MEICOM

ITNA TRAINING NEEDS ANALYSIS

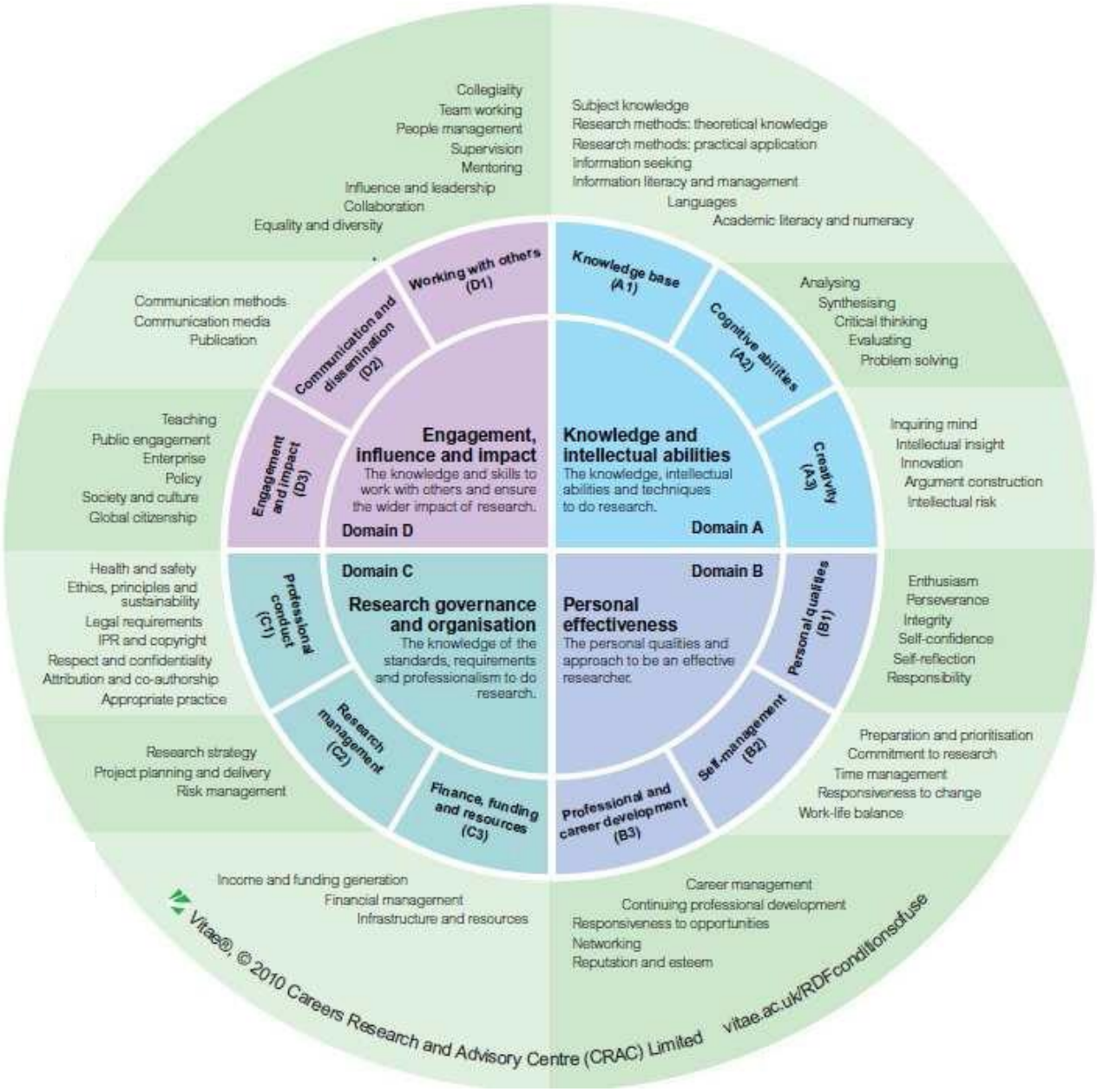
Successful and timely completion of your research degree will depend on developing a mixture of subject-specific skills, intellectual skills, such as critical thinking, and more generic skills, like communication and enterprise. Many of these skills will also be important in your future life, whatever career or life choices you make.

