
B 12	The concept of sustainable development has proven insufficient in practice; it is time to come up with a new framework that gives less weight to the economy	T 12	Environmental policy making, instruments
B 13	Population control is essential for preserving the planet	T 13	International cooperation and assistance, burden sharing

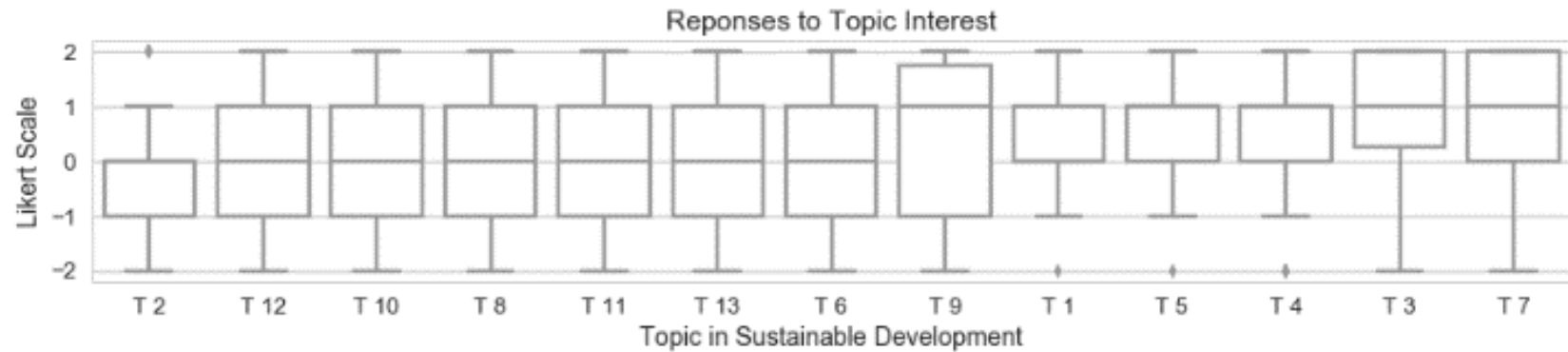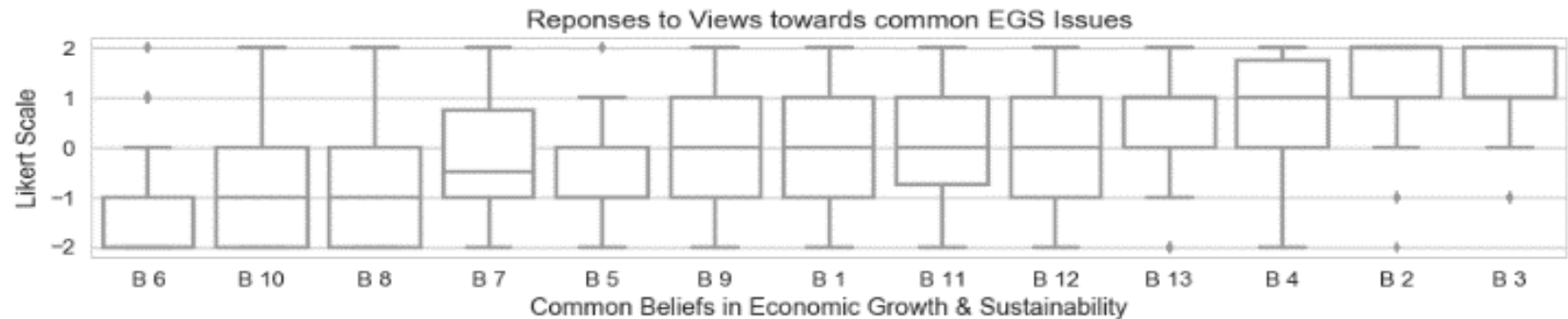| Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Distribution of Results
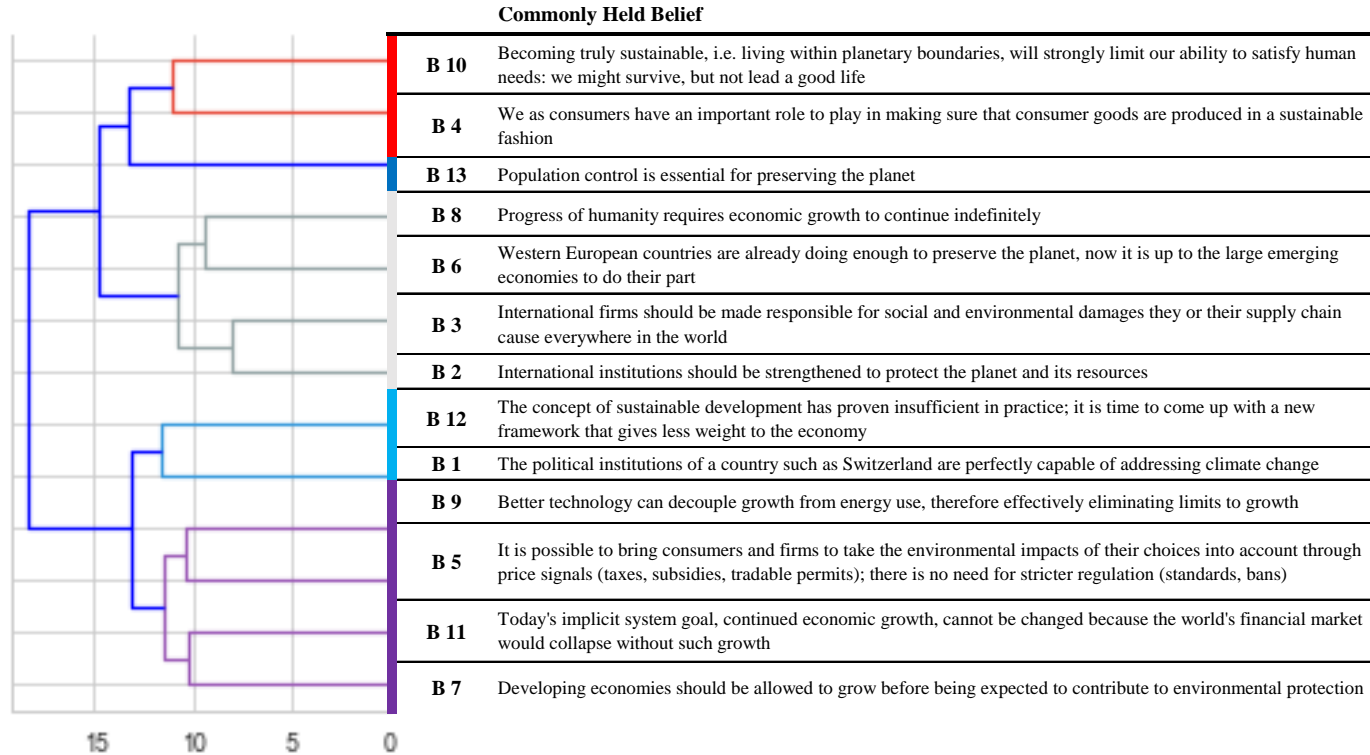
Topic interest is normally distributed
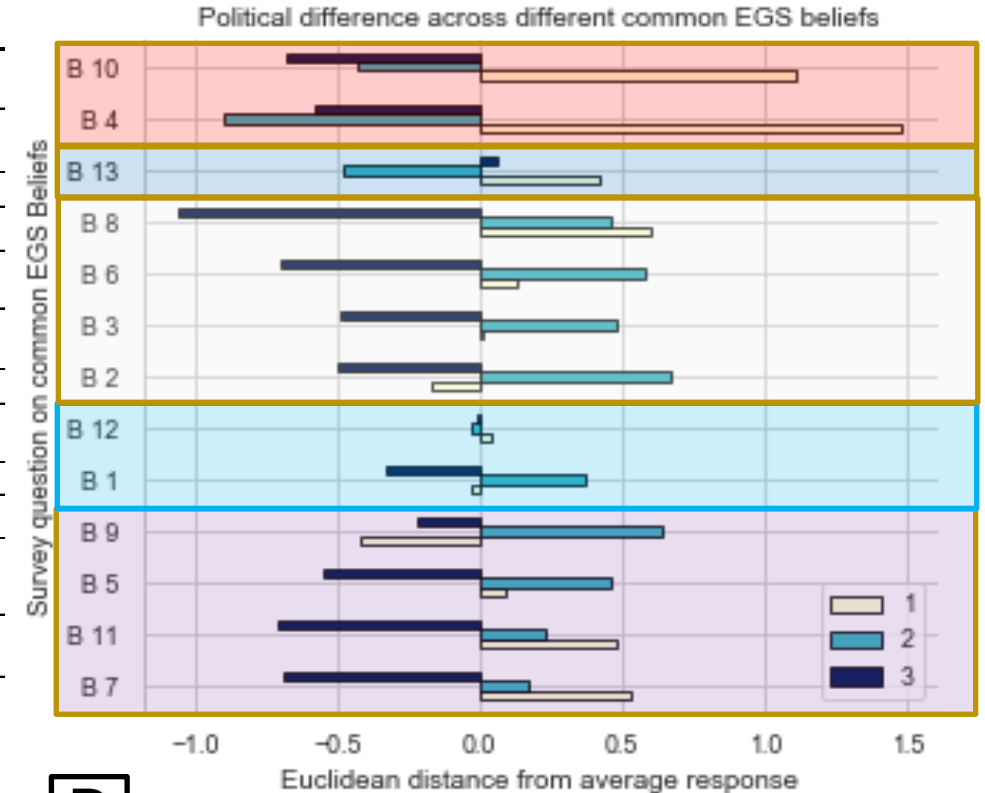
Many EGS beliefs are skewed

