



Mid-term assessment of the MEDEA Research School activities

Horizon 2020 Research and Innovation Programme; Marie Skłodowska-Curie grant agreement No. 641789.

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1: Abstract

A wide range of research school activities of the MEDEA ESR training programme were monitored through observations and repeated structured individual interviews with participating Early Stage Researchers (ESRs; i.e. doctoral students). In the early stage of the project, instructional video presentations of participating laboratories and key scientific principles turned out helpful for the early start-up of ESRs. An intertwined chain of monthly e-based Webinars led by senior scientists and web-based Journal Clubs led by ESRs constitute the longitudinal backbone of ESR training and interaction. I herein report on start-up pitfalls, successful structuring and adjustments of foci for these activities. The scientific competence of the ESRs was further supported by a highly appreciated Summer School in 2016. There, MEDEA members and selected experts interacted and supported the ESRs in their new research missions.

The early stage of the project included adequate outreach training with specific training in instructing school teachers and pupils in scientific discovery with the Photonics Explorer Kit[®]. Several ESRs successfully performed such outreach, whereas others still struggle without finding target schools. It is suggested that the supervisors (not the doctoral candidates) address such administrative obstacles.

Substantial secondments in partner laboratories constitute key promotion of ESR networking and future employability. For some ESRs this is already largely achieved, but for others it is a pressing challenge to align secondments with individual research in the home laboratory within the MEDEA 3 year timeframe. This report suggests that secondment host co-supervisors need to be involved as early as possible in the supervision and planning of each ESRs work.

Overall, the assessed research school programme comes across as very ambitious, and very well organized. There is a tendency of curriculum overload that may interfere with individual research project management and home institute obligations. The investigated research school programme indeed covers most aspects of high quality research and outreach training. However, it is suggested that early training in scientific writing (including peer feedback) could be prioritized in the coming year. Notably, the scientific outcomes of the ESRs may to some degree be presented in non-English monographs with a limited readership within and beyond the MEDEA research group.

Key words: *Assessment, research school, PhD training, doctorateness.*

2. Introduction

MEDEA is a European research network in the Horizon 2020 Research and Innovation Programme composed of academic and industrial partners that study molecular electron dynamics investigated with intense fields and attosecond pulses [1]. MEDEA runs a research school with 15 employed doctoral students (Early Stage Researchers; ESRs, <http://www.medeia-horizon2020.eu/team-structure/phd-studentfellow/>), and the report at hand assesses the design and performance of all planned and performed research school activities, including:

- Instructional videos:
 - How-to-for-beginners video series
 - Virtual Lab visits video series
- Outreach Training (at the Milano Winter School)
- Outreach activities (using the Photonics Explorer Kit in schools)
- A webinar lecture series (run by senior researchers)
- A web-based journal club series (run by the ESRs)
- An extensive research focussed Winter School (Crete)
- A mobility program for the ESRs including
 - A secondment at an academic partner laboratory
 - A secondment at an industrial partner laboratory

During the herein presented MEDEA self-assessment the number of ESRs has increased from 10 to 15 doctoral students. Each ESR has a yearly updated Career Development Plan (CDP) which outlines individual research milestones in relation to the MEDEA work packages, and that schedules involvement in MEDEA training activities.

3. Methods and informants

Research school activities were partly assessed through selected activity observations. This included participation in the Milano Winter School and the Aarhus mid-term meeting, along with selected live observations of web-based journal clubs and recorded webinars.

In addition to activity observations, twenty-six structured individual interviews were conducted [2], 25-60 minutes in length. All interviews were recorded and played back for transcription and content analysis. Two sets of interviews were performed. In February 2016, 11 *start-up interviews* were performed with enrolled students in order to monitor newly employed ESR:s expectations and early experiences of research school activities, as well as their view on their journeys towards their doctorates. This allowed for some early adjustments of the ongoing MEDEA activities. Another set of 4 start-up interviews was added in December 2016, with ESRs who were recruited late**. See the interview scheme for the start-up interviews in Table 1.