The ITNA Training Needs Analysis form uses Vitae's Researcher Development Framework (RDF) to help you think about your current skills, pinpoint gaps in your knowledge, and identify areas for future development. The RDF articulates the knowledge, behaviours and attitudes of researchers, from postgraduates to establish academic leaders and is endorsed by Research Councils UK.

There are four sections to the form, based on the RDF domains (below or for more details, including suggested skills levels see:

https://www.vitae.ac.uk/vitae-publications/rdf-related/researcher-development-framework-rdf-vitae.pdf/view)

Use the sections to outline your goals for this year in each area. At the end of the form is a summary sheet to outline your specific plans.


Collegiality
Team working
People management
Supervision
Mentoring
Influence and leadership
Collaboration
Equality and diversity
Subject knowledge
Research methods: theoretical knowledge
Research methods: practical application
Information seeking
Information literacy and management
Languages
Academic literacy and numeracy
Working with others (D1)
Communication and dissemination (D2)
Engagement and impact (D3)
Knowledge base (A1)
Cognitive abilities (A2)
Creativity (A3)
Communication methods
Communication media
Publication
Analysing
Synthesising
Critical thinking
Evaluating
Problem solving
Teaching
Public engagement
Enterprise
Policy
Society and culture
Global citizenship
Engagement, influence and impact
The knowledge and skills to work with others and ensure the wider impact of research.
Domain D
Knowledge and intellectual abilities
The knowledge, intellectual abilities and techniques to do research.
Domain A
Inquiring mind
Intellectual insight
Innovation
Argument construction
Intellectual risk
Health and safety
Ethics, principles and sustainability
Legal requirements
IPR and copyright
Respect and confidentiality
Attribution and co-authorship
Appropriate practice
Domain C
Research governance and organisation
The knowledge of the standards, requirements and professionalism to do research.
Domain B
Personal effectiveness
The personal qualities and approach to be an effective researcher.
Professional conduct (C1)
Research management (C2)
Finance, funding and resources (C3)
Personal qualities (B1)
Self-management (B2)
Professional and career development (B3)
Enthusiasm
Perseverance
Integrity
Self-confidence
Self-reflection
Responsibility
Research strategy
Project planning and delivery
Risk management
Preparation and prioritisation
Commitment to research
Time management
Responsiveness to change
Work-life balance
Income and funding generation
Financial management
Infrastructure and resources
Career management
Continuing professional development
Responsiveness to opportunities
Networking
Reputation and esteem
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vitae.ac.uk/RDFconditionsofuse

Domain A: Knowledge and Intellectual Abilities

The knowledge, intellectual abilities, and techniques used in research (Knowledge Base, Cognitive Abilities, Creativity)

