

Education in Sustainable Chemistry in Spain: The activities of the Spanish Network in Sustainable Chemistry

Santiago V. Luis

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University Jaume I

Castellón, Spain

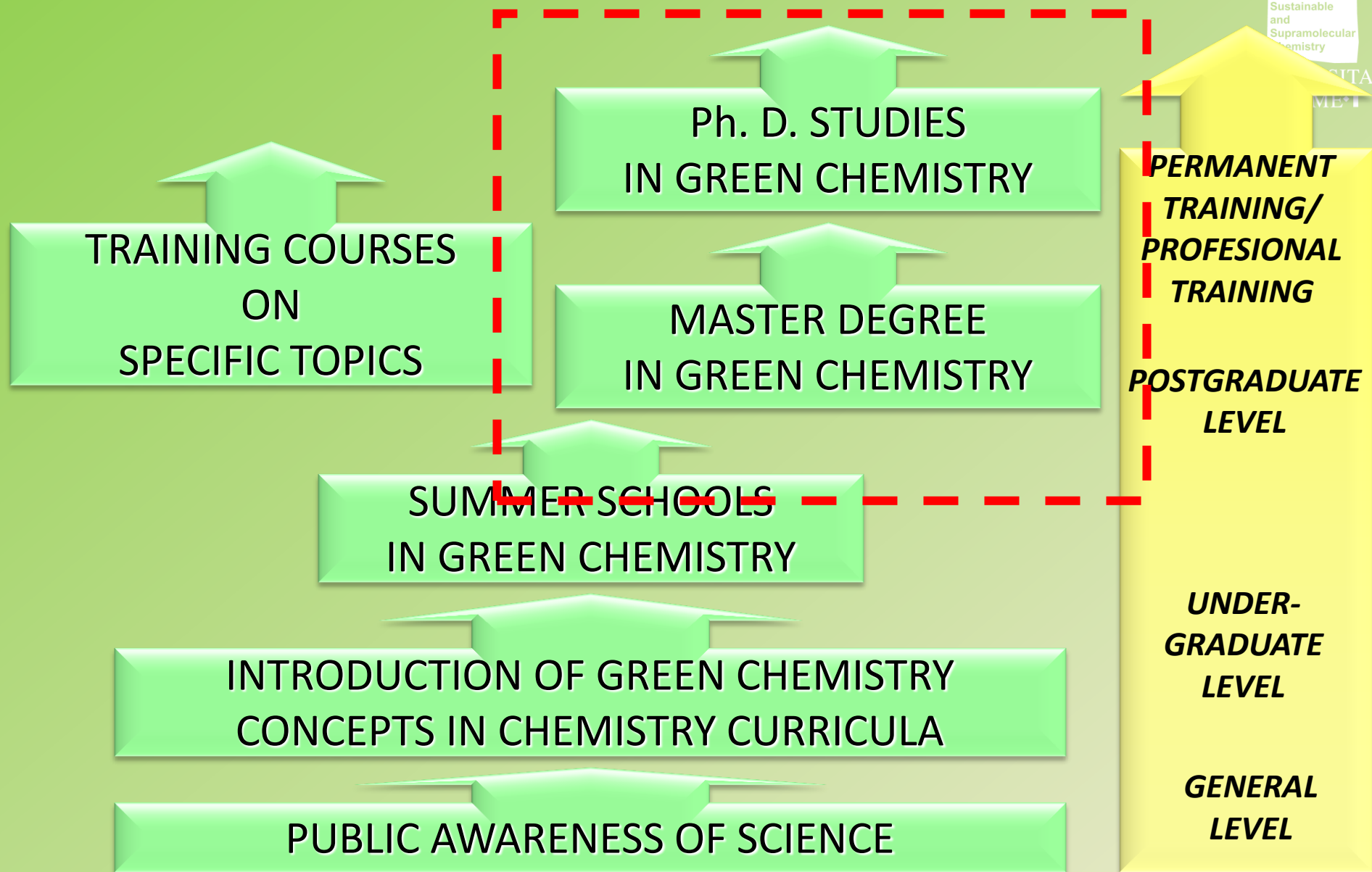


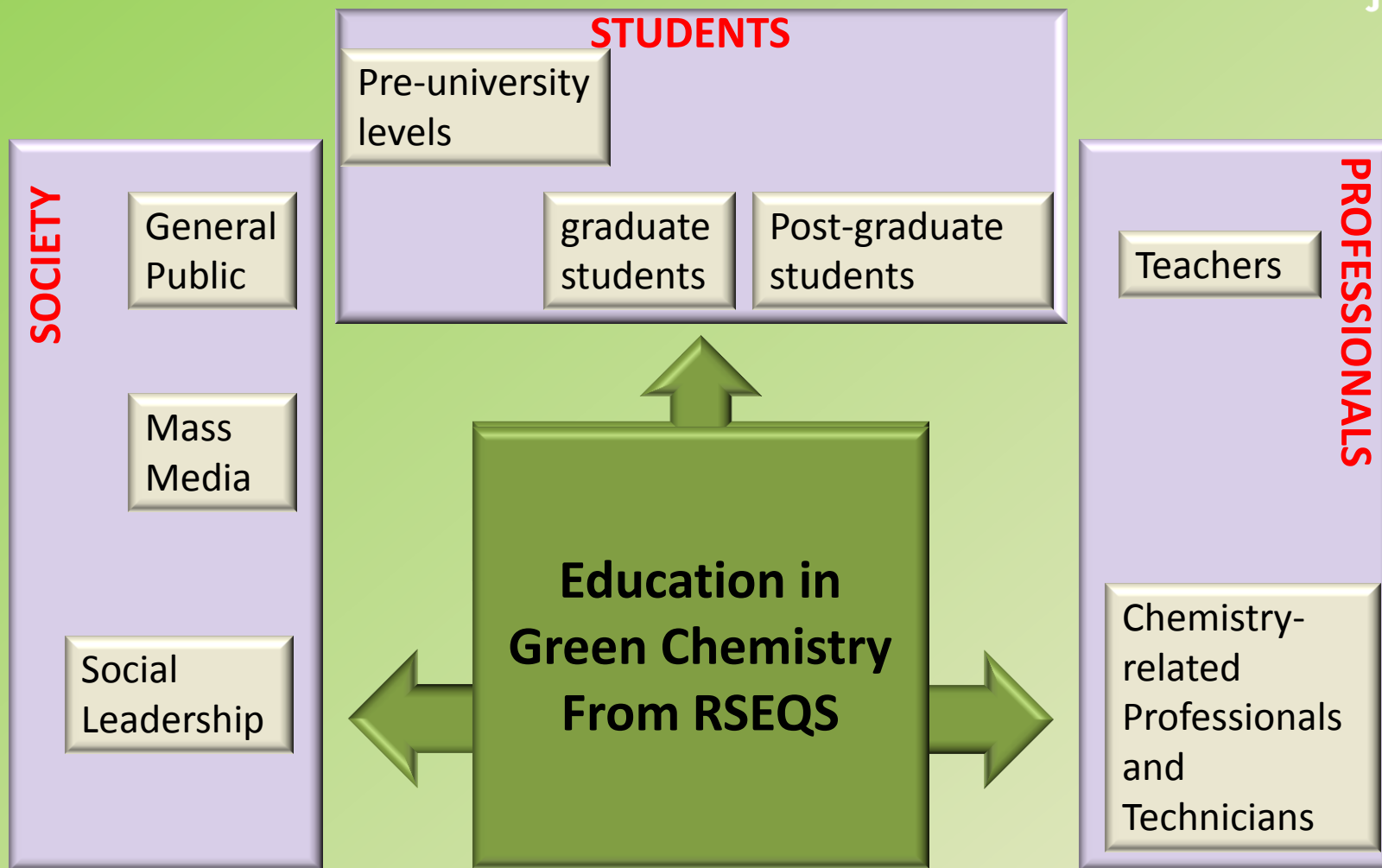
Red Española de Química Sostenible
Green Chemistry Network of Spain

