

Training Programmes Design (WP3)

D3.3 Accreditation and Qualification
System Report



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Responsible Research and Innovation

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HEIRRI training programmes to European
and other national and international
accreditation systems.

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 O - Other

Responsible for deliverable

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Abbreviations

AU	Aarhus University
ECTS	European Credit Transfer System
EHEA	European Higher Education Area
ENQUA	European Association for Quality Assurance in Higher Education
HEI	higher education institution
HEIRRI	Higher Education Institutions and Responsible Research and Innovation
IBL	inquiry-based learning
IHS	Institute for Advanced Studies, Vienna
LO	learning outcome
MOOC	Massive Open Online Course
OA	Open Access
PBL	problem-based learning
QF-EHEA	Framework for Qualifications of the European Higher Education Area
R&I	research and innovation
RRI	Responsible Research and Innovation
SCL	Student-Centred Learning
UiB	University of Bergen
UNIST	University of Split
UPF	Pompeu Fabra University
USA	United States of America
WP	work package



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Deliverable 3.3

Accreditation and

Qualification System

Report

**Alexander Lang, Marlene Altenhofer, Milena Wuketich, Erich Griessler,
& the HEIRRI consortium**



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0. About HEIRRI

Responsible Research and Innovation (RRI) is a transformative emerging principle of research and innovation policy. The RRI concept emerges from scholarly research that is critical of the status quo of the science-society interface. The aim of the HEIRRI project (Higher Education Institutions and Responsible Research and Innovation) is to start the integration of RRI within the formal and informal education of future scientists, engineers, and other professionals involved in the research, development, and innovation (R&D&I) process.

HEIRRI wants to stress the potential of RRI as a transformative, critical, and radical concept. However, the project also takes into account the six RRI “key aspects” identified by the European Commission (public engagement, gender equality, open access, science education, ethics, and governance in research and innovation). HEIRRI has created and shared a stock-taking inventory constituted by a State of the Art Review and a Data Base on an open access (OA) basis. The inventory gathers results of other EU funded RRI projects, good cases, and practices of RRI and RRI learning. Also, different stakeholders involved and/or affected by R&I have participate in a debate and reflection process on RRI learning through online and offline Forum actions.

Results from the inventory represent the basis for RRI Training programs and formative materials, offering students knowledge and skills to develop viable solutions to specific problems related to R&I, integrating theory and practice. They are designed for different HEI educational levels (undergraduate, Master and PhD, summer courses, and Massive Open Online Courses (MOOC)), mainly based on Problem Based Learning methodology, and supported by multimedia materials (videos and microvideos, 2.0 materials, etc.). All results and products elaborated by HEIRRI will be uploaded in open access at the RRI Tools platform¹.

An internationalisation plan guarantees the spreading and future use of the HEIRRI materials by HEIs from Europe and beyond. A global scope and expertise on RRI is provided by the HEIRRI consortium consisting of Pompeu Fabra University (UPF), University of Bergen (UiB), Aarhus University (AU), University of Split (UNIST), the Institute for Advanced Studies (IHS), the European network of science centres and museums (AEESTI/Ecsite), “la Caixa” Foundation (FBLC), a network of universities (Catalan Association of Public Universities, ACUP, who chairs the Global University Network for Innovation, GUNi), and a private company specialised in R&I (Innovatec).

¹ <https://www.rri-tools.eu>



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1. About the Accreditation and Qualification System Report

HEIRRI work package 3 (WP3) aims to co-create at least ten training programmes on RRI which are compatible with international accreditation and qualification systems, especially the European Higher Education Area (EHEA) and its rules determined in the Bologna Process. The successful implementation of Task 3.2 guarantees that the HEIRRI training programmes meet high quality standards and have a clear and validated system of accreditation and qualification. The process and results of Task 3.2 are presented in the document at hand, HEIRRI Deliverable D3.3 “Accreditation and Qualification System Report”.

The report will first briefly describe the main objectives and the workflow of Task 3.2. The overall procedural design and methods used with regards to specific objectives and the rationale behind specific design choices will be presented.

Second, the formal requirements for the HEIRRI training programmes are outlined and discussed. These requirements are identified, described, and discussed based on desk research and input from stakeholder workshops. Besides a general overview, the chapter will elaborate on several key requirements, e.g. learning outcomes and course credits. The second section is particularly important for those who want to use the training programmes, as the meaning of the different elements of each training programme syllabus is described. It is a helpful guidance for adapting and modifying the training programmes to different contexts. Users can find e.g. guidance on how European Credit Transfer System (ECTS) credits are calculated.

Third, the report will describe how the HEIRRI training programmes are adapted to the before identified requirements of accreditation and qualification systems. The actual adaptation process will be depicted in a transparent way on the basis of selected examples. The final HEIRRI training programmes as well as background information on how these were developed can be found in HEIRRI Deliverable 3.2 (Lang et al., 2017).



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2. Main objectives and implementation of WP3 Task 3.2

WP3 Task 3.2 aims to ensure the compatibility of the HEIRRI training programmes with the requirements of Higher Education Institution (HEI) accreditation and qualification systems. The underlying purpose of this task is to make it easier for possible end users of the HEIRRI training programmes to implement them within a given institutional context and higher education curriculum. Since the training programmes are going to be used by HEI within and beyond Europe, it is important to design them in a way that is compatible to the formal requirements of HEI curricula and accreditation systems and quality standards. The ECTS and the Framework for Qualifications of the European Higher Education Area (QF-EHEA) developed in the Bologna Process constitute the main points of reference in this task.

In the process of developing the HEIRRI training programmes it became clear that it is not possible to have adapted versions of each training programme ready for different accreditation and qualification systems. There is a multitude of systems for awarding credits on completion of the course alone, which would have made the programme descriptions rather complex and excessively long. Furthermore, within the designated timespan for developing the training programmes such an endeavour would not have been feasible: The available means were used to develop training programmes of high quality incorporating perspectives and ideas from different HEI stakeholders across Europe. Thus, it was decided to make the rationale behind the training programme structure and content, which guided the design of the individual components of the training programmes, transparent. Potential users of the training programmes from HEIs and higher education systems with different requirements for accreditation can therefore easily understand and then translate and transform the training programmes into their own accreditation and qualification system.

In order to achieve that the higher education training and teaching components, the modules, and courses on RRI conform to the accreditation systems, it was necessary to identify formal requirements that apply to higher education courses such as the HEIRRI training programmes. On the one hand, Task 3.2 attained this identification by desk research using the main and most important documents considering the EHEA, starting with central documents of the ECTS. On the other hand, HEI stakeholders participating in the workshops in Task 3.1 as well as other experts from the HEIRRI Advisory Boards provided further insights and shared their experience with regards to formal requirements of accreditation and qualification systems.

The process of aligning the HEIRRI training programmes with the accreditation and qualification systems requirements was implemented in parallel with the development process: A draft template for the HEIRRI training programmes syllabi was designed; this template comprises all necessary elements and contains also key criteria to be considered in the development process in order for the programmes to be in line with accreditation and qualification systems requirements. The template was then discussed with an expert on accreditation and qualification systems and further refined. The template provided guidance for writing the first draft training programmes.



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Through the stakeholder workshops and further consultations, the HEIRRI training programmes template was further developed by adding necessary parts and elements on the practical implementation of the programmes. Furthermore, the relationship between learning outcomes, teaching and learning activities, as well as assessment methods came into focus and was made more explicit than before.

In finalising the training programmes, which also included adapting certain teaching and learning activities, shortening or extending draft course designs, etc., the workload and ECTS credits of the training programmes were re-calculated, partly also based on the input and feedback from stakeholders and other higher education experts.