The students in these tails play an important role in creating an environment of critical discourse
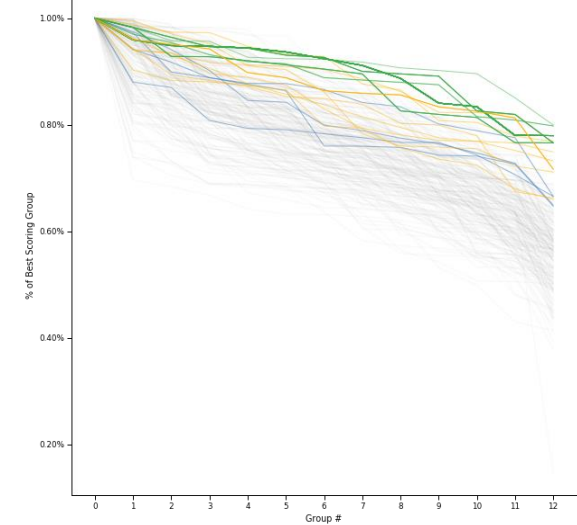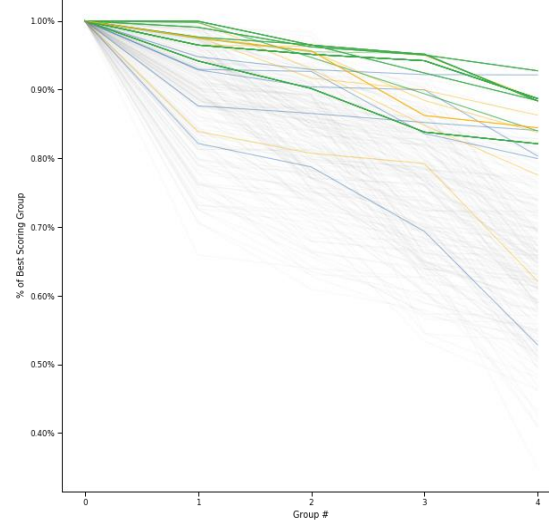
Political Views

