

CURRICULUM DEVELOPMENT IN TIMES OF A PANDEMIC

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The European project MELODY is developing and evaluating a basic CBRN training curriculum for First responders and First receivers. As an adaptation to pandemic restrictions, pilot courses in form of face-to-face classroom lectures and hands-on training for end-users are partly supplemented with digital evaluation events focusing on eLearning and online webinars. Despite different settings, initial analysis of data from one face-to-face and one online evaluation event indicate that overall the curriculum is well-suited for its purpose. Results from both tests point towards the same weaknesses regarding specific learning objectives. Two more tests need to be performed and analysed. The conclusions will inform further improvement of the curriculum before its final validation in another round of pilot courses in four European countries.

1 Introduction

The ability of emergency response personnel to assess and to mitigate the risks of incidents with (potential) release of chemical, biological or radio-nuclear (CBRN) material is just as much a matter of civil protection as it is of occupational safety. Yet, in European countries few and varying resources are spent on basic CBRN awareness training of the average emergency response personnel.

Therefore, EU-project MELODY is developing a basic training curriculum on CBRN awareness and initial management of CBRN incidents. The curriculum is designed for personnel of the emergency services, from dispatch officers over the classical First Responders (police, ambulance and fire & rescue personnel) to First Receivers such as general practitioners and staff working at hospital emergency rooms. The MELODY team aims for an EU-wide harmonized curriculum that builds on existing CBRN training initiatives, suits the needs of the emergency response organisations and can be implemented in all EU Member States.

Early on in the project a gaps and needs analysis of current CBRN training in EU Member States was performed. One outcome from this analysis was insight into the varying investment of time for vocational CBRN training, differing considerably between services and countries. In response to the identified gaps the draft MELODY curriculum comprises of seven modules that can be combined into courses lasting from a couple of hours to several days (see Figure 1). The curriculum further builds on the Concept of Operational Functions, i.e. all emergency response activities that need to be performed in order to mitigate the risks of (CBRN) incidents [1, 2], and on the EDEN CBRN Training Framework for First Responders [3, 4].

Each module of the curriculum comprises of several topics. Learning objectives were specified and training material was developed using learning formats such as interactive classroom teaching, reflecting quiz questions, small group scenario discussion, hands-on practical training and table-top exercise.

Importantly, as much as possible and suitable, most parts of the curriculum are intended to be taught to mixed classes of participants, i.e. all professions targeted by MELODY should participate at the same time. Only the advanced module 6 consists of task-specific topics intended for individual target groups.

With the intention of maximum flexibility and in order to reach as many end-users as possible, the first two modules on CBRN terminology and basic CBRN knowledge were designed for both, traditional classroom and individual online-learning. This latter MELODY eLearning can be used stand-alone, as preparation for the more advanced modules 3 to 7 or as a brief refresher training.