The HEIRRI training programmes will be tested and evaluated in the second part of the HEIRRI project. The insights from these pilot experiences will be used, if necessary, to further adapt the training programmes, for example, by re-calculating the workload and ECTS credits students receive on completion of the courses.



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3. Requirements for HEIRRI training programmes

In order to be aligned to accreditation and qualification systems, the training programme designs have to meet certain formal requirements regarding their format, design, and content. There are several elements in the description of the training programmes – e.g. learning outcomes, course content, or teaching and learning activities – that need to be presented and also substantially have to meet certain standards.

On the one hand, there are requirements imposed by individual HEIs or national qualification frameworks. Due to the multitude and diversity of these requirements, they cannot be fully addressed by HEIRRI. However, on the other hand, there are formal international requirements and recommendations with regards to higher education programmes and individual components (training programmes) that are, with minor differences, widely shared in Europe and the European Union. These include requirements and propositions of the EHEA and, to some extent, the European Qualifications Framework for Lifelong Learning. In the next sections, this report will give an overview of the overall design and required elements, and then elaborate on some of the key aspects for the development of the HEIRRI training programmes.

3.1 Overall design: required elements and necessary features

The European Union's "ECTS Users' Guide" (European Union, 2015) identifies specific requirements with regards to the conceptualisation and description of higher education programmes and individual educational components (seminars, lectures, summer schools, etc.). Besides some basic data, which have to be set by the different HEIs, there are numerous aspects regarding the courses the HEIRRI project has to provide for each training programme. Table 1 lists, describes, and discusses these various elements, which should be included in the outline of each RRI training programme designed by HEIRRI. While the elements (first column) are based on the recommendation in the ECTS guideline (European Union, 2015, p. 57), the description and discussion (second column) derives from literature research and deliberations from stakeholder consultations. However, it is not only about having these elements included in the description, but to answer to specific underlying ideas represented in the various standards and guidelines. The training programmes were designed in a way so that especially learning outcomes, teaching and learning activities, assessment methods, and credit points awarded on completion are not only appropriate for successfully learning RRI, but also that they answer to requirements and recommendations of accreditation and qualification systems.

In the syllabus template of the HEIRRI training programmes, elements which cannot be defined by the HEIRRI team have been omitted to improve readability. Such elements include descriptions that depend on the HEI, the study programme, and the curriculum in which the HEIRRI training programmes are used. For each HEIRRI training programme, a syllabus has been produced and was included in the programme design. However, the training programme documentation even goes beyond that and

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describes the rationale, the overall design, different activities, and practical steps in implementing the programme.

Table 1: Required elements for the description of individual educational components in line with ECTS guidelines

Element	Description and Discussion
Code	<p>The syllabus has to comprise an individual code in order to make it identifiable and assignable to a study programme or a higher education institution. The code depends on the individual HEI's and study programme's system.</p> <p><i>The code cannot be defined by the HEIRRI project and thus is not part of the syllabus template used for the HEIRRI training programmes.</i></p>
Title	<p>Each training programme has to have a meaningful title. HEIRRI defines a title that wants to summarise the aim of the course and stir up curiosity by possible participants. The titles are easily understandable within the given institutional context and considering the educational level of potential participants.</p>
Type (compulsory/optional)	<p>The type of the course, whether it is compulsory or optional, depends on the individual curriculum in which the course is used. Although it would be important to have courses on RRI that are required for all students, we acknowledge that this might not be possible in different HEIs and study programmes.</p> <p><i>Therefore, the course type is not defined by the HEIRRI project and thus is not part of the syllabus template used for the HEIRRI training programmes.</i></p>
Cycle (short/first/second/third)	<p>Each course has to be assigned to a certain higher education "cycle" within the QF-EHEA (BWGQF, 2005, pp. 59–63). This framework does not label the different cycles as bachelor's, master's, or PhD degree studies in order to be compatible with different national frameworks of qualification and their terminology. Nonetheless, the different cycles can be matched with different qualification frameworks, including the European Union's European Qualifications Framework (EQF) for Lifelong Learning (European Union, 2008).</p> <p>The HEIRRI project identifies the higher education cycle in line with the QF-EHEA as well as the EQF, and indicates the equivalent degree level (bachelor's, master's, PhD) whenever possible. More on the characteristics of different cycles as well as how the HEIRRI training programmes have been aligned with these can be found below in the respective section.</p>
Year of study	<p>For each HEIRRI training programme the year of study in which it should be implemented is suggested. Some learning outcomes and teaching methods only work for students with a certain degree of study experience and in a specific state regarding their study (e.g. in the process of writing a final thesis).</p> <p><i>Since study programmes vary to a great extent, this element has to be adapted according to the specific conditions and structures of the study programme in which a course is used.</i></p>
Semester/trimester	<p>Similar to the year of study, this part strongly depends on the structure of the individual curriculum and the specific higher education system.</p> <p><i>The semester/trimester will not be defined by the HEIRRI project and thus is not part of the syllabus template used for the HEIRRI training programmes. However, in some of the training programmes, approximate suggestions of semesters/trimesters are given.</i></p>
Number of ECTS credits	<p>ECTS credits are awarded on completion of a course and are calculated based on the estimated workload for a course. In this context, "[w]orkload is an estimation of the time the</p>



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	<p>individually typically needs to complete all learning activities [...] required to achieve the defined learning outcomes in formal learning environments” (European Union, 2015, p. 10) and “one [ECTS] credit corresponds to 25 to 30 hours of work” (European Union, 2015, p. 10).</p> <p>ECTS credits should facilitate compatibility and comparability between different higher education programmes and between different HEIs. However, “[g]iven the diversity of programmes and HEIs, it is unlikely that the credits and learning outcomes of a single educational component in two different programmes will be identical” (European Union, 2015, p. 30). Thus, the EU advises an “open and flexible approach to the recognition of credits” (European Union, 2015, p. 30).</p> <p>HEIRRI calculates ECTS credits for each training programme in line with the official guidelines. More on the calculation of ECTS credits as well as how to convert them into other higher education credit systems can be found in section 3.7.</p>
Name of lecturer	<p><i>The name of the lecturer cannot be defined by the HEIRRI project and thus is not part of the syllabus template used for the HEIRRI training programmes.</i></p>
Learning outcomes (LO)	<p>One key aspect for higher education courses is the definition and presentation of learning outcomes (LO). Learning outcomes can be defined as “statements of what the individual knows, understands and is able to do on completion of a learning process” (European Union, 2015, p. 10). The ECTS framework and the QF-EHEA put special emphasis on learning outcomes and are thus supporting a more general “shift towards learning outcomes” (CEDEFOP, 2009, p. 1) taking place in Europe. Learning outcomes defined for an individual training programme have to correspond with the learning outcomes as defined for a whole curriculum or the designated higher education cycle. In this context, it is important that there is “consistency between the learning outcomes stated in the programme, the learning and teaching activities and the assessment procedures” (European Union, 2015, p. 26).</p> <p>The HEIRRI training programmes identify learning outcomes that are aligned with the QF-EHEA’s Dublin Descriptors for higher education qualification cycles. Furthermore, the training programme documents will explicitly link its learning outcomes to specific teaching and learning activities. More information on how learning outcomes are defined in the HEIRRI programmes can be found in section 3.4.</p>
Mode of delivery	<p>The syllabus of an educational component has to indicate the mode of delivery, i.e. if the course is based on an in-class face-to-face interaction between teachers and students or on distance learning, e.g. by using e-learning platforms. The HEIRRI training programmes indicate the proposed mode of delivery, whether the course is classroom-based (face-to-face), is based on distance learning (e.g. a Massive Open Online Course), or any other form of delivery.</p>
Prerequisites and co-requisites	<p>In some cases, students need specific knowledge and skills in order to be able to meaningfully participate in teaching and learning activities of a course and to complete it successfully. In other cases, it is necessary that students attend different courses at the same time because they are linked in terms of content (e.g. tutorials or practical classes linked to a theoretical lecture in order to learn how to apply the learned knowledge). Possible prerequisites and co-requisites have to be identified by each course.</p> <p>When implementing training on RRI, it is important to consider what abilities and knowledge are necessary in order to be able to accomplish certain learning outcomes in a given teaching setting. These prerequisites and co-requisites are identified in each HEIRRI</p>