- What are your expectations and initial experience of the Webinars?
- What are your expectations and initial experience of the Journal Clubs?
- What are your expectations and initial experience of outreach training?
- What are your expectations and initial experience of upcoming outreach in schools?
- What are your expectations and initial experience of our upcoming secondments?
- What are your expectations and initial experience of etworking with your peer ESR:s?
- How did you experience your inclusion in the pre-existing ESR group?*
- What do you think signifies becoming a PhD?
- What are your career expectations?

*Table 1: interview question scheme used for the start-up interviews. Question** was added to late ESR recruitments joining the ESR group.*

Close to the MEDEA mid-term meeting in Aarhus University, in December 2016, the ESRs were again interviewed (10 interviews). These *mid-term interviews* were mainly retrospective, assessing how the ESRs had experienced the passed 10 months of research school activities (see interview scheme in Table 2).

- Please comment how activities/resources have evolved up to now.
- Did you see The "How to for beginners" videos and the "virtual lab visits"?
- If you did, was it during recruitment, or after your ESR admission?
- How have you experienced the series of Webinars?
- How have you experienced the series of Journal Clubs sessions?
- How have you experienced the outreach training and mission?
- How have you experienced the planning and performance of secondments?
- Have you had interactions with your secondment co-supervisors? What kind?
- How did you experience the Crete Summer School?
- Did you practice any academic writing so far? Any early manuscript drafts?
- What is your view on and experience of your development of academic independence?
- How do you vision your future research and professional networking?

Table 2: interview question scheme used for the midterm interviews. As in the start-up interviews, long-term career oriented questions were added at the end of the interviews. This was done in order to understand the ESRs views on doctorateness [3] that may differ between countries and disciplines, but also as a mean to potentially trigger the ESRs vicarious experience of relevance [4]. These long-term matters will be analysed further in the final phase of the MEDEA project.

4. Observations

4.1. Overall balance and composition of research school activities

The monitored research school is highly appreciated by the ESRs, who in short time have developed a sense of belonging to the MEDEA community and an informal peer network. The research school activities offer rich opportunities to interact and learn from top experts in the field who readily share their knowledge. ESRs also experience fruitful interaction with adjacent research groups which comes in handy in particular for those ESRs who are not in the core of attophysics experimentalists (theorists, engineers and chemists maybe considered somewhat peripheral in relation to the main MEDEA programme). The research school programme comes across as ambitious and seriously designed, but suffers to some degree of activity overload. ESRs worry for instance about finding time for extensive planned secondments while still upholding their individual research in their home laboratories. Some also worry about the relevance of the upcoming secondments for their PhD theses (secondment adjustments were suggested by the EU officers during the MEDEA Midterm meeting). The interviews further revealed some instances of unnecessary doubling of administrative demands on the ESRs, both from MEDEA and from the home institution (f. ex. double study plans and double co-supervisor teams, etc).

4.2. The Summer School – interacting deeply with peers and experts

The extensive MEDEA summer school (held in Crete) was extraordinarily appreciated by the ESRs. There they interacted with the highest possible level of international experts in their fields, including crossover conversations with researchers from selected adjacent scientific programmes. The ESRs unanimous appreciation is mirrored in some of the mid-term interview statements:

“–This was the best MEDEA activity so far”

“–Really well organised for us, for the students”.

“–The presenters gave tutorials. Not like in a conference where they’d talk about their very latest research that is difficult to follow. Instead they talked about the fundamental basis of their research.”

”– The experts were really available; you could go and have a lunch with them.”

“–They [experts and peer ESRs] had the time to go through our posters. Not like coming to a conference after 1yr [of studies], before you have very interesting results to show”.

The meeting was organized in a suitable location with a programme that promoted a rich mixture of formal and informal meetings such as expert talks and ESR poster sessions. Senior researchers did engage in the ESRs research tasks, and were in turn challenged by the ESRs. The talks provided novel and partly unpublished research, including details normally not presented in publications. The summer school was also an opportunity for late admitted MEDEA ESRs to get to know the MEDEA group. However, there could have been some more exclusive MEDEA activity during the summer school to further such inclusion even more.