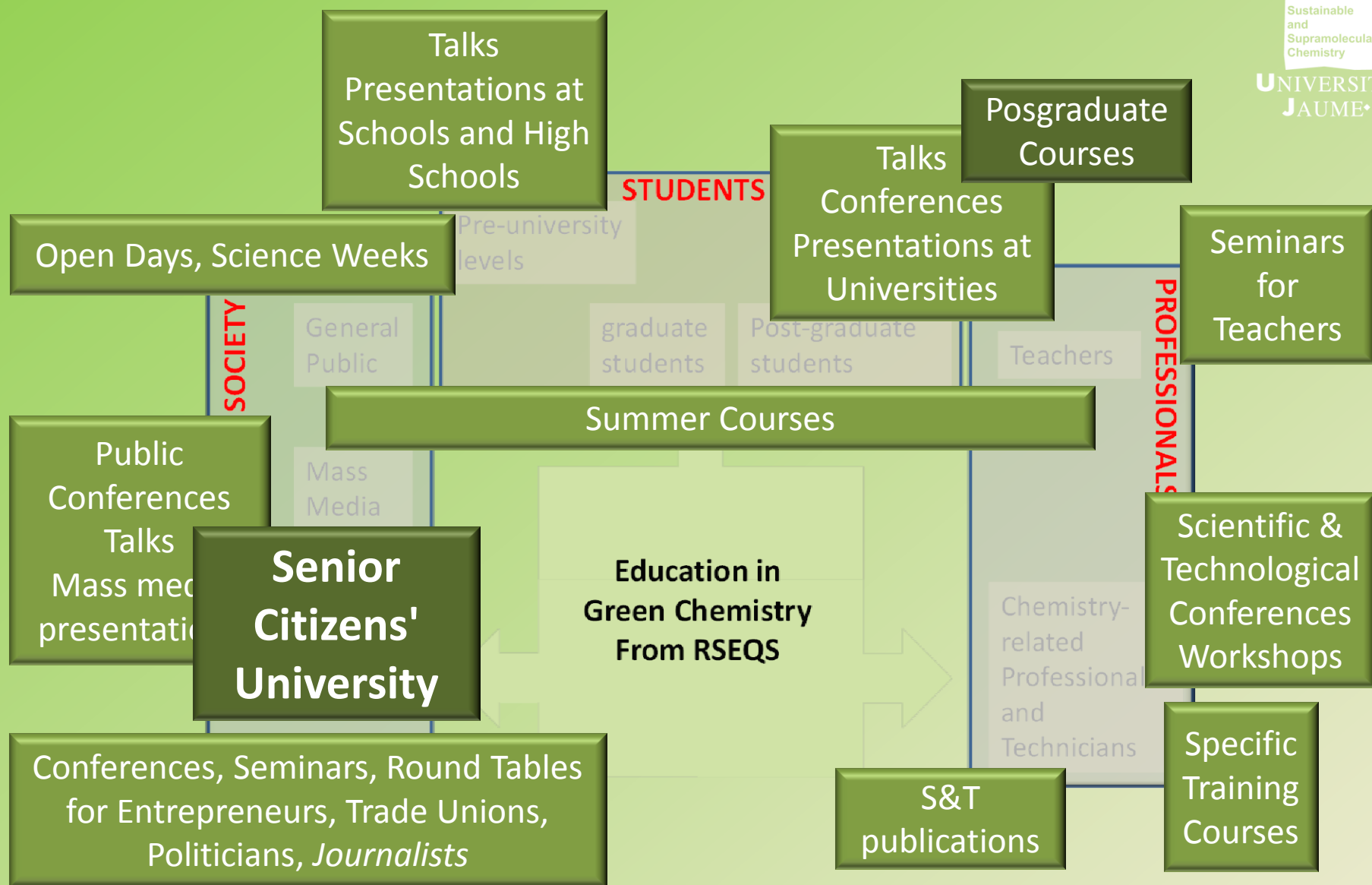


Sustainable and Supramolecular Chemistry

CITAT
VIB* I







CULTURAL HERITAGE POSTGRADE

(209 students in 2014)

Senior
Citizens'
University

- **The current role of Science:
Sustainability, Technology and
Nature**

Students in three groups:

- group A 72
- group B 62
- group C 68

Gender distribution:

- Male 66
- Female 136

Senior
Citizens'
University

The current role of Science: Sustainability, Technology and Nature

1. SCIENCE AND TECHNOLOGY IN TODAY'S WORLD: A CRITICAL VISION

3 HOURS

2. CHEMISTRY AND THE ENVIRONMENT

1.5 HOURS

3. SUSTAINABLE CHEMISTRY AND GREEN CHEMISTRY

1.5 HOURS

4. INDUSTRIAL RAW MATERIALS: TOWARDS THE USE OF RENEWABLE RAW MATERIALS

1.5 HOURS

5. SUSTAINABLE MATERIALS

1.5 HOURS

6. SCIENCE, TECHNOLOGY AND ETHICS

0,75 HOURS

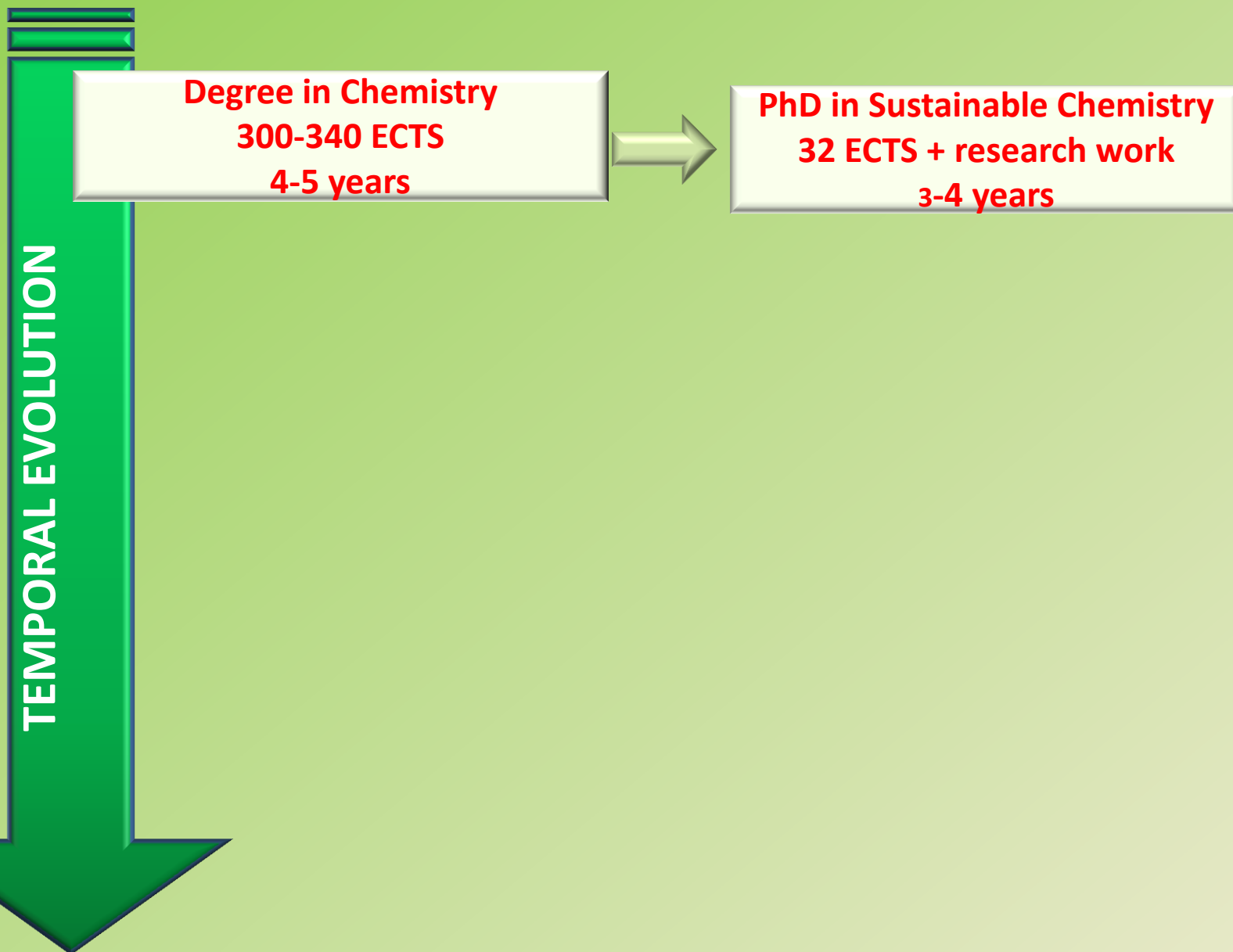
7. CURRENT FRONTIERS IN SCIENCE AND TECHNOLOGY

0.75 HOURS



Sustainable
and
Supramolecular
Chemistry

UNIVERSITAT
JAUME I



Degree in Chemistry
300-340 ECTS
4-5 years



PhD in Sustainable Chemistry
32 ECTS + research work
3-4 years

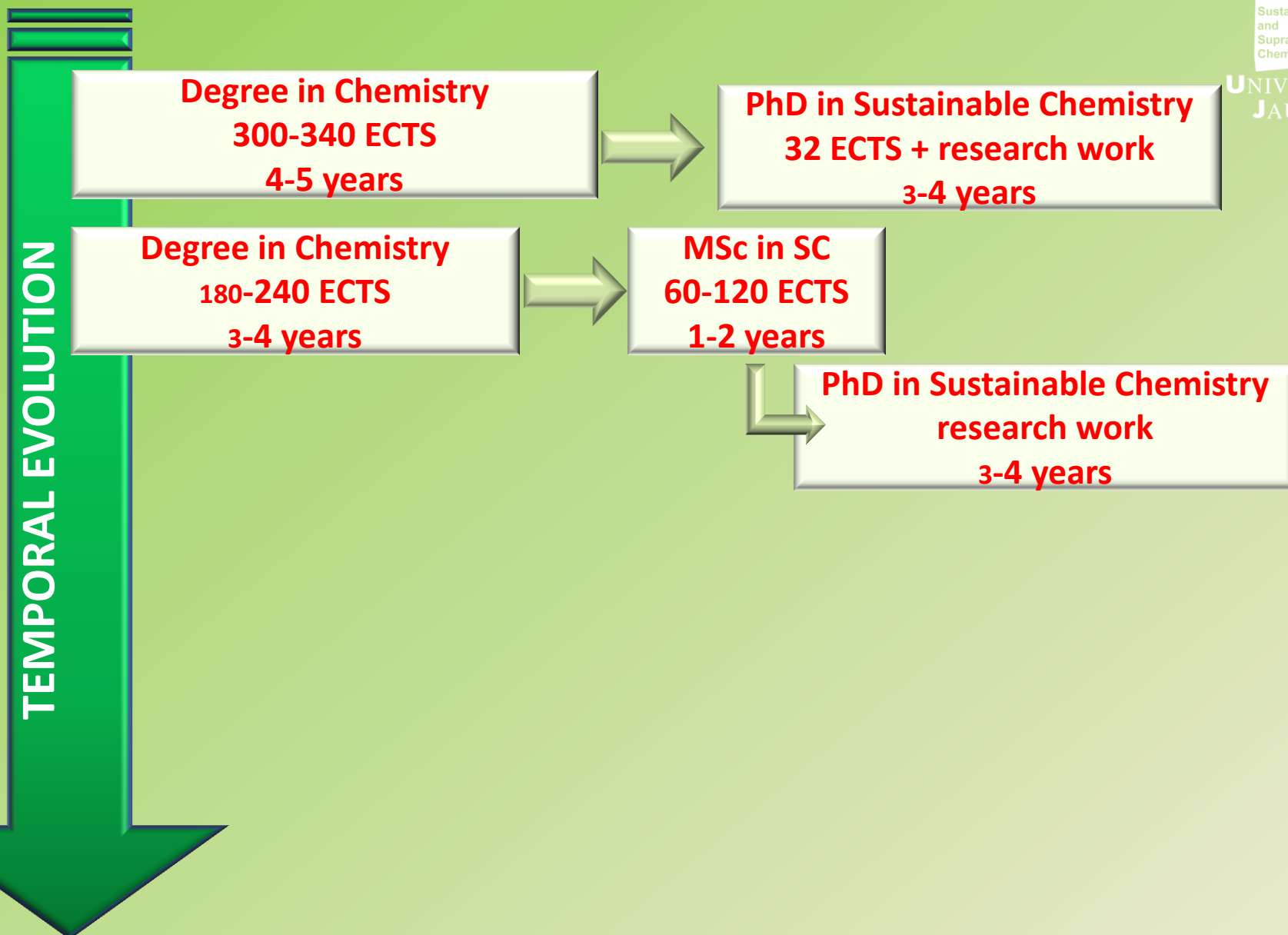
TEMPORAL EVOLUTION

Red Española de Química Sostenible

Menciones de calidad
2003 - 2004
2004 - 2005

**QUÍMICA
SOSTENIBLE**

Programa de Doctorado Interuniversitario
Desarrollo de Nuevos Procesos Químicos con Bajo Impacto Ambiental