Knowledge Base

- I am aware of key concepts, challenges, opportunities and history of my project. The aim of this project is to modulate the frequency and chromosomal distribution of meiotic recombination events (crossover) by altering the meiotic chromatin structure and/or by affecting post-translational modifications of meiotic proteins with the help of chemical compounds influencing DNA, histone and further protein modifications.
- Novel genetic variation assured through homologous recombination (HR) during meiosis is crucial for breeding programs. However, crop plants such as barley show an uneven distribution of meiotic recombination events along chromosomes -almost no meiotic recombination in pericentromeric regions- which makes it difficult for breeders to explore all potentially available genetic diversity.
- Various abiotic and biotic factors, such as temperature, pathogen infection, nutrient availability, salinity and drought stress, heavy metals, insecticides, herbicides and fungicides can increase, redistribute or decrease recombination events; only a few were tested in barley (*Hordeum vulgare*).
- Researchers and breeding companies are interested in establishing high-throughput and cost-friendly ways to measure meiotic recombination events. Hence, establishing protocols for efficient, high-throughput and cost-fiendly measurements of meiotic recombination events could enable identifying factors that can modulate the frequency and/or distribution of crossovers in barley and thus boost breeding programs for barley and other crop plants. Single pollen genotyping can be one option for this.
- We aim to treat barley F1 hybrids (*Hordeum vulgare* cv. Barke x *Hordeum vulgare* cv. Morex) with various chemical compounds altering the meiotic chromatin structure and/or affecting post-translational modifications (PTMs) of meiotic proteins both to potentially impact the meiotic recombination landscape. In particular, we aim to i) develop an *in planta* method to deliver compounds in barley spikes (containing cells at pre-meiosis and/or during meiosis) and to ii) refine SNP genotyping of single pollen nuclei to measure meiotic recombination rates upon treatments at high-throughput.
- During the first 9 month, I tried to establish a reliable protocol for the direct injection of compounds *in planta* allowing to harvest seeds, which requires thorough understanding of meiosis and plant development/morphology in barley. To inject compounds before/during meiosis in barley, one needs to get familiar with meiosis and corresponding developmental stage under certain growth conditions and and for each cultivar studied. Using various concentrations of different detergents and surfactants, i.e. Silwet-L 77, TWEEN 20, Triton X-100, uptake rates of compound solutions were evaluated.
- Single pollen nuclei of barley have a low DNA content (≈5pg) making it difficult to genotype directly individual haploid nuclei. Therefore, so far a whole genome amplification of single pollen nuclei was performed to achieve reliable genotyping efficiencies, which however is rather expensive per sample and allows low sample throughput [1]. To decrease the cost per sample and to increase the sample throughput, we tried targeted PCR-based amplification of selected SNPs using multiple pairs of primers preceding SNP genotyping (pre-amplification) to improve single pollen SNP genotyping efficiency. We could achieve a 15~20% of readout for each SNP. In sum, targeted SNP pre-amplification allows a cost-friendly approach to genotype single haploid pollen in order to measure the meiotic recombination rate within selected interval(s). Currently, various (alternative) approaches are studied to increase genotyping efficiency and sample throughput further.
- To figure out which SNP genotyping system is the most suitable for the project, KASP, rhAmp, and Taqman-based SNP genotyping approaches can be tested. So far, we compared KASP and Taqman systems showing similar efficiencies (15~20% efficiency per interval).
- To get multifaceted advices from different people, I am continuously participating in various meetings and talks, e.g. regular progress meetings within our team and with my supervisors as well as PhD progress, hot topic, departmental and institute seminars.
- For practical approach of my project and results, I need to know how to demonstrate and explain what I want to establish and how to perform. For this, I am trying to train myself to read more and write. In my case, I need to train myself for critical thinking and read more.

Cognitive skills

- Analysing and reflecting my performance and results is crucial. For me, one important part is to learn how to organize all data that I produce efficiently and to figure out how these can be interpreted.
- I need to learn how to analyze and critically evaluate my own results and those of others by attending and actively participating in meetings, discussions, talks and seminars regularly.
- I need to know relevant studies in my research area, current progress of this study and how to connect my project to this lack of understandings.
- Currently I am not well-performing on critical thinking of my results or those of other people. For this, I need to learn and read more. Practically, I want to get familiar with one scientific paper per day.

Creativity

- As modulating COs in barley and its efficient detection using single pollen nuclei are not well-established so far, I need to come up with ideas that can improve our study. There are many different chemical compounds or factors that can be tested on barley. And there also exists a wide range of possibilities how to efficiently perform SNP genotyping.
- For seeking helpful informations, I am searching many different fields of science regarding my project and try to contact them and ask questions relating to what I study.

Domain B: Personal Effectiveness

The personal qualities and approach to be an effective researcher (Professional and Career Development, Self-Management, Personal Qualities)

Personal qualities

- I am happy about what I am studying now and highly motivated to advance this study and to contribute to the field.
- I constantly discuss with my supervisors about what I have achieved so far and what I want to achieve in the future.