4.3. Webinars and Journal Clubs – the longitudinal backbone

An intertwined chain of monthly e-based Webinars led by senior scientists and web-based Journal Clubs led by ESRs constitute the continuous longitudinal backbone of MEDEAs ESR training and activities (Figure 1).

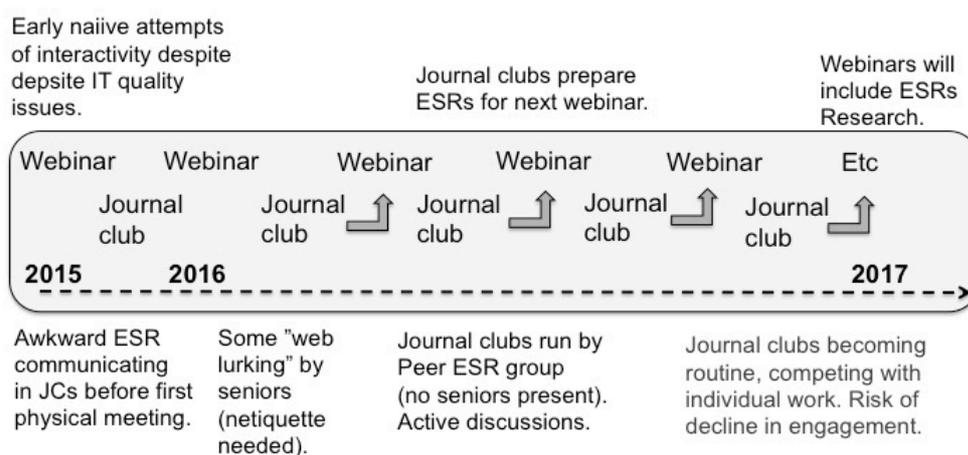


Figure 1: Overview of the webinar and Journal Club development.

The Webinars provide essentially the same advantages as the disciplinary summer school, only in the form of discrete stand-alone sessions of selected speakers. An early change from less efficient web communication to the MEDEA BlueJeans web service secured sufficient sound and image quality to allow talks with slides and

audience interaction. An appreciated additional BlueJeans-feature is the session recording that allows ESRs to play back the webinars in order to revisit their contents (this was used by several ESRs). The selected speakers are well known researchers who passionately share their expertise. For instance, one ESR said:

“–There were some particular [important] topics that I wasn’t aware of that I got to know more about, really nice, and then there were a few topics I couldn’t understand, but it is always good to know some of the things that’s happening in the field”

Webinar themes and performances are highly rated among the ESRs. The Webinars provide novel well interconnected scientific information from the attosecond field including “behind-the scene”-details one would rarely share in publications. The ESR group is predominantly composed of attosecond science experimentalists but also include a range of related theorists, engineers and chemists. The interviews showed a certain divide between theorists and experimentalists. For instance, the latter sometimes found it hard to follow advanced theory-oriented webinars. It is therefore inevitable that themes chosen by the MEDEA seniors do not fit the expertise and research of each and every ESR, but most of the ESR group still acknowledges that the covered themes provide an adequate breadth and background. During 2016 the ESRs have discussed the next upcoming Webinar during the Journal Club meetings. This connection was much appreciated among the interviewed ESRs.