TEMPORAL EVOLUTION

Degree in Chemistry
300-340 ECTS
4-5 years

PhD in Sustainable Chemistry
32 ECTS + research work
3-4 years

Degree in Chemistry
180-240 ECTS
3-4 years

MSc in SC
60-120 ECTS
1-2 years

PhD in Sustainable Chemistry
research work
3-4 years

UNIVERSITAT JAUME I

TÍTULO: Máster en Química Sostenible

DIRECCIÓN: Santiago V. Luis Lofuente (Departamento de Química Inorgánica y Orgánica)

COORDINACIÓN: Universitat Jaume I

INTERUNIVERSITARIO: Universitat Jaume I, Universitat de València, Universitat Pública de Navarra

NÚMERO DE CRÉDITOS: Mínimo 60 créditos ECTS (European Credit Transfer System)

DURACIÓN: 1 curso académico

FECHAS DE REALIZACIÓN: Octubre 2006 - Septiembre 2007

DIRECCIÓN A: Licenciados en Química, Ingeniería Química u otras titulaciones afines. Otras titulaciones con un nivel de medio de conocimientos de Química. Profesionales de la Química o de sus afines (investigadores y técnicos superiores en activo en instituciones o empresas)

NÚMERO DE PLAZAS: 35

PRECIO: Según tasas oficiales

ENTIDADES COLABORADORAS: Red Española de Química Sostenible, Red Española de Química Sostenible, Red Española de Química Sostenible, Red Española de Química Sostenible

* Aprobado por el decreto 44/2006, De 31 de marzo, del Consejo de la Generalitat Valenciana (Diag y Núm. 5233, 4/4/2006)

www.masterquimicasostenible.uji.es

INFORMACIÓN: Centro de Estudios de Postgrado y Formación Continua. Tels. (+34) 954 387229 / 7230. centro.postgradu@uji.es



Máster en Química Sostenible (Interuniversitario)

octubre 2006
septiembre 2007

TEMPORAL EVOLUTION

Degree in Chemistry
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research work
3-4 years

Degree in Chemistry
240 ECTS
4 years

MSc SC
60 ECTS
1 year

PhD in Sustainable Chemistry
research work
3-4 years

Degree in Chemistry
240 ECTS
4 years

MSc SC
60 ECTS
1 year

PhD in Sustainable Chemistry
research work
3 years

INTERUNIVERSITY MSc IN SUSTAINABLE CHEMISTRY: 60 ECTS

Máster universitario en



Química Sostenible

[Interuniversitario | 12ª edición]

Participar en el Máster te permitirá:

Adquirir los conocimientos y conceptos necesarios para hacer compatible el desarrollo tecnológico en el campo de la Química con el medio ambiente.

Alcanzar una formación diferencial encaminada a cubrir las nuevas necesidades de la industria química y relacionadas (alimentaria, farmacéutica, cosmética...)

Formarte con profesores españoles y europeos líderes en sus campos respectivos.

Formarte en contacto con estudiantes de distintas universidades españolas en un entorno internacional (> 85% de extranjeros).

Clasificado entre los estudios de Máster mas relevantes en Ciencia y Tecnología (ranking El Mundo, 2016)

Contacto: Santiago V. Luis
luis@uji.es

<http://www.mies.uji.es>

<http://www.facebook.com/quimicasostenibleuji>

Grupo de Química Sostenible y Supramolecular

<http://www.quimicasostenible.uji.es>

Participan: UJI, UPV, UV, UEX

Colaboran: REDOS, PTOS, IUCT, CSIC, UNIOVI, UCOR,

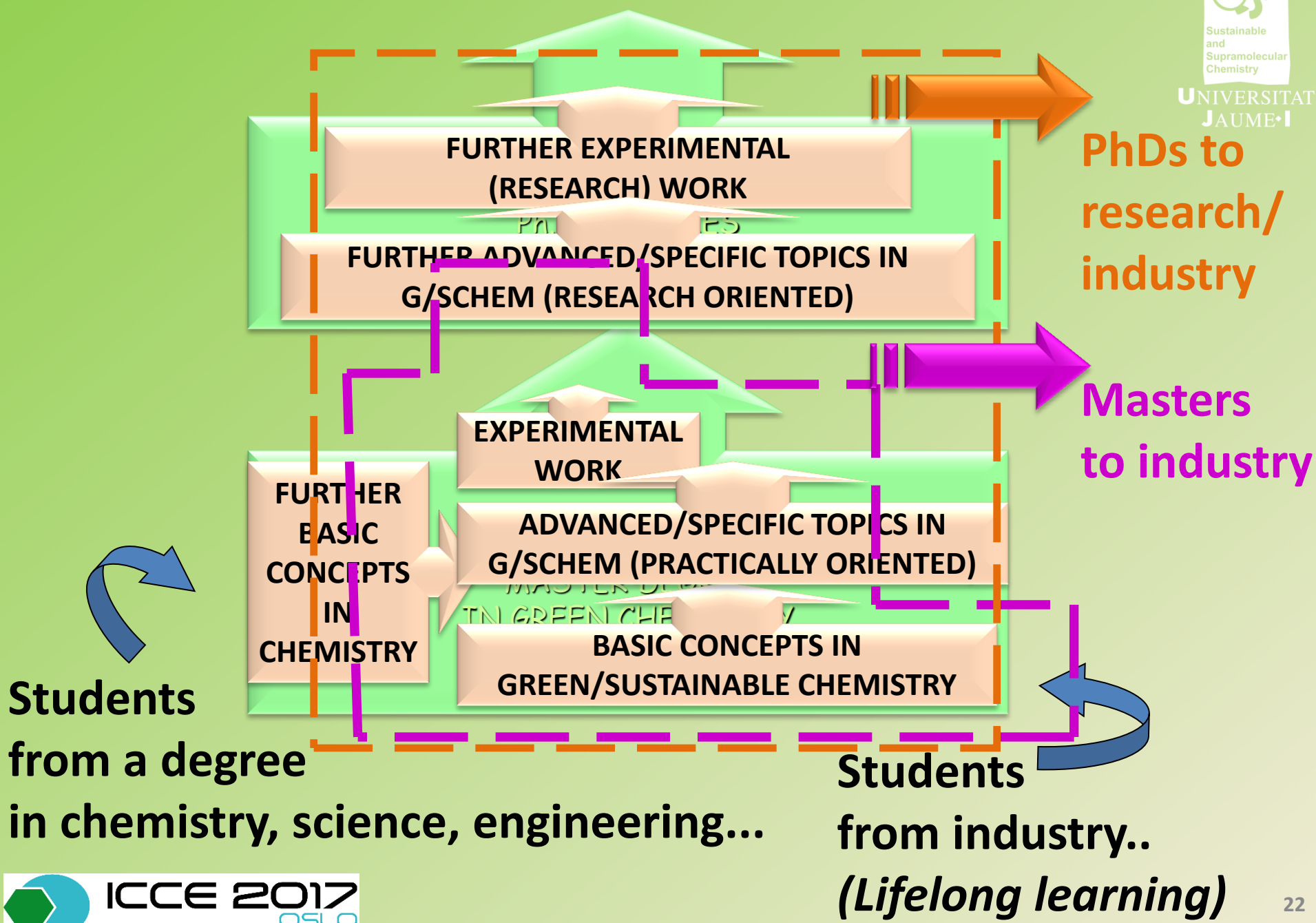
UNIZAR, UCLM, UCM

INTERUNIVERSITY PhD IN SUSTAINABLE CHEMISTRY: COMPLEMENTARY TRAINING + RESEARCH WORK

Química Sostenible



**FROM RELATED MASTERS,
AFTER APROVAL OF THE
ACADEMIC COMMITTEE**



TRAINING MODULES IN THE SPANISH INTERUNIVERSITY POSTGRADUATE PROGRAM IN SUSTAINABLE CHEMISTRY

Complementary training in Chemistry

Chemistry and Energy:

Chemistry and Energy (B)
Electrochemistry (A+R)
Photochemistry (A+R)
Fuel-Cells (A)
Microwaves in Chemistry (R)
Sonochemistry (R)

Benign Solvents:

General Concepts (B)
Chemistry in Water (R)
Ionic Liquids (A+R)
Supercritical Fluids-Properties (R)
Reactions/Extractions in scFs (A)
Alternative Green Solvents (R)

Green Catalysis:

General Concepts (B)
Acid-Base Catalysis (A)
Oxidation Catalysts (A)
Enantioselective Catalysis (B)
Zeolites & Related Materials (R)
Supported Catalysts (R)
Alternative Green Solvents (R)
Industrial Catalytic Processes (A)

Biotransformations:

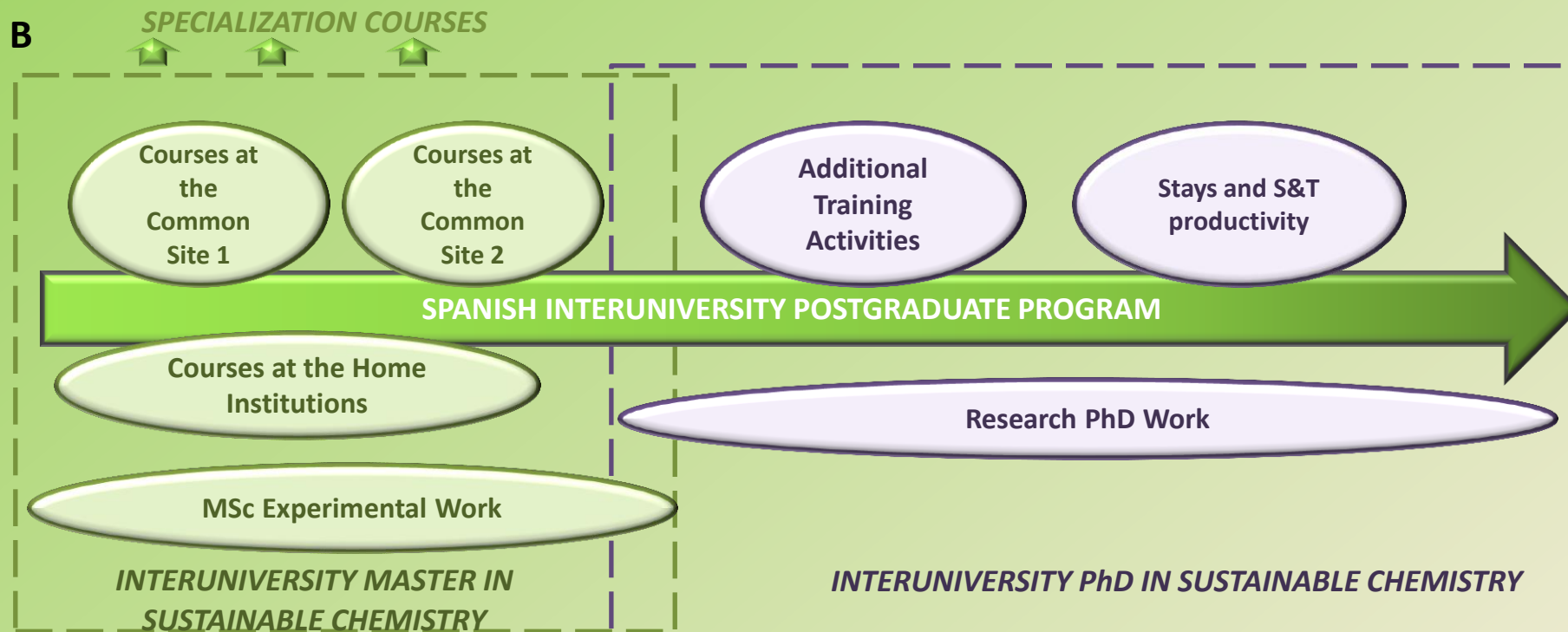
Biotransformations (B)
Biotechnology (R)
Enzymes in Chemistry (A)
Whole Cells & Microorganisms in Chemistry (A)

Green Chemical Engineering:

Green Engineering Principles (B)
Process Intensification (A)
Green Metrics (B)
Design and Evaluation of Reactors (R)
High Pressure Chemistry (A)
On-line Monitoring (R)
Waste management (A)

Other subjects:

Green Chemistry Principles (B)
Renewable Raw Materials (B)
Industrial Applications (B)
(Eco)Toxicology (B)
Environmental Chemistry (A)
Risk Analysis (A)
Environmental legislation (A)
Economy & Sustainability (A)
Facilitated Chemistry (B)



MASTER IN SUSTAINABLE CHEMISTRY

1 YEAR

3 YEARS

CS1

21 ECTS

WORKSHOP
IN
SUSTAINABLE
CHEMISTRY

CS2

18 ECTS

COMPLEMENTARY TRAINING
IN SUSTAINABLE CHEMISTRY
AND TRANSVERSAL COMPETENCIES
PRACTICAL RESEARCH WORK

W
IN
SC

W
IN
SC

W
IN
SC

HI COURSES: 3-21 ECTS
PRACTICAL WORK: 18 ECTS

PhD IN SUSTAINABLE CHEMISTRY

CS: COMMON SITE
HI : HOME INSTITUTION

COMMON INTENSIVE COURSES: 3 ECTS each

CS1

- General Concepts
- Industrial Applications
- Homogeneous Catalysis
- Heterogeneous Catalysis
- Supported Systems
- Biocatalysis
- Benign solvents

CS2

- Renewable Raw Materials
- Sustainable Energies
- Industrial Biotransformations
- Microwaves and Ultrasounds
- Electrochemistry & Photochemistry
- Supercritical Fluids

COMPLEMENTARY TRAINING IN SUSTAINABLE CHEMISTRY AND TRANSVERSAL COMPETENCIES

Additional courses on Sustainable Chemistry

Publications and Patents

Participation in accredited courses

Participation in accredited scientific/technological events

Active participation in funded R+D projects

Stays at other laboratories

Participation in Workshops and Congresses

Training in complementary skills

V WORKSHOP ON SUSTAINABLE CHEMISTRY NANOSCIENCE

15th MAY 2017

Edificio Centro de Posgrado y Consejo Social. Sala de Actos.
Universitat Jaume I Castellón

09:30-09:45

Presentation

09:45-10:45

"Magnetic nanoparticles and nano-composites for biomedical applications; synthesis, assembly into functional clusters, evaluation costs and impacts of production"

Prof. Dermot Brougham.
University College of Dublin

10:45-11:45

"Polymer Therapeutics as Nano-sized medicines"