Commonly Held Belief

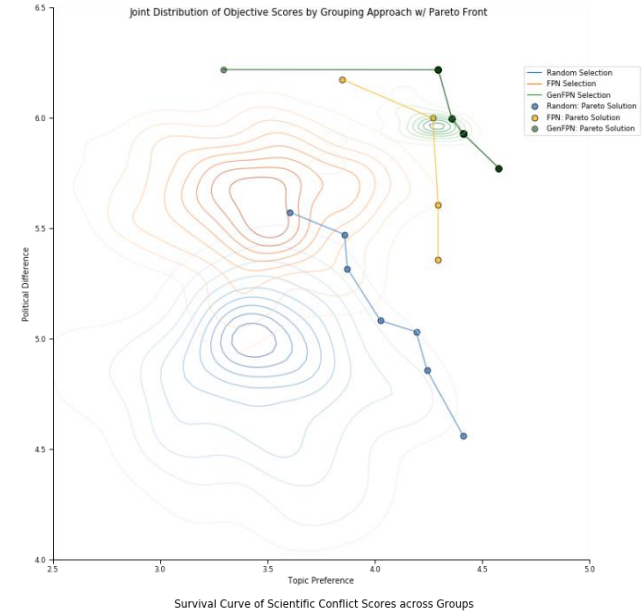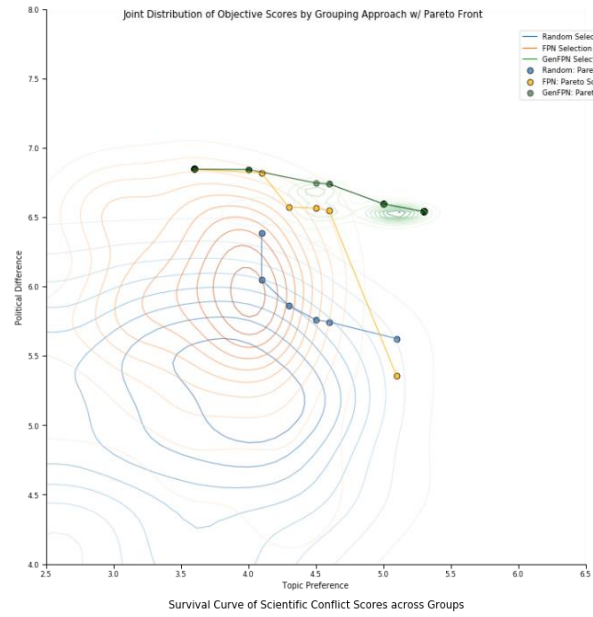|	
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B 13	Population control is essential for preserving the planet
B 8	Progress of humanity requires economic growth to continue indefinitely
B 6	Western European countries are already doing enough to preserve the planet, now it is up to the large emerging economies to do their part
B 3	International firms should be made responsible for social and environmental damages they or their supply chain cause everywhere in the world
B 2	International institutions should be strengthened to protect the planet and its resources
B 12	The concept of sustainable development has proven insufficient in practice; it is time to come up with a new framework that gives less weight to the economy
B 1	The political institutions of a country such as Switzerland are perfectly capable of addressing climate change
B 9	Better technology can decouple growth from energy use, therefore effectively eliminating limits to growth
B 5	It is possible to bring consumers and firms to take the environmental impacts of their choices into account through price signals (taxes, subsidies, tradable permits); there is no need for stricter regulation (standards, bans)
B 11	Today's implicit system goal, continued economic growth, cannot be changed because the world's financial market would collapse without such growth
B 7	Developing economies should be allowed to grow before being expected to contribute to environmental protection

A

B

Group Formation Strategies

BLUE : Randomized Grouping

ORANGE : Furthest Political Neighbour

GREEN : Generative Approach

Results

Section A

Num. Students: 15

Num. Groups: 5

	Objectives			Improvement (% Gain)		
Solution Description	Topic Interest	Political Variance	**Fitness**	vs. Exp. Random	vs. Best Random	vs. Best FPN
Expected Random	4.60	6.34	29.15	-	-	-
Best Random	5.40	6.35	34.28	18%	-	-
Best FPN	5.40	6.91	37.32	28%	9%	-
Best GenFPN	5.60	6.82	38.20	31%	11%	2%

Section B

Num. Students: 39

Num. Groups: 13

	Objectives			Improvement (% Gain)		
Solution Description	Topic Interest	Political Variance	**Fitness**	vs. Exp. Random	vs. Best Random	vs. Best FPN
Expected Random	3.18	5.01	15.93	-	-	-
Best Random	4.03	5.38	21.65	36%	-	-
Best FPN	4.10	5.93	24.32	53%	12%	-
Best GenFPN	4.46	6.20	27.65	74%	28%	14%

Improvement over Expected Performance of Randomly Gene