The Journal Clubs started in the late autumn of 2015 (Figure 2). They initially suffered from uncertainties in session format and web communication. It turned out essential that ESRs first had an ice-breaking physical Journal Club session at the Milano Winter School Meeting, where they also negotiated the subsequent session format. This created a relaxed peer work climate further enhanced by the exclusion of senior researchers that might inhibit ESR peer discussions. ESRs from the MEDEA partners take turns in selecting papers, which ESRs regard well selected for scientific breadth. The interviews showed that the covered journal papers constitute narrower themes than those treated in the Webinars, as expected. After some sessions the Journal Clubs started to also prepare for the next up-coming Webinar, a synchronization appreciated by the ESRs. The Journal Clubs have throughout been well prepared and introduced by the presenting ESR. However, lately the sessions have become a routine relying heavily on the paper presentation rather than on a peer analysis of the contents (Figure 1). Here follow some interview statements on the Journal Club activities:

“–The journal clubs are sometimes far from what I do, but with the webinars there is still a super-strong connection... ..making us aware what the others are doing,

–What I appreciate with Journal Clubs is that some of us [ESRs] are explaining [the topics], so you feel less shy asking question that may seem stupid to someone on your own level instead of asking a professor..

–Sometimes there is too little communication, it is more like a lesson.. ..maybe this is a matter of our commitment to the Journal Club.., we now feel less responsible when someone else presents (who is always well prepared)”.

Actions to counteract the decline of Journal Club activity were discussed at the midterm Aarhus meeting, and the ESRs are now taking initiative to keep up the engagement in the JCs (still having ownership of the journal clubs). In this meeting it was also decided that Webinars in the second half of the MEDEA project period should treat the individual research results of the ESRs, in support of their evolving research and manuscript writing.



Figure 2: MEDEA ESRs performing a live Journal Club on the BlueJeans web communication platform.

4.4. Outreach training and arrangements of school activities – whose responsibility?

The MEDEA winter School in early 2016 provided appreciated hands-on training in the principles of outreach communication provided by educators of the Da Vinci Museum in Milano. There were also instructors from Eyest who provided exiting training in the use of the Photonics Explorer kit prior to use in schools [5] (Figure 3). The Winter School meeting further included a physical Journal Club (see section 4.3.) and a range of invited oral presentations that received mixed reviews by the interviewed ESRs. ESRs who were recruited after the Winter School received appreciated Photonics Explorer training by Eyest staff in a one-day session in conjunction with the Summer School meeting in Crete.

Each ESR has to conduct schoolteacher and class training using Photonics Explorer from Eyest, and share insights with the pupils into their careers as junior researchers. ESRs who did such outreach report it was challenging but also inspiring:

“–During preparation I was inspired by how the scientist in the Da Vinci Museum interacted with us – so I tried to do it like that”.

“–Before [doing school outreach] I was more stressed that before a conference. But then I faced interested students and teachers who really appreciated it.. I really had a good feeling despite the fear it would be too simple or too difficult. It went really well; a super-good experience. We were invited back next year.

“–The most difficult and interesting thing was to try to explain in simple words what I’m doing [in my work]. The students were more interested in this than in the experiments.”

Several ESRs however ended up spending considerable efforts on finding willing schools and teachers, and some have yet not succeeded in this, partly due to schools resistance but also language barriers:

“–Nothing is going on. We tried a lot; contacting teachers and schools, but they didn't give me any response, not responding to emails”.

There is a need for a clear divide in responsibility, so that MEDEA ESR supervisors make the necessary school arrangements for their PhD students and the ESRs focus solely on performing their outreach activities.



Figure 3: MEDEA ESRs at the Milano Winter School, involved in instructional discussions of the Explorer Photonics Kit.

4.5. Instructional introductory videos

During the start-up of the MEDEA project, two sets of instructional video presentations of participating laboratories (Virtual Lab Tour) and key scientific principles (How-to for Beginners) were displayed on the MEDEA site (Figure 4). These turned out useful and appreciated as broad orientations for the newly employed ESRs, who indeed claim they did watch most of the films at that stage. One of the doctoral candidates summed this up:

*"I saw them some time after being recruited.. ..short presentations.. ..they were helpful.. ..
 ..Yes wow, "How to for beginners" videos provided some basics which was really nice"*

The videos could also have been part of the ESR recruiting strategy, but they were not yet produced prior to the main recruitment phase.