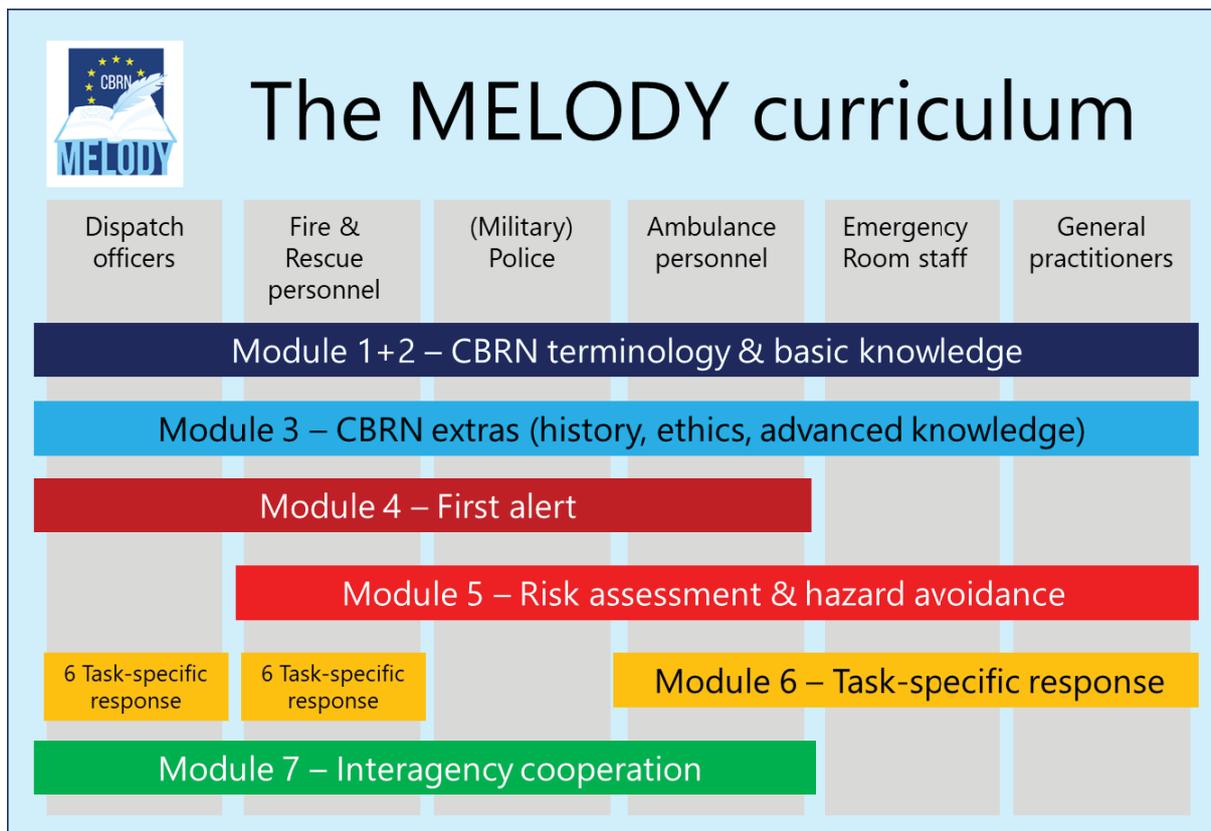


Figure 1. Outline of the MELODY CBRN training curriculum for First Responders and First Receivers.

2 Evaluation strategy

As part of the development process, the project team is testing and evaluating the curriculum together with end-users from several European countries. The evaluation strategy is inspired by evaluation literature such as Kirkpatrick's four levels of evaluation [5, 6], Biggs & Tang's work on constructive alignment [7] and the work by Vedung [8] on intervention theories as evaluation tools. We are looking at three aspects of the curriculum, i.e. its logic, its implementation and its effect, which together provide the possibility to evaluate the curriculum from different perspectives and which contribute to an in-depth understanding of the curriculum and its implementation (Figure 2). The evaluation aspect "Programme logic" focuses on the curriculum and the training contents in relation to the project objectives. "Programme implementation" asks how the training contents is deployed and perceived by the participants (trainees, trainers and expert observers). The third evaluation aspect, "Programme effect", focuses on the trainees' learning. For each of the three evaluation aspects the team defined evaluation criteria, which then guided the development of specific evaluation tools (see Table 1). The analysis of the evaluation data is then geared towards input to the evaluation criteria.

Evaluation strategy

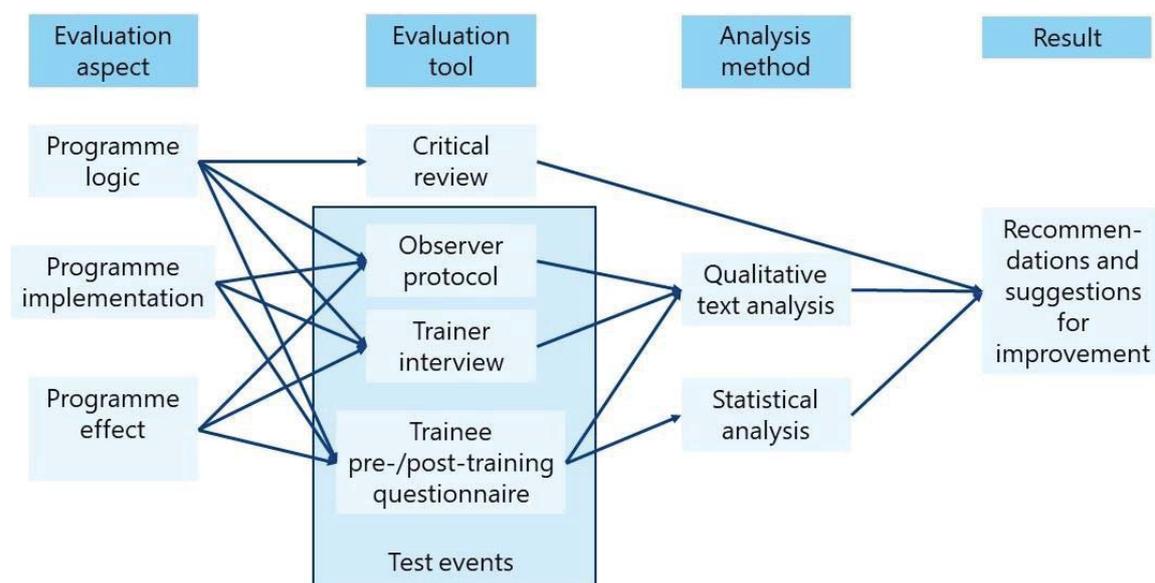


Figure 2. Illustration of the strategy used to evaluate the first version of the MELODY CBRN training curriculum for First Responders and First Receivers.