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	training programme in a general manner. More on this issue can be found in section 3.3.
Course content	For each HEIRRI training programme, the content of the course was identified. The course content is in line with the overall aim of HEIRRI to promote learning about RRI in higher education. However, the HEIRRI training programmes often recommend adapting the course content (e.g. case examples of R&I processes) depending on the discipline and study programme.
Recommended or required reading and other learning resources/tools	<p>Depending on the topical focus as well as teaching and learning activities of the training programmes, the recommended or required reading to actively participate and successfully complete the programme has to be identified.</p> <p>The HEIRRI training programmes identify recommended and required reading on RRI and related issues. Since the HEIRRI training programmes will be implemented in various higher education contexts (e.g. regarding the scientific field/discipline), the HEIRRI training programmes recommend adapting the required reading to the specific characteristics needs of the envisaged participants. In the HEIRRI training materials, a list of recommended literature can be found.</p>
Planned learning activities and teaching methods	Each training programme indicates the planned learning activities and teaching methods. In proposing learning activities and teaching methods, HEIRRI considers the “paradigm shift from a teacher-centred to a learner centred approach, which is, under the term of Student-Centred Learning (SCL), recognised as an underlying principle of EHEA” (European Union, 2015, p. 14). More information on how the HEIRRI training programmes deal with this issue can be found in section 3.5.
Assessment methods and criteria	The ECTS guideline states that “the achievement of learning outcomes has to be assessed through procedures based on clear and transparent criteria” (European Union, 2015, p. 10). The HEIRRI training programmes identify how assessment of the students’ achievement should take place.
Language of instruction	<i>The language of instruction depends on the individual HEI and study programme. It cannot be defined by the HEIRRI project and thus is not part of the syllabus template used for the HEIRRI training programmes. All HEIRRI training programmes are in English.</i>

3.2 Higher Education Cycles and the Dublin Descriptors

The development of the HEIRRI training programmes aims to offer training programmes for different higher education audiences. As outlined in the description of work, HEIRRI wants to provide training programmes for bachelor’s, master’s, and PhD students as well as other higher education stakeholders and beyond. In order to use the training programmes in different accreditation and qualification systems, which may have different categories to classify students groups, the main characteristics of these different audiences had to be defined.

The Bologna process has been working towards creating the European Higher Education Area (EHEA) with the goal to have a shared framework for qualification so that degrees become comparable and recognisable between different HEIs and countries (European Commission, n.d.). In the EHEA, the different higher education levels are defined as higher education “cycles” (BWGQF, 2005, pp. 59–63).

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In principle, this framework does not label the different cycles as bachelor’s, master’s, or PhD degree studies in order to be compatible with different national frameworks of qualification and their terminology. Nonetheless, the different cycles can be matched with different qualification frameworks, including the European Union’s European Qualifications Framework (EQF) for Lifelong Learning (European Union, 2008). In Europe, higher education systems and institutions often identify 60 ECTS credits as workload for one full time year (BWGQF, 2005, p. 46).

In order to make the use of the training programmes easier for end users – irrespective of their respective higher education context, the predominant terminology, and/or level for the different higher education qualification cycles – every HEIRRI training programme indicates the higher education level according to the QF-EHEA (cycles), the EQF (levels), and the equivalent degree common in the EHEA (see Table 2).

Table 2: Higher education qualification cycles and equivalents (highlighted in grey: cycles relevant for the HEIRRI project)

QF-EHEA	Equivalent degree	EQF level	Total ECTS credits necessary
First cycle	Bachelor	6	180–240
Second cycle	Master	7	90–120
Third cycle	PhD, Doctorate	8	not specified

For the first and second higher education cycle, the QF-EHEA indicates an approximate workload necessary to complete them in the form of ECTS credits. Since the third cycle, the doctoral or PhD programme, is different with regards to its design, the total amount of ECTS credits is not defined.

To characterise the quality of the different higher education cycles, the QF-EHEA introduces the “Dublin Descriptors” as “cycle descriptors”. These are a set of qualification descriptors indicating the expected learning outcomes students have to achieve in order to complete a cycle. Although the expected achievements and skills for each cycle are “not meant to be prescriptive, they do not represent threshold or minimum requirements and they are not exhaustive” (BWGQF, 2005, p. 65), but they are appropriate reference points for the identification and development of learning outcomes, suitable teaching methods, and course content for the HEIRRI training programmes.

Across the different cycles, the Dublin Descriptors identify very generic learning outcomes in five categories: (1) knowledge and understanding, (2) applying knowledge and understanding, (3) making judgements, (4) communication skills, and (5) learning skills. Table 3 gives an overview of the Dublin Descriptors including the learning outcomes and competencies students have to achieve in order to complete a higher education cycle. In the development of the HEIRRI training programmes (which happened in a co-construction process, see HEIRRI Deliverable 3.2), the alignment of the programmes’ learning outcomes with the respective higher education audience in line with the Dublin Descriptors was one important goal. Involved higher education stakeholders and experts provided valuable

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feedback on the appropriateness of certain learning outcomes for the designated student audiences within a specific higher education cycle.

In line with the basic ideas and goals of the HEIRRI training programmes, which have been further refined in the course of the co-construction process, the training programmes especially aim to enable students to reflect, investigate, and discuss RRI aspects of R&I processes, to incorporate societal perspectives and knowledge into R&I processes, and to understand the manifold relationships between science and society, etc. Since concepts of RRI function as means of initiating thinking, reflection, and discussion processes, students have to have knowledge and understanding of them. In principle, all of these learning outcomes can be aligned with the learning outcomes defined by the Dublin Descriptors. In section 4 of this document, it will be shown how this has been done in the training programmes by using illustrative examples from the programmes.

Table 3: The framework for qualification of the European Higher Education Area (BWGQF, 2005, pp. 193–197; adapted by the authors)

Category	First cycle (Bachelor's) outcomes	Second cycle (Master's) outcomes	Third cycle (PhD) outcomes
	Qualifications that signify completion of the first cycle are awarded to students who:	Qualifications that signify completion of the second cycle are awarded to students who:	Qualifications that signify completion of the third cycle are awarded to students who:
Knowledge and understanding	> have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study;	> have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with the first cycle, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context;	> have demonstrated a systematic understanding of a field of study and mastery of the skills and methods of research associated with that field;
Applying knowledge and understanding	> can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study;	> can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;	> have demonstrated the ability to conceive, design, implement and adapt a substantial process of research with scholarly integrity;

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Making judgements	> have the ability to gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues;	> have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements;	> have made a contribution through original research that extends the frontier of knowledge by developing a substantial body of work, some of which merits national or international refereed publication; > are capable of critical analysis, evaluation and synthesis of new and complex ideas;
Communication skills	> can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences;	> can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;	> can communicate with their peers, the larger scholarly community and with society in general about their areas of expertise;
Learning skills	> have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy.	> have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.	> can be expected to be able to promote, within academic and professional contexts, technological, social or cultural advancement in a knowledge based society.