Self-management

- I am not very good at managing my time efficiently. Sometimes I finish work at very late hour or even fail to go to non-scientific courses e.g. German classes or writing courses in the institute. I need to come up with ideas to plan my schedule more clearly and efficiently and stick to the schedule.
- I am fully focusing on my studies and I am trying to find out ways to advance it further.

Professional and career development

- I have to establish my network with people in my research area and beyond. For this, I want to participate in as many conferences as possible to share ideas and to discuss about my project, and to establish a possible career network. The MEICOM network is very helpful for this, especially for early-stage researchers like myself.
- I need to present and discuss my own skills and techniques, personal attributes and experiences for future career development.
- I need to practice how to present myself in CV in efficient way.

Domain C: Research Governance and Organization

The knowledge of standards, requirements, and professionalism to do research (Professional Conduct, Research Management, Finance, Funding and Resources)

Professional conduct

- I am aware of relavant health and safety issues as well as ‘good’ working practices. I am also constantly using the electronic safety instruction system that includes lectures and exams available at our institue.
- Since I am working with chemical compounds that can be harmful for the environment, I am aware of possible impacts and I take care of it.
- I am aware of the importance of research ethics and copyrights.

- I want to get a better understanding of legal issues/requirements within and outside my research area, if needed.

Research management

- For a broader understanding and for writing my thesis, I want to gather more knowledge from available literature, disccusions, talks and conferences.
- To put myself on the right track, I consistently discuss my progress with supervisors.

Finance, funding and resources

- I am aware of the importance of funding for research. Right now my project is funded by EU, however, for my future career, I want to learn how to write my own competitive research proposal.

Domain D: Engagement, influence and impact

The knowledge and skills to work with others and ensure the wider impact of research (Working with Others, Communication and Dissemination, Engagement and Impact)

Working with others

- I am aware of the importance of team working and collaborations in science. I have no problems with communicating colleagues or other people in the institute or in conferences, and make amicable relationship. Having network with people in different or related fields can be helpful mutually.
- I try to make my duties before deadlines.
- I am trying to inform junior students in my former department in Korea about opportunities and difficulties to study abroad and about qualifications neeeded.
- Science projects generally consist of different people's work and effort. One-man cannot easily approach to the matter in various angles. For this, collaboration with different researchers is key.

Communication and dissemination

- I actively communicate with the other 11 early-stage researchers in MEICOM and I look forward to participate in all upcoming workshops and meetings.
- I am aware of the power of media to transfer information.
- I submitted a protocol chapter "*In planta* delivery of chemical compounds into barley meiocytes - EdU as compound example" to the lab protocol series Methods in Molecular Biology (Springer Nature).

Engagement and impact

- I have teaching experiences during my bachelor, however, I didn't have a chance so far to supervise or teach undergraduate projects or vistors/guests after I started my PhD studies. I am willing to do so in future.
- I am aware that informing young students who might be interested in science and giving them information on what they might not recognize are important. For this, I am happy to participate the Think Tank event in Birmingham in February 2019 and further events in frame of MEICOM.

You can use this section to identify a small number of specific prioritised goals for your development year.

This should be revisited at the end of the year to assess progress.

Identified skill area for development	**Planned Activity**	**Success criteria (i.e. how will you know you've achieved your goal)**	**Deadline (when do you want to achieve it by?)**
Communication and dissemination	Publication	Submit at least one scientific manuscript	31.12.19.
Research methods-practical application	Develop protocol	Develop a protocol for efficient and high throughput SNP genotyping of single haploid barley pollen nuclei to measure meiotic recombination rates	31.12.19.
Academic literacy and numeracy	Academic writing	Be able to sum up my results and goals in my project efficiently.	31.12.19.
Communication	Attending conferences	Be able to present my project and results with confidence. Participate in at least two confernces or meetings.	31.12.19.

Signature (MEICOM ESR)

..... Date 28. 01. 2019.

Signature (Supervisor)

..... Date 28.01.2019

Signature (Second or co-Supervisor)

..... Date 29.1.2019

1. Dreissig, S., et al., *Measuring meiotic crossovers via multi-locus genotyping of single pollen grains in barley.* PloS one, 2015. **10**(9): p. e0137677.