Dra. M. Jesus Vicent
Centro de Investigación Príncipe Felipe, Valencia

11:45-12:15

Coffee break

12:15-13:15

"Graphene in water. Synthesis, toxicity and applications"

Dra. Ester Vazquez
Universidad de Castilla-La Mancha

13:15-15:30

Lunch

15:30-16:30

"Membrane-Like Supported Ionic Liquid Nano Catalytic Devices"

Prof. Jairton Dupont
Nottingham University

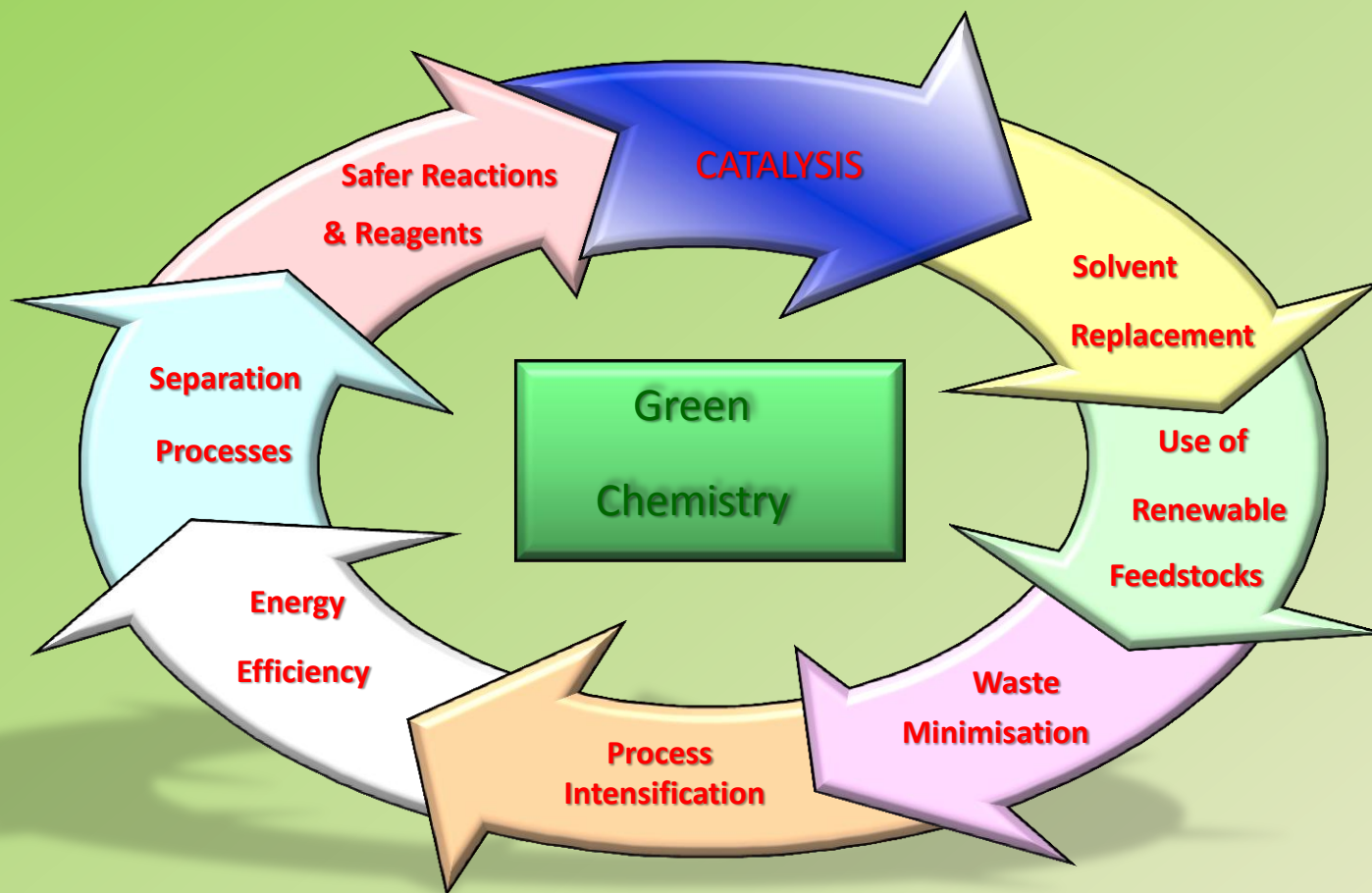
16:30-17:30

"Metallo-Organic Capsules for Catalytic Applications".

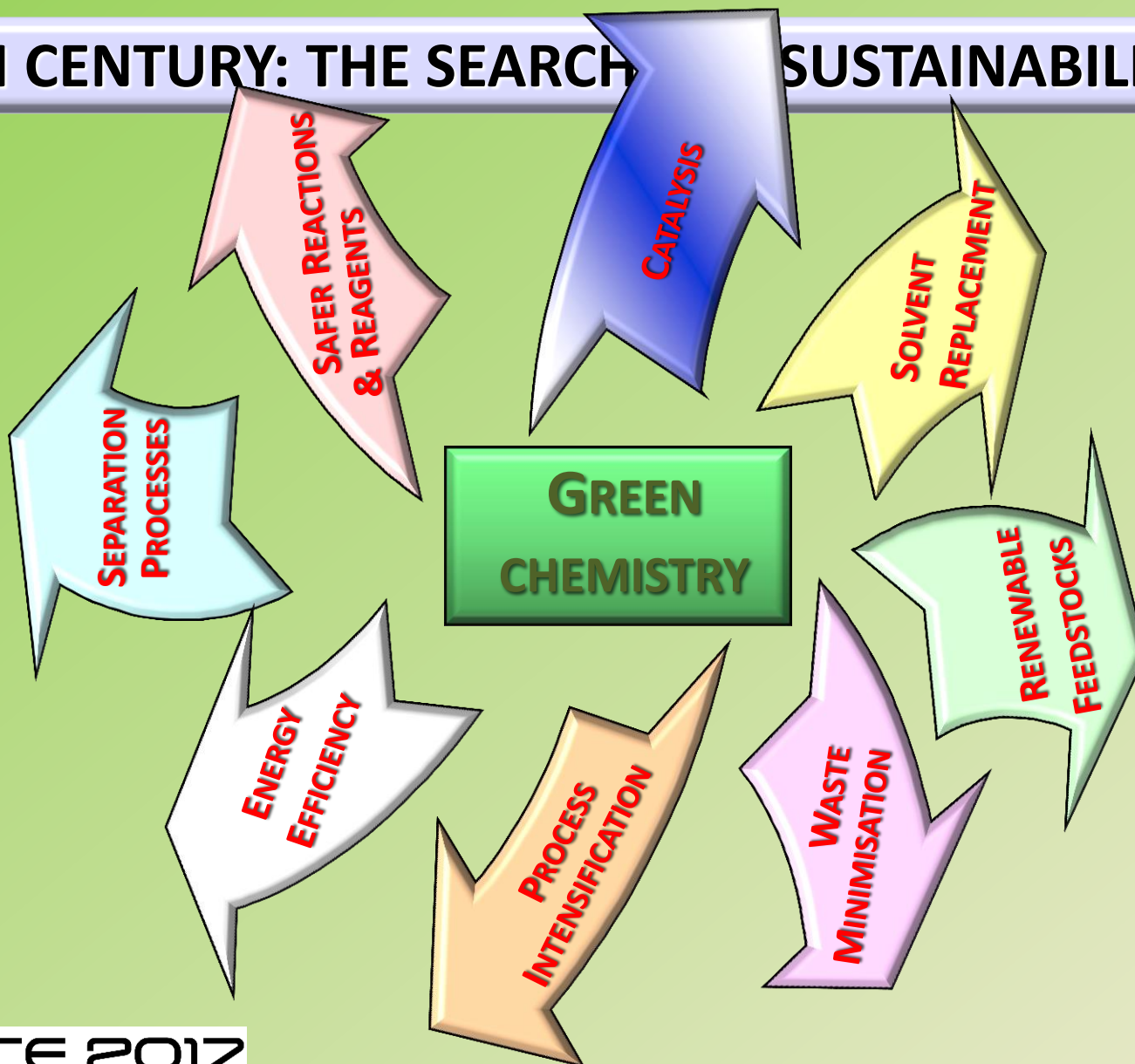
Dr. Vicente Marti Centelles
University of Edinburgh