3.3 Prerequisites and co-requisites

Higher education courses should identify prerequisites and co-requisites students must already have or must acquire in parallel. Prerequisites could be certain skills or knowledge necessary to be able to actively participate in the teaching and learning activities of a given course, to be able to successfully complete the course, and to achieve the defined learning outcomes.

The HEIRRI training programmes are designed in a way that make them usable in and easily adaptable to different higher education institutions and contexts. Thus, it was not possible to identify very specific pre- and co-requisites considering the structure of a curricula, e.g. certain introductory courses or specific important knowledge to a study programme or discipline. Rather, the HEIRRI training programmes identify more general pre-existing knowledge or experiences students need to have in order to meaningfully participate in the course activities. For example, the HEIRRI training programme “Enhance your Thesis” aims to promote reflection on RRI aspects of the students’ master theses. They have to deal with their thesis projects they are already working on and thus the programme identifies the following requirement: “Students should already have a topic/research question for and at least a preliminary design of their master’s thesis research.” For students who do not meet this requirement, participation in this course would not be meaningful, because they could not work on identifying and



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investigating RRI aspects of their own theses, which is one core teaching and learning activity of the course.

This flexibility and openness makes it necessary that depending on the HEI and study programme in which the training programmes are implemented, further prerequisites and co-requisites have to be identified by the course instructor or study programme coordinator.

3.4 Learning outcomes

One major characteristic of higher education systems in Europe is the “shift to learning outcomes” (CEDEFOP, 2009) that goes hand in hand with a more student-centred approach than a teacher-centred one. There are several reasons for this shift: (1) the aim of courses or study programmes becomes clearer and individuals are better able to understand what they are expected to achieve through participating in the programmes’ teaching and learning activities, (2) education and training in different settings and systems become more easily comparable and combinable, and (3) the “content of qualifications, rather than [...] the particularities of the institutions delivering them” (CEDEFOP, 2009, p. 1) comes into focus.

As described above, learning outcomes can be defined as “statements of what the individual knows, understands and is able to do on completion of a learning process” (European Union, 2015, p. 10). Instead of focusing on the input by the course instructor or lecturer, the results of the teaching and learning processes come to the fore. Learning outcomes can be identified for whole study programmes, modules, individual courses, or even single course activities. In general, the HEIRRI training programmes represent designs to facilitate learning processes to acquire knowledge about RRI and abilities to put ideas of RRI in practice. Each programme identifies appropriate learning outcomes for the designated audience and thus complies with this requirement of higher education and accreditation systems.

There are different ways to categorise and describe learning outcomes, including different national models, Bloom’s taxonomy, the OECD’s design and selection of key competences framework, or the EU key competences (CEDEFOP, 2009, pp. 36–50). The “ECTS Users’ Guide” gives some guidelines for formulating learning outcomes (European Union, 2015, p. 23). Table 4 shows key points to consider in drafting learning outcomes, as well as specific characteristics of learning outcomes regarding RRI.

Table 4: Formulating learning outcomes

<p>In formulating the learning outcomes for the HEIRRI training programmes, the following guidelines have been considered:</p> <p>The “ECTS Users’ Guide” identifies “three essential elements” as basis for “a widely accepted way of formulating learning outcomes” (European Union, 2015, p. 23): (1) an “active verb” indicating what students should be able on completion of the course (e.g. describe, recall, analyse, investigate, discuss, organise, or design), followed by (2) an “object or skill” this outcome relates to, which is then combined with (3) the “way of demonstrating the achievement” (European Union, 2015, p. 23). The learning outcomes described in the HEIRRI training programmes follow this basic rule.</p> <p>For example, the HEIRRI training programme “Enhance your Thesis” defines learning outcome 1 as follows: “On completion of the course students will be able to <i>apply</i> [=active verb] <i>concepts of RRI</i> [=object] <i>to discuss research and innovation processes and their outputs</i> [=way of demonstrating the achievement]”. Similar to this example, the other learning outcomes were formulated, considering the overall aim of the programmes to promote RRI.</p>
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The identification and formulation of concrete HEIRRI training programme learning outcomes were made based on different previous work and inputs:

- In work package 2 of the HEIRRI project, different existing, appropriate, and meaningful learning objectives with regards to RRI were identified. Furthermore, HEIRRI Deliverable 2.2 provides also a systematic overview what “teaching RRI” means in general (for details see Mejlgaard et al., 2016).
- Stakeholder and experts involved in the co-construction process highlighted learning outcomes they consider important for students in order to be able to facilitate and promote RRI in their future work life (for details see Lang et al., 2017).
- In the last phase of revising the HEIRRI training programmes, the “EnRRICH tool for educators” (Tassone & Eppink, 2016) provided further valuable input for re-formulating some of the learning outcomes in order to better align them with basic ideas of RRI.

In HEIRRI Deliverable 3.2 (Lang et al., 2017), the key characteristics of the HEIRRI training programmes’ learning outcomes and how they were defined are outlined.

3.5 Teaching and learning activities

In accordance with the standards of the EHEA, the HEIRRI training programmes identify the teaching and learning activities that are implemented in order to enable students to reach the defined learning outcomes. By doing so, HEIRRI answers to recommendations and demands of European accreditation and qualification systems. In the EHEA, “Student-Centred Learning (SCL), [is] recognised as an underlying principle” (European Union, 2015, p. 14), which is further emphasised in the “Standards and Guidelines for Quality Assurance in the European Higher Education Area” (ESG) (ENQUA et al., 2015, p. 12). SCL has certain important characteristics, including “active [...] learning; [...] critical and analytical learning and understanding; [...] responsibility and accountability on the part of the student; [...] [or i]ncreased autonomy of the student” (European Union, 2015, p. 15). The ESG underlines that “[i]nstitutions should ensure that programmes are delivered in a way that encourages students to take



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an active role in creating the learning process, and that the assessment of students reflects this approach” (ENQUA et al., 2015, p. 12).

The HEIRRI training programmes combine different teaching and learning activities depending on the learning objective to be reached, but also on the presumed available resources as well as the demands of stakeholders and experts consulted in the HEIRRI WP3 co-construction process (for details on the key findings from this co-construction process see Lang et al., 2017). In section 4.2 below, it is outlined how the HEIRRI training programmes have concretely been adapted to these requirements.

3.6 Assessment methods

One key characteristic of learning outcomes is that students should be able to demonstrate that they have achieved them. Thus, in identifying and elaborating learning outcomes, it is always necessary to reflect on how they can be assessed in a meaningful way. In the HEIRRI training programmes development, this issue was thoroughly discussed and reflected upon by the involved stakeholders, consulted experts, and the HEIRRI consortium.

In line with the learning outcomes as well as teaching and learning activities, all HEIRRI training programmes identify certain approaches for assessing students’ achievements. In the training programme descriptions, the assessment methods are explained in more detail and explicitly linked to certain teaching and learning activities as well as learning outcomes. At the same time, the training programmes leave freedom to the course instructor in assessing the achievements of the students; since there are many different standards and traditions in various higher education and national contexts, it would not be possible to strictly define criteria for this purpose in a meaningful way.

In later sections of this report, it will be shown how the assessment methods are adapted to the needs of teaching and learning RRI (section 4.3) and how the learning outcomes, teaching and learning activities, as well as assessment methods are aligned (section 4.4).