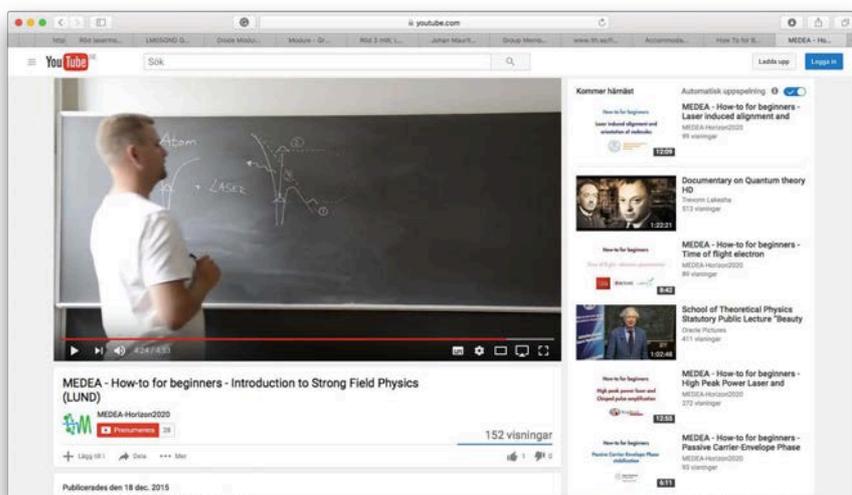


Figure 4: A How-to for Beginners video from the MEDEA site.

4.6. Secondments and co-supervision – aligned with ESRs individual work?

Each ESR is scheduled to perform extensive secondments with industrial and non-industrial MEDEA partners. This mobility programme has an underlying ambition to bring experimentalist and theorist ESRs closer to each other's work and competencies. Some secondments are already successfully up and running, and in these cases they have been well hosted and useful for the ESRs. Such mobility has been especially valuable in case of technical problems in the home laboratory of the ESR. Most ESRs are however still in an early planning stage of secondments. There is a pronounced worry that the ca 9 months of scheduled secondments will interfere with their home laboratory work (within the 36 month ESR programme). These worries are particularly heard from ESRs who are currently not convinced that their secondments will have any clear impact on the contents of their PhD theses.

“–We have decided where I should go, but we have not talked to the host.. ..I haven't met my secondment supervisors yet.”

“–It is a bit too much; 3yrs is already a short time to do a PhD and if you then also need to go somewhere else to do something else; is not the best thing to do. Needs to be really really well planned”.

“–It is still early but I think it will be very complicated [to fit secondment work results] into my thesis”.

In the Aarhus Midterm Meeting in January 2017 there were constructive discussions with the EU representatives on how to better align secondments with the individual work for some of the ESRs.

In each ESRs Career Development Plan there are assigned co-supervisors from the secondment partner institutions. However, most ESRs reported that there has been none or very limited contacts with their secondment co-supervisors. Such early contacts would have a potential to improve the alignment between each ESRs individual work and the secondments.

5. Conclusion and outlook

The MEDEA Research School provides an impressive ambitious scientific breadth and a multitude of training activities, on the verge of what can fit into the 36 months MEDEA programme. The interviewed ESRs constitute a heterogeneous group in terms of scientific profile and it is therefore suggested such individual differences are taken into account in each ESRs remaining Career Development Plan whenever possible, so that individual work is aligned with research school activities. Each ESR appears to have a good working relation with their main supervisor, but it would be constructive to involve the secondment co-supervisors earlier in each ESRs progress than is currently the case.

For the remainder of the MEDEA programme it is important that the research outcomes of the ESRs are integrated in the research school activities. Currently only few of the ESRs have trained science writing or authored manuscripts, as most are in the data collection or theory evolution phase. However, academic writing will be imperative in the second half of their doctoral programme and it is (despite this is culturally controversial) suggestive that as much thesis work as possible is written in the Lingua Franca of science, English, in order to maximise ESRs peer sharing of ideas, manuscripts and chapters within the international MEDEA PhD student cohort.

6. Acknowledgments

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7. References

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