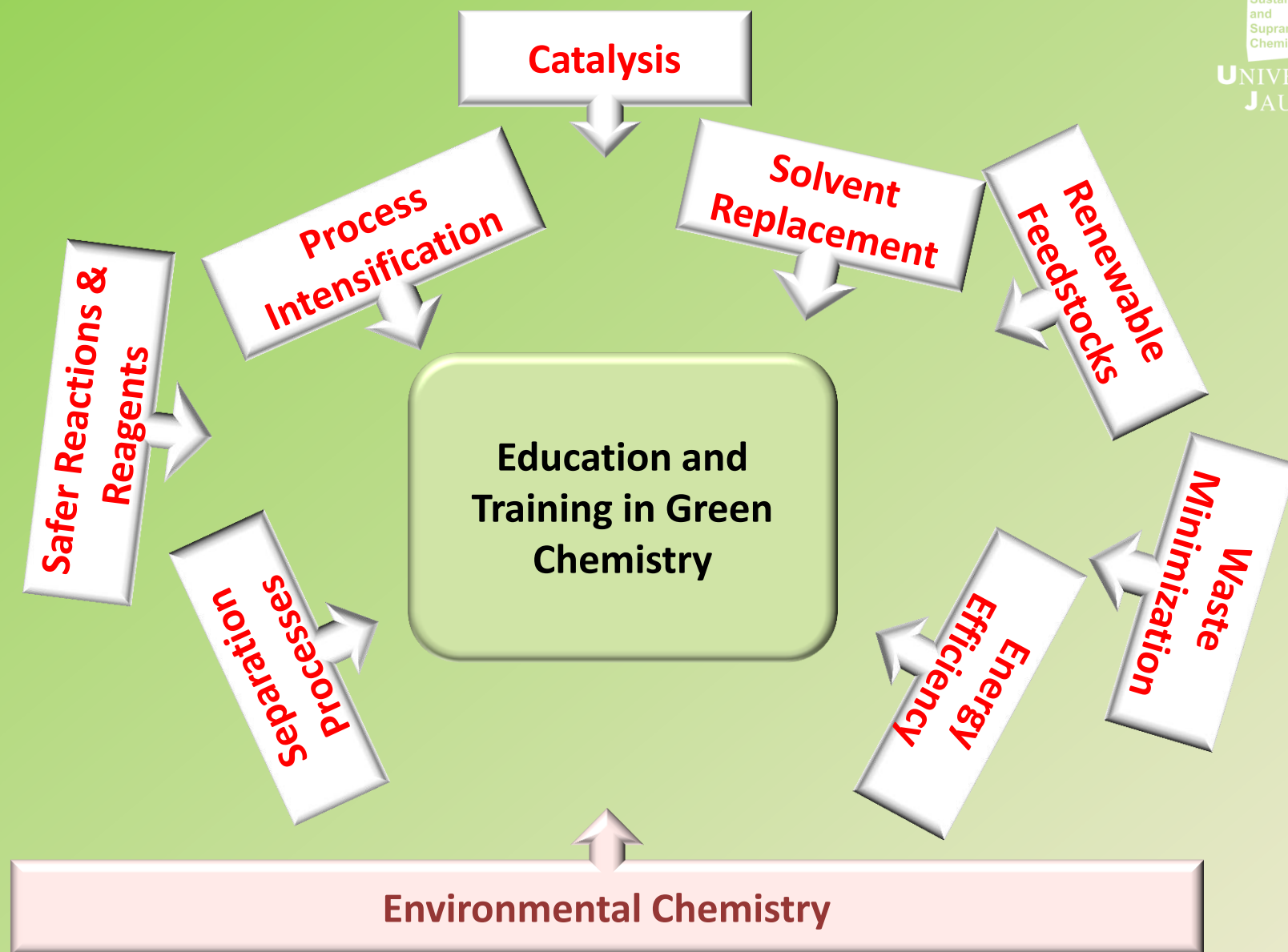
ANNUAL
WORKSHOP ON
SUSTAINABLE
CHEMISTRY
TOOLS

XXI CENTURY: THE SEARCH FOR SUSTAINABILITY



XXI CENTURY: THE SEARCH FOR SUSTAINABILITY





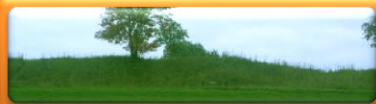
WHAT **ADVANTAGES** A COOPERATIVE TRAINING (INTERUNIVERSITY PROGRAM) DOES PROVIDE?



All subjects are covered by high level specialists in the field



The program is set up by a combination of different ideas. Each participating Center contributes with its own expertise area and its own approach



Students from different Universities, interests and backgrounds are forced to interact very closely



Researchers and Professors from different Universities, interests and backgrounds interact within them and with the students, in particular during intensive sessions at common sites



Development of cooperation in experimental work and development of researches combining different subjects and expertises are favored



Scale Economy is gained: It is easier to reach a critical mass and the cost for individual Universities is very much reduced