3.7 ECTS credits

ECTS credits indicate the workload for a course, a module, or even a whole study programme. The workload is the time a student typically needs to achieve the defined learning outcome by participating in the teaching and learning activities of a course. In calculating ECTS credits, the time students spend on participating in various teaching and learning activities in class, the time they need to prepare ahead of the course (e.g. reading assignments), and the time to complete other required tasks (e.g. writing an essay, preparing a presentation, or doing research on a specific topic) individually or in groups outside of class are considered.

Depending on the abilities of different students there might be some variation in the actual workload. Furthermore, the calculation of ECTS credits varies depending on the national context; the European Union indicates that “one credits corresponds to 25 to 30 hours of work” (European Union, 2015, p.



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10). While in some countries one ECTS credit equals a workload of 25 hours (e.g. in Austria or Spain), in others it equals a workload of 30 hours (e.g. Germany). Given this situation, the EU suggests an “open and flexible approach to the recognition of credits” (European Union, 2015, p. 30).

Defining ECTS credits for the successful completion of certain learning activities is important not only for international mobility and flexibility in the education systems, but also to facilitate better transparency (BWGQF, 2005, p. 44). They are awarded to students who show that they have achieved the set learning outcome(s). Thus, the calculation of ECTS credits is closely related to the teaching and learning activities, assessment methods, and activities students have to complete successfully.

Each HEIRRI programme indicates the student’s credits awarded on its completion. In section 4.5, the workload for all HEIRRI training programmes as well as their individual parts and elements are outlined and converted into ECTS credits. In calculating the ECTS for the training programmes, the feedback and comments by the HEI stakeholders and experts included in the co-development process were considered (for details of this process see Lang et al., 2017). The calculation of HEIRRI training programmes will again be revisited and modified according to the results of their piloting.

In higher education systems other than those in line with the EHEA and ECTS standards, the calculation of credits awarded to students on completion of a course is often based on the contact hours in class, that means the time teachers and students are together in a learning environment and engage together in teaching and learning activities. Before the implementation of the Bologna Process, this was already common in many higher education systems in Europe. However, depending on the format of the course (lecture, workshop, seminar, laboratory, etc.) in-class hours are weighted differently. For example, in the United States of America (USA) the “credit system is based on how the inputs are organised and the weight of credit points is based purely on the inputs” (Ulicna et al., 2011, p. 61) and 30 credits are equal to one academic year.

In the HEIRRI project, it is not possible to consider the peculiarities of all different higher education systems and adapt the training programmes accordingly. However, the HEIRRI training programme descriptions as well as the deliverable at hand outline the characteristics of the programmes in a transparent way so that they can be easily adapted to different higher education systems. In line with this goal, HEIRRI makes the estimated student workload for different training programmes and their individual elements transparent, and also the duration and type of certain parts of the training programmes. Thus, both the students’ workload and the contact time in class are explicit and can be used for adapting the training programmes to the standards and requirements of each HEI and system.



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4. Adapting the HEIRRI training programmes

In the following sections, the report will outline how the designs of the HEIRRI training programmes have been adapted to the above outlined criteria for individual educational components to be in line with EHEA and ECTS requirements. The report will focus on selected HEIRRI training programmes to illustrate our efforts of adapting the training programmes to the specific requirements of accreditation systems and standards. The focus will be on the key elements of the HEIRRI training programmes that need alignment with higher education systems requirements: the learning outcomes, teaching and learning methods, as well as assessment methods and criteria. Furthermore, the report will show how these three elements fit with each other. The last section outlines how ECTS credits were calculated; this should also support the transfer of the HEIRRI training programmes into higher education accreditation systems other than those based on ECTS requirements and credits.

4.1 Learning outcomes

Each learning outcome identified in the HEIRRI training programmes has been assessed regarding its appropriateness for the specific educational level using the framework for qualifications of the European Higher Education Area. In the co-construction process, the involved stakeholders and the members of the Advisory Boards provided further input on the identification and formulation of the learning outcomes. In the following, we will use three training programmes as examples of how they correspond to the Dublin Descriptors criteria. Therefore, one programme each for students of the first, second, and third cycle of higher education was selected.

In the first cycle (bachelor's students), participants should acquire basic knowledge on the meaning of R&I in general, and RRI in particular. They get to know basic ideas, concepts, and aims of RRI and have to be able to explain them, then also to relate R&I processes in their own field to these concepts, and discuss the relationship between R&I and society on a more general level (see Table 5). These are in line with the learning outcomes for the first cycle identified by the EQF (see Table 3); students

- “have demonstrated knowledge and understanding in a field of study that [...] includes some aspects that will be informed by knowledge of the forefront of their field of study”;
- “can apply their knowledge and understanding in a manner that indicates a professional approach to their work [...], and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study”;
- and “have the ability to gather and interpret relevant data [...] to inform judgements that include reflection on relevant social, scientific or ethical issues” (BWGQF, 2005, pp. 194–195).

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**Table 5: HEIRRI training programme “Studying Responsibility: A Module-Based Integration of RRI into Bachelor’s Programmes”:
Learning outcomes**

<p>“On completion of this course students will be able to</p> <ol style="list-style-type: none"> 1. explain what research and innovation means in their respective field of study; 2. explain different concepts, ideas, relevance, and aims of Responsible Research and Innovation (RRI); 3. relate research and innovation processes in their own field and the role of responsibility in these processes; 4. and to discuss the relationship between science, research, innovation, and society. They will be able to identify the potential impact of science/research/innovation on individuals, groups, or society as a whole.” (Lang et al., 2017, pp. 44–45)
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In the second cycle, the learning outcomes are more advanced. Students go beyond knowing and discussing the basics of RRI and R&I impacts and will learn to apply RRI concepts to discuss R&I development more thoroughly, consider others’ perspectives, and outline possibilities to make R&I processes more responsible (see Table 6). Students in this cycle have to show that they are able to take up a more active role and integrate their insights from deliberation and exchange into their own work. This is in line with the learning outcomes identified in the EQF for the second cycle; students have to show that they

- “can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study”;
- and “have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements” (BWGQF, 2005, pp. 195–196).

**Table 6: HEIRRI training programme “Enhance your Thesis”:
Learning outcomes**

<p>“On completion of the course students will be able to</p> <ol style="list-style-type: none"> 1. apply concepts of RRI to discuss research and innovation (R&I) processes and their outputs; 2. assess possible societal implications and impacts of concrete research activities; 3. acknowledge and react constructively to suggestions from their peers regarding their own research work; 4. and to propose adaptations to better align a research project with societal needs, values, and expectations.” (Lang et al., 2017, pp. 62–63)

In the third cycle, students are expected to work on their own dissertation thesis in actual research settings or projects. They have more experience and knowledge about R&I and RRI issues within and beyond their field than bachelor’s or master’s students. In the HEIRRI training programmes they have to show that they are able to develop their own ideas how to guide research in general, and their own project in particular towards being more responsible within their own field (see Table 7). In parallel to the expectation that they “made a contribution through original research that extends the frontier of knowledge” (BWGQF, 2005, p. 197), they should show that they are capable of developing a

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framework promoting RRI to guide their own work and that of others and of integrating ideas of RRI into their own work.

Table 7: HEIRRI training programme “Supporting RRI: Developing RRI Guidelines for PhD Candidates”: Learning outcomes

“On completion of this course students will be able to

1. identify possibilities to promote Responsible Research and Innovation (RRI) given their own position in research and innovation (R&I) processes and institutional structures;
2. develop and formulate RRI guidelines for PhD candidates within their field;
3. and to deliberate on how to implement RRI into their own research projects.” (Lang et al., 2017, p. 80)

In the process of identifying the learning outcomes for the HEIRRI training programmes, the Dublin Descriptors were used as guidance. However, given their very general nature, the focus in formulating appropriate learning outcomes was on the stakeholders’ input collected through interviews, workshops, and other forms of consultation (see Lang et al., 2017). Based on their experiences and expertise in teaching issues related to RRI in higher education, they identify appropriate learning outcomes for different audiences. In discussing and commenting on first drafts of the training programmes, various experts and stakeholders gave valuable feedback in this regard. Several learning outcomes then were dropped or re-formulated to better match the higher education systems requirements and the audiences’ abilities.

4.2 Teaching and learning methods

As outlined above, the EHEA supports SCL as teaching and learning approach. In line with the principles of SCL, the teaching and learning activities employed in the HEIRRI training programmes are interactive and demand a high level of active participation, critical reflection, and independent work from students. They are often based on ideas of problem-based learning (PBL) and inquiry-based learning (IBL). Besides aligning the teaching and learning activities with SCL, there is an intrinsic reason to design them in this way: Students should have the opportunity to learn about RRI in a way that mirrors basic ideas and aspects of concepts of RRI.

The HEIRRI training programmes comprise several teaching and learning approaches based on ideas of SCL; these include, but are not limited to, the following:

- Discussion and analysis of example cases: Students get a case example of an R&I process or development (video or text), which is in some way challenging, problematic, or shows how RRI can be implemented, and have to discuss and analyse the case along different questions related to RRI. Through their deliberations, they become familiar with key issues and questions of RRI.
- Role play exercise: A scenario or case example of an R&I development is presented and then students have to slip into different roles representing various stakeholder groups who have an interest in this R&I development. They then have to elaborate on the perspective of these different stakeholders, reflect their roles’ positions, and engage in discussions on what responsibility means in this context for them.



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- **Public engagement activity:** In various HEIRRI training programmes, students engage with societal actors in one way or another. In some cases, they have to plan and design an activity promoting mutual dialogue on a certain R&I topic, in other cases they participate in pre-organised activities, in which they present to and discuss their own work with stakeholders, e.g. in a Science Café.
- **Integrating RRI in research (projects):** In several HEIRRI training programmes, students have to reflect on how to integrate RRI in (their own) research projects. Supported by different activities (desk research, stakeholder engagement, group discussions, etc.), they work towards (re-)designing projects in order to incorporate principles of RRI into the research processes.

4.3 Assessment methods

In drafting the HEIRRI training programmes, the identification of assessment methods appropriate for the selected interactive and student-centred teaching and learning methods as well as the topic of RRI were important. To achieve this task, stakeholders and experts involved in the co-development of the training programmes were also asked to outline their ideas on how to conduct meaningful assessment of the students' learning outcomes.

The HEIRRI training programmes use different methods in line with these findings to assess the students' achievements of the defined learning outcomes based on the input of different stakeholders and experts. The assessment methods are in line with the overall objective of the training programmes, thus to promote reflection on issues of responsibility in R&I contexts and to empower students to implement more responsible practices of R&I. In general, the assessment methods aim to capture the students' own reflection and work on issues of RRI and do not to simply test imparted knowledge of different concepts or elements of RRI. Assessment methods include but are not limited to:

- **Preparation of reports or essays on the findings of the students' activities in the course:** Students often have to outline their own broader reflection on issues of R&I and RRI, but also the perspectives of others on the given topic (e.g. consulted stakeholders or other students).
- **Written contributions to online forums or chats, answering to predefined questions facilitating reflection on responsibility in/of R&I, the societal implications of R&I developments, etc. as well as raising own questions and issues.**
- **Preparation and implementation of presentations:** This often includes follow-up discussions and the consideration of the audience's input in the further work.
- **Active and constructive co-organisation of and/or participation in the different activities of the course:** In several training programmes, students have to design and implement or at least co-organise or host interactive events such as a dialogue activity or a Science Café. Although their efforts in this regard are often hard to assess given a strict grading system, course instructors should also include this work in their overall assessment.

4.4 Alignment of learning outcomes, teaching and learning methods, and assessment methods

The alignment of learning outcomes, teaching and learning methods, as well as the assessment methods are important quality criteria for the design of individual educational activities in a curriculum. There has to be “consistency between the learning outcomes stated in the programme, the learning and teaching activities and the assessment procedures” (European Union, 2015, p. 26). In the co-development process of the HEIRRI training programmes, several stakeholders and experts commented on this alignment of learning outcomes, teaching and learning methods, and assessment.

Thus, the relationship between the learning outcomes, teaching and learning methods, as well as assessment methods were outlined in every training programme description. In the training programmes, these links were established in the continuous text describing the sequence of the different activities. Table 8 shows a more formalised example of this alignment and how these relationships are identified in the training programme descriptions.

Table 8: “Doing and Experiencing Dialogical Reflection on Research and Innovation”: Alignment of learning outcomes, teaching and learning activities, and assessment methods

Learning outcome	Teaching and learning methods	Assessment
On completion of this course students will be able to		
1. explain methods to facilitate dialogue and discussions on research and innovation (R&I) with different societal actors	Introductory presentation by course instructor on dialogue approaches. Independent preparation of presentations on different dialogue approach in working groups using recommended literature.	Student presentations on selected dialogue approaches.
“In Part 1, students get to know different approaches to facilitate dialogues on R&I developments and related issues. [...] Through preparing presentations on selected dialogue approaches in working groups, they will show that they are able to ‘explain methods to facilitate dialogue and discussions on research and innovation (R&I) with different societal actors’ (LO1). The presentations are part of their assessment.” (Lang et al., 2017, p. 49)		
2. adapt a dialogue approach to facilitate dialogue on a specific R&I process or development	Group work supported by the course instructor: desk research, literature research, group discussions, supervision meetings, etc.	Design papers by working groups: outline of the design of a dialogue activity on a certain R&I development or challenge.
“In Part 2 of the course, students have to develop a dialogue activity themselves. Through their efforts, students will train how to ‘adapt a dialogue approach to facilitate dialogue on a specific R&I process or development’ (LO2). They have to deliver a written design corresponding to the outlined aspects below. This design paper is part of students’ overall assessment of the course.” (Lang et al., 2017, p. 50)		

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3. carry out a dialogue activity to discuss a specific R&I process or development and analyse the participants' different perspectives on and assessment of the R&I issue under debate	Implementation of the planned dialogue activity in class with student colleagues as participants.	Final group report: Description of the implementation and the main findings of the dialogue activity.
<p>"In Part 3 [...] students have to implement their activity with the other students as participants. Thus, students do not only have the possibility to organise and conduct a dialogue experiment themselves, but also to actively participate in and experience such an activity. Part 3 is in line with learning outcome LO3, to 'carry out a dialogue activity to discuss a specific R&I process or development and analyse the participants' different perspectives on and assessment of the R&I issue under debate'. This learning outcome is assessed by evaluating students' final reports as well as their success in implementing the dialogue experiment." (Lang et al., 2017, pp. 51–52)</p>		
4. reflect on the quality of the dialogue and interaction facilitated through a dialogue activity	Round of feedback at the end of each dialogue experiment.	Final group report: Discussion of the feedback on the dialogue activity received from their peers.
<p>"Students complete the course by handing in a group report describing the implementation as well as the results of the activity. They should describe how their initial plan worked out, what challenges they had to face and how they dealt with them, but also reflect on the positive aspects of facilitating a dialogue. They should also deal with and address the feedback gathered from the participants in the dialogue experiment. This reflection task is in line with learning objective LO4, 'to reflect on the quality of the dialogue and interaction facilitated through a dialogue activity'." (Lang et al., 2017, p. 53)</p>		

4.5 Calculation of ECTS and other credits

The HEIRRI training programmes award between 0.0 and 3.0 credits on completion when implemented without using any of the suggested adaptation possibilities. However, there are courses that can be extended beyond that to award up to 5.0 ECTS credits on completion ("Doing and Experiencing Dialogical Reflection on Research and Innovation").