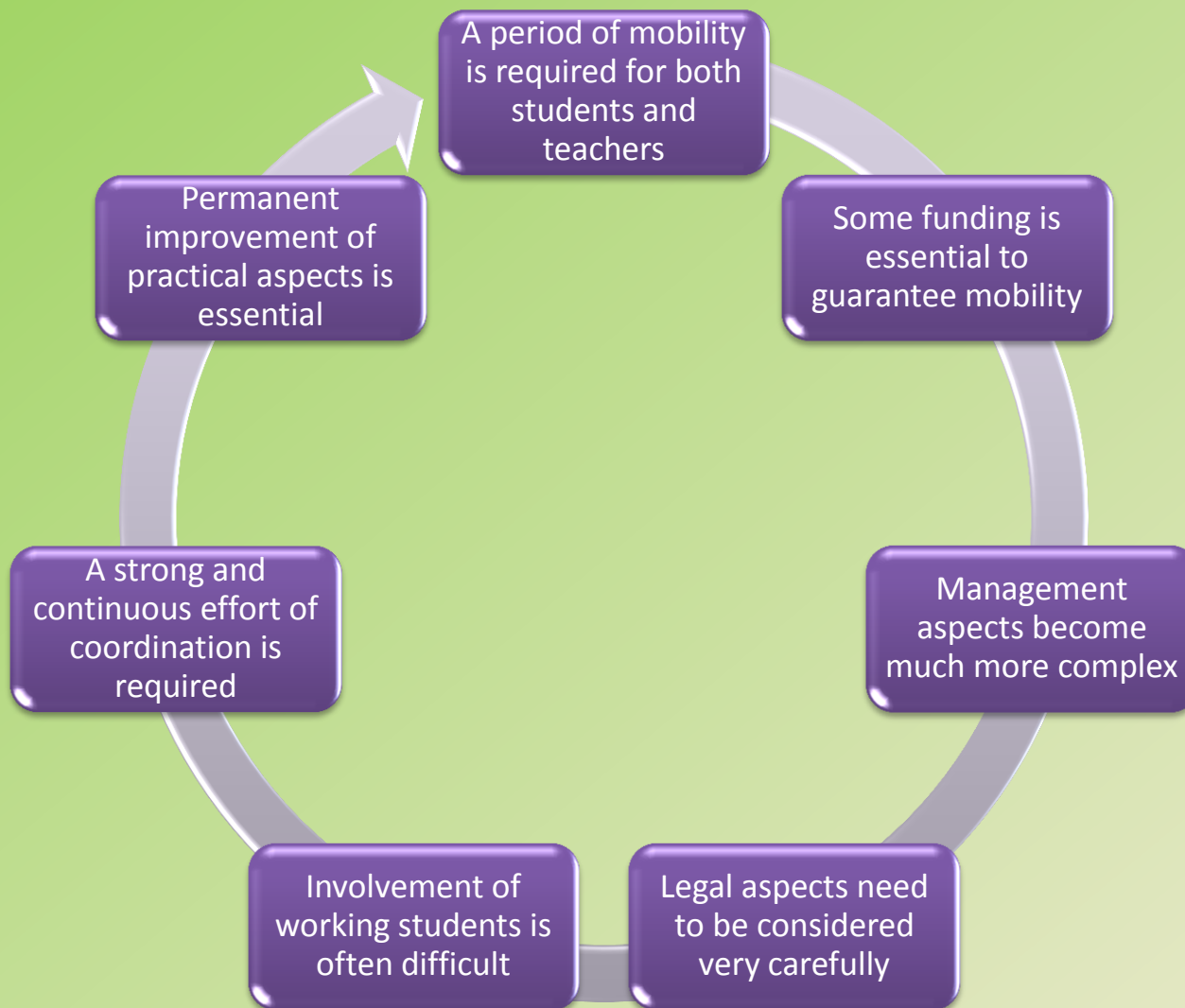


The involvement of high level experts from industry and at an international level is greatly facilitated



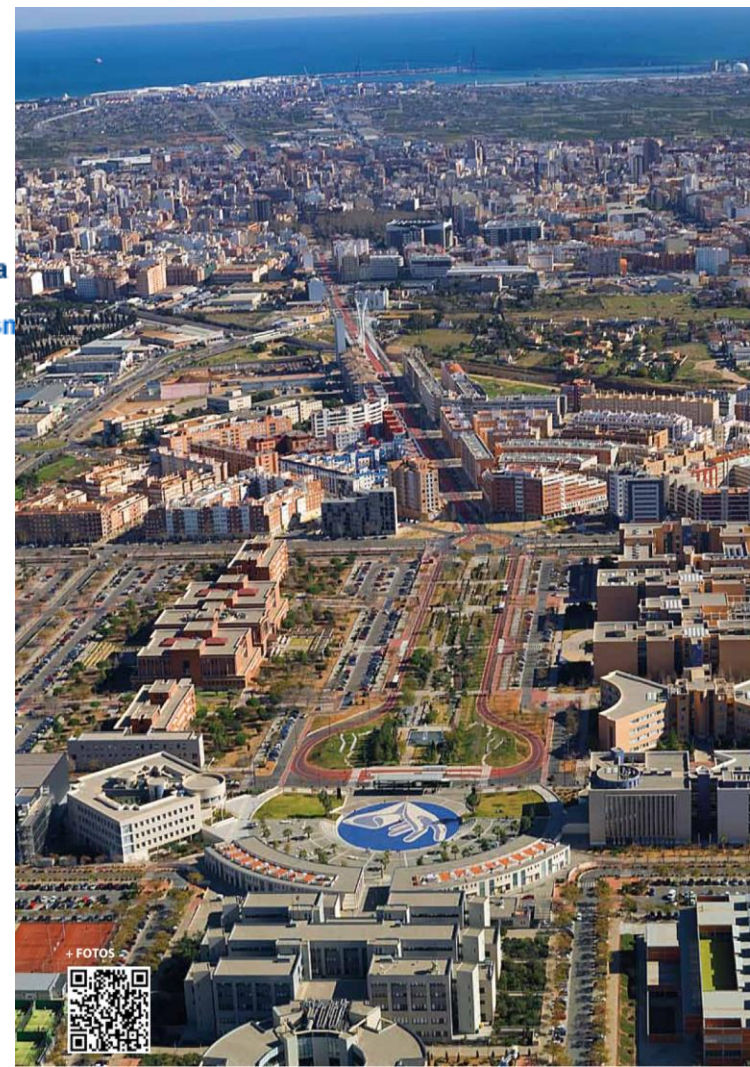
Combines a common core of training with some degree of specialization based on the expertises at the Home Institution

WHAT **DRAWBACKS** A COOPERATIVE TRAINING INTERUNIVERSITY PROGRAM) DOES PROVIDE?



Where are we coming from?

Castellón, Spain



International Relevance of the Spanish Interuniversity Postgraduate Program in Sustainable Chemistry:

International conferences:

ACS Annual Green Chemistry & Engineering Conference, Washington- 2005
 4th IUPAC Conference on Green Chemistry, Foz de Iguazu (Brazil) – 2012
 6th ANQUE International Congress of Chemistry, Puerto de la Cruz, Tenerife – 2006
 6th Green Chemistry Conference, Barcelona – 2004
 RSC/SUSCHEM forum, London, 2006
 Universidade Nova da Lisboa, Caparica (Portugal) – 2006
 4th International Congress on Green Process Engineering, Sevilla -2014
 ACS Annual Green Chemistry & Engineering Conference, Washington- 2015

Publications:

B. Altava, M. I. Burguete and S. V. Luis, *Educ. Quím.*, 2013, **24**, 132 (in Spanish).
 B. Altava, M. I. Burguete, E. García-Verdugo and S. V. Luis, *SmartQuimic*, 2014, 1 (2), 68(in Spanish).
 B. Altava, M. I. Burguete, E. García-Verdugo and S. V. Luis, *Educational efforts in Green and Sustainable Chemistry from the Spanish Network in Sustainable Chemistry*, in *Worldwide Trends in Green Chemistry Education*, V. Zuin and L. Mammimo Eds, RSC, 2015.

**RED ESPAÑOLA DE QUÍMICA SOSTENIBLE
SPANISH NETWORK FOR SUSTAINABLE CHEMISTRY**

REDQS:

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