The two train-the-trainer programmes ("Teaching RRI in Higher Education" and "Facilitating Reflection on RRI") address academic and non-academic HEI members and others who want to teach RRI in higher education. These programmes do not envisage an assessment if participants achieved the learning outcomes by default. Therefore, no ECTS credits will be awarded; however, it is possible to implement additional assessment and then award 1.0 ECTS credit on completion of each course.

Table 9: HEIRRI training programmes: Overview of ECTS credits

Training programme	ECTS credits		
	Default	Minimum	Maximum
Studying Responsibility: A Module-Based Integration of RRI into Bachelor's Programmes	2.0	0.5	2.5
Doing and Experiencing Dialogical Reflection on Research and Innovation	3.0	2.0	5.0
Enhance your Thesis	2.0	2.0	4.0
Responsible PhD: RRI and PhD Research Projects	1.0	1.0	2.0



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Supporting RRI: Developing RRI Guidelines for PhD Candidates	1.0	1.0	2.0
Teaching Responsible Research and Innovation in Higher Education	0.0	0.0	1.0
Facilitating Reflection on Responsible Research and Innovation	0.0	0.0	1.0
Considering Responsible Research and Innovation by Design	2.0	2.0	2.0
Concepts and Practice of Responsible Research and Innovation	1.0	1.0	2.0

The following tables outline the estimated workload for an individual student for all different elements of the HEIRRI training programmes. The total workload is then converted into ECTS credits. In some cases, the estimated workload converted to ECTS credits does not add up to a round sum. In these cases, the ECTS credits have been rounded up or down to the next half ECTS credit.

The descriptions of the elements follow the original formulations in the HEIRRI training programme designs so that they are clearly recognisable. In calculating ECTS credits, the higher end of the range of workload per ECTS credit is used, which means that we equal 30 hours of students' workload with 1.0 ECTS credit. **Please consider the standards of your own country and HEI and re-calculate the ECTS credits accordingly** or modify the scope of specific teaching and learning activities to make similar outcomes possible in less time. **In tables 10-18, one credit corresponds to 30 hours of work. But, as the calculation of credits varies depending on the national context, each institution should adapt these workloads to their particular requirements.**

The indicated workload is an estimation and by no means fixed: Through making different teaching and learning activities more elaborate and difficult (e.g. asking additional or more complex questions to be answered by the students) or easier (e.g. by selecting less complex texts as reading assignments) the workload can be increased or decreased. The calculation of workload for different activities should provide a rough idea of the scope of the training programmes and their elements and should be adapted by those implementing the courses, as they are experts for their higher education context (including the study programme, students, etc.) and know what to expect from their audience.

Students often have to conduct activities at home in working groups; the estimation of workload considers the individual work the students have to bring into these activities, but also the time necessary to coordinate them. The workload given is the time each and every individual has to invest also in group efforts to achieve a certain learning outcome.

Besides the estimated workload in hours for the students, the tables also indicate the in-class hours in which the course instructor facilitates teaching and learning activities. This should support teachers who want to use the training programmes in higher education systems with a credit system based on how the input (teaching) is organised. There is no default length for lesson periods. **In calculating the ECTS credits, lesson periods of one hour were assumed.** If lesson periods are of different length in your higher education context, you have to re-estimate the workload of the students accordingly.

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Table 10: ECTS credits calculation for HEIRRI training programme “Studying Responsibility: A Module-Based Integration of RRI into Bachelor’s Programmes”

Element of training programme	Workload in hours (30 hours = 1 ECTS credit)
Module 1: What is research and innovation? What is responsible research and innovation?	
In-class element 1: Introduction and explanation of research and innovation	2
Reading of introductory literature and preparation of questions for in-class element 2	5
In-class element 2: Discussion activity based on Inverted/Flipped Classroom	2
Preparation of final assessment	6
Module 2: Cases of RRI	
In-class element 3: Introduction and overview of RRI concepts	2
In-class element 4: Card-based engagement exercise	5
Preparation of final assessment	8
Module 3: Practical approaches towards RRI	
In-class element 5: Problem-based learning activity I	3
In-class element 6: Introduction and overview of RRI concepts	2
In-class element 7: Problem-based learning activity II	4
Preparation of final assessment	6
Module 4: Challenging research processes	
In-class element 8: Introduction and overview of RRI concepts	2
In-class element 9: Role-play exercise	5
Preparation of final assessment	8
Total estimated workload in hours	60
Total ECTS credits	2.0 ECTS credits
In-class hours	27
Adaptation Possibility 1: Longer module (Module 2)	
Identification of and formulation of central discussion points of card-based engagement exercise	4
Preparation of in-class presentation	7
Additional in-class unit: Presentations (including listening to and discussing others’ presentations)	4
Additional workload in hours	15
Additional ECTS credits	0.5 ECTS credits
Additional contact hours	4

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Table 11: ECTS credits calculation for HEIRRI training programme “Doing and Experiencing Dialogical Reflection on Research and Innovation”

Element of training programme	Workload in hours (30 hours = 1 ECTS credit)
Part 1: How to facilitate dialogue on R&I: dialogue approaches	
In-class unit 1: Introduction	2
Preparation of student presentation (group work)	5
In-class unit 2: Student presentations	2
Part 2: Planning dialogue activities	
In-class unit 3: Designing dialogue activities (supervised group work)	2
In-class unit 4: Designing dialogue activities (supervised group work)	2
Development of dialogue activity and elaboration of design paper (group work)	26
Part 3: Doing and experiencing dialogical reflection	
Organisation and preparation of dialogue experiment (group work)	8
In-class unit 5: Implementing and participating in dialogue experiments I	2
In-class unit 6: Implementing and participating in dialogue experiments II	2
In-class unit 7: Implementing and participating in dialogue experiments III	2
In-class unit 8: Implementing and participating in dialogue experiments IV	2
Processing and analysing of collected data: preparation of final report	35
Total estimated workload in hours	90
Total ECTS credits	3.0 ECTS credits
In-class hours	12
Adaptation Possibility 3: Inviting societal actors and stakeholders to participate in the dialogue	
Identification of relevant stakeholders with regards to the R&I development	10
Contacting and inviting identified stakeholders	20
Additional preparation before the implementation of the activity	10
Additional work to process and analyse data	20
Additional workload in hours	60
Additional ECTS credits	2.0 ECTS credits

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Table 12: ECTS credits calculation for HEIRRI training programme “Enhance your Thesis”

Element of training programme	Workload in hours (30 hours = 1 ECTS credit)
Part 1: What are “responsible” research and innovation?	
In-class unit 1: Problem-based learning activity	2
In-class unit 2: Introducing and discussing RRI	2
Part 2: Present your thesis	
Preparation of lightning talk on thesis	5
In-class unit 3: Lightning talks on theses I	2
In-class unit 4: Lightning talks on theses II	2
Part 3: Investigate your thesis	
Research on RRI aspects of master’s thesis supported by instructor or supervisor	24
Preparation of presentation on findings	6
Part 4: Enhance your thesis	
In-class unit 5: Presentation and discussion of findings I	2
In-class unit 6: Presentation and discussion of findings II	2
Preparation of final report	13
Total estimated workload in hours	60
Total ECTS credits	2.0 ECTS credits
In-class hours	9
Adaptation Possibility 2: Adding stakeholder interviews	
Additional in-class unit in Part 3	4
Identification and contacting of relevant experts and stakeholders	5
Preparing interview guidelines	5
Conducting and transcribing interviews	20
Analysing interviews and additional work to integrate the findings in the final report	20
Additional workload in hours	60
Additional ECTS credits	2.0 ECTS credits
Additional contact hours	4

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Table 13: ECTS credits calculation for HEIRRI training programme “Responsible PhD: RRI and PhD Research Projects”

Element of training programme	Workload in hours (30 hours = 1 ECTS credit)
Part 1: Concepts of RRI	
Preparation of an article on RRI	4
In-class unit 1: Discussion of RRI articles and collection of insights (group work)	2
Part 2: RRI concepts in practice: Inquiring cases of R&I	
In-class unit 2: Discussion of RRI concepts in relation to case studies and short presentations of insights (group work)	1
Part 3: RRI in PhD students’ research	
Preparation of presentations of PhD research projects or project proposals	4
In-class unit 3: Presentations of PhD research projects or project proposals and discussions	2
Preparation of posters or flip charts on the insights from in-class unit 3	4
Part 4: Responsible PhD: Conclusions	
In-class unit 4: Exhibition of posters/flip charts, discussions, engagement with others’ posters/flip charts, and final plenary discussion	3
Preparation of final essay	10
Total estimated workload in hours	30
Total ECTS credits	1.0 ECTS credit
In-class hours	8
Adaptation Possibility 1: Public engagement activity	
Additional in-class unit in Part 3: Preparation of the Science Café activity	2
Identification, contacting, and invitation of Science Café guests	5
Preparation of the Science Café activity	8
Conducting the Science Café	5
Additional in-class unit in Part 3: Debriefing after the Science Café activity	2
Preparation of a protocol of the Science Café activity	6
Additional preparation of final essay	2
Additional workload in hours	30
Additional ECTS credits	1.0 ECTS credit
Additional contact hours	9

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Table 14: ECTS credits calculation for HEIRRI training programme “Supporting RRI: Developing RRI Guidelines for PhD Candidates”

Element of training programme	Workload in hours (30 hours = 1 ECTS credit)
Preparation of basic RRI literature and questions	7
Workshop	
Session 1: Introducing RRI	1.5
Session 2: Put RRI into PhD research practice	1.5
Session 3: Support practicing RRI	2
Session 4: RRI guidelines for PhD students	1
Reflection essay	12
Total estimated workload in hours	25
Total ECTS credits	~ 1.0
In-class hours	6
Adaptation Possibility 1a: Follow-up workshop 1	
Preparation of progress presentation	8
Additional in-class session	5
Additional workload in hours	13
Additional ECTS credits	~ 0.5
Additional contact hours	5
Adaptation Possibility 1b: Follow-up workshop 2	
Preparation of progress presentation	8
Additional in-class session	5
Additional workload in hours	13
Additional ECTS credits	~ 0.5
Additional contact hours	5
Adaption Possibility 1c: Online forum	
Online exchange of experiences	8
Recap post	5
Additional workload in hours	13
Additional ECTS credits	~ 0.5
Additional contact hours	0

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Table 15: ECTS credits calculation for HEIRRI training programme “Teaching Responsible Research and Innovation in Higher Education”

Element of training programme	Workload in hours (30 hours = 1 ECTS credit)
Part 1: Concepts and relevance of Responsible Research and Innovation	
Writing a short personal introduction	0.5
Introductory texts and videos	0.5
Reading assignment: introduction to RRI	3
Forum activity 1: “The meaning of RRI”	2
Online chat 1: “The meaning of RRI”	1
Part 2: Practical approaches to RRI	
Introductory texts and videos	0.5
Reading assignments: RRI approaches	3
Forum activity 2: “Practicing RRI”	2
Online chat 2: “Practicing RRI”	1
Part 3: Teaching RRI in higher education	
Introductory texts and videos	0.5
Reading assignment: teaching approaches	3
Forum activity 3: “RRI teaching experiences and approaches”	2
Online chat 3: “Barriers for teaching RRI”	1
Total estimated workload in hours	20
Total ECTS credits*	~1.0 ECTS credit
In-class hours	(online course)

*By default, this training programme does not award ECTS credits. However, Adaptation Possibility 2 of this programme integrates assessment of the participants’ achievements. The ECTS credits indicated in this table can be awarded if this adaptation is implemented.

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Table 16: ECTS credits calculation for HEIRRI training programme “Facilitating Reflection on Responsible Research and Innovation”

Element of training programme	Workload in hours (30 hours = 1 ECTS credit)
Part 1: Reflecting the impacts of R&I	
In-class unit 1	2
Part 2: Applying concepts of Responsible Research and Innovation	
In-class unit 2	2
Part 3: Facilitating reflection on RRI in higher education	
In-class unit 3	2
Total estimated workload in hours	6
Total ECTS credits	0.0
In-class hours	6
Adaptation Possibility 3: Additional assessment and ECTS credits	
In-class units 1–3	6
Reading assignment	5
Final paper	15
Additional workload in hours	26
Additional ECTS credits	~1.0

*By default, this training programme does not award ECTS credits. However, Adaptation Possibility 3 of this programme integrates assessment of the participants’ achievements. The ECTS credits indicated in this table can be awarded if this adaptation is implemented.



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Table 17: ECTS credits calculation for HEIRRI training programme “Considering Responsible Research and Innovation by Design”

Element of training programme	Workload in hours (30 hours = 1 ECTS credit)
Reading assignment for Day 2	5
Day 1: Exchanging perspectives – finding ideas	
Session 1: Exchanging perspectives (in class)	2
Session 2: Finding ideas (in class)	2
Session 3: Initiating reflection on RRI (in class)	2
Day 2: Integrating RRI	
Session 1: Discussing RRI (in class)	2
Session 2: Sharing and applying RRI I (in class)	2
Session 3: Sharing and applying RRI II (in class)	2
Day 3: Walkshop	5
Day 4: Making research more responsible	
Independent group work: Project proposal (in class)	4
Creative elaborations of findings (in class)	2
Preparation for Day 5	1
Day 5: Final presentations	
Group presentations and discussions: RRI proposals (in class)	5
Plenary reflection (in class)	1
Reflection essay	15
Total estimated workload in hours	50
Total ECTS credits	~ 2.0 ECTS credits
In-class hours	30

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Table 18: ECTS credits calculation for HEIRRI training programme “Concepts and Practice of Responsible Research and Innovation”

Element of training programme	Workload in hours (30 hours = 1 ECTS credit)
Week 1: Introduction	
Online learning activities and quiz	2
Homework: Reading assignment	5
Week 2: Holistic RRI concepts	
Online learning activities and quiz	2
Week 3: Normative RRI framework – six policy agendas	
Online learning activities and quiz	2
Week 4: Inspiring RRI cases	
Online learning activities and forum discussion	2
Homework: Research on further RRI cases	5
Week 5: Roleplay exercise	
Online forum roleplay exercise	2
Week 6: RRI in practice	
Preparation of session	5
Online learning activities and forum discussion	2
Preparation of reflection post	8
Week 7: Reflection post and open discussion	
Online exchange and discussion	2
Adaption and submission of reflection post	2
Week 8: Final exam	
Preparation for final exam	15
Preparation of peer assessment	4
Final exam	1
Peer assessment of reflection posts	1
Total estimated workload in hours	60
Total ECTS credits	2.0
In-class hours (online learning activities)	16



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