Table 1: Overview of evaluation aspects and criteria in relation to the evaluation tools developed.

Evaluation aspect	Evaluation criteria	Evaluation tools
Programme logic	<ol style="list-style-type: none"> Has the curriculum the potential to deliver the MELODY objectives and to close the gaps identified in the Needs Assessment? Can the learning outcomes be achieved? 	<ul style="list-style-type: none"> Desktop review of curriculum and training content Focus group interview with the trainers Observation protocol for evaluators Post-training questionnaire for trainees
Programme implementation	<ol style="list-style-type: none"> Do training contents and training method create opportunities for learning and do they support the learning process? Is the context of the learning situation appropriate? Does the curriculum meet end-users' needs and does it fit into their organization? Are the trainees satisfied with the training? 	<ul style="list-style-type: none"> Desktop review of the Trainer Guide Pre-/Post-training questionnaire for trainees Focus group interview with trainers Observation protocol for evaluators
Programme effect	<ol style="list-style-type: none"> What effect does the curriculum have on learning? What have the trainees learnt? 	<ul style="list-style-type: none"> Pre-/ post-knowledge test for trainees Post-training questionnaire for trainees (self-reported learning)

The main evaluation tool for assessing the programme logic is a desktop review, a so-called constructive alignment, of the curriculum and of the training content, performed by subject matter experts of the MELODY team.

In order to collect empirical data for the assessment of programme implementation and programme effect, the team is organizing pilot courses, that are accompanied by evaluation sessions. During these sessions the following evaluation tools are used:

- A pre- and post-training questionnaire including a pre-/post-training knowledge test for trainees;
- An interview guide for focus group interviews with the trainers, who delivered the pilot course;
- An observation protocol for evaluators, who observed the pilot course.

Four national training centres for First Responders are MELODY partners and these are the hosts and facilitators of the so-called test events (pilot course plus evaluation sessions). These training centres are Central European CBRN-E Training Center of the Hungarian National Police in Budapest, Emergency Service Training Centre West Finland in Pori, Campus Vesta Training Center for Emergency Services in Ranst, Belgium, and the Defence CBRN Center in Vught, The Netherlands.

They recruit trainees, trainers and expert observers, organize the logistics and deploy the training material that is selected for the pilot course.

The overall plan for the test events was to organize one- to two-day live events with five representatives from each of the six MELODY target groups, a total of 30 "CBRN-naïve" trainees, and at least one expert observer from each of the target groups. The expert observers should be experienced trainers (not necessarily with CBRN expertise), responsible on regional or even national level for vocational training in their own organisation. All test events are to be held in the respective national language, which also means that training material and evaluation tools need to be translated from English and that free-text answers and comments written down by test participants need to be translated back to English, the working language of MELODY project members.

Since MELODY explicitly targets "CBRN-naïve" emergency response personnel, the two basic modules 1 and 2 are to be taught in all pilot courses. Apart from these two, additional training material from modules 3 to 7 is included as appropriate under the circumstances of each test event. Depending on the chosen training material, the evaluation tools are adjusted for each test event.

The evaluation data collected from all participants, i.e. trainees, trainers and expert observers, are compiled into a broad picture of the end-users' feedback to the respective pilot course. Qualitative data such as free-text answers and comments as well as the transcribed notes from trainer interviews are analysed by meaning condensation. Quantitative data is analysed simply by calculating mean values for each group of participants and for questions or statements relating to the same evaluation criterion or the same learning objective. In order to measure the effect of the pilot course on learning, the trainees' performance in the pre- and the post-training knowledge test is compared (the "learning delta"). Their performance in the post-training knowledge test, which includes more questions than the pre-training section, also provides information on the degree to which specific learning objectives are accomplished.

3 Evaluation in times of CoVID-19 – Challenges and opportunities

Four face-to-face test events in four countries, i.e. Hungary, Finland, The Netherlands and Belgium, had originally been planned in April-October 2020 for the purpose of collecting evaluation data. Due to the CoVID-19 pandemic these plans had to be changed.

Not only does the pandemic restrict the possibilities for travels and face-to-face test events, it also impacts on the availability of trainees, mainly from the medical professions.

Two face-to-face test events could nevertheless be performed (Hungary, Finland), if only with on-line participation of MELODY team members (see Table 2). Two test events are carried out completely in a digital on-line format (MELODY network-wide, combined Belgium/The Netherlands).

Table 2: Overview of MELODY test events performed during CoVID-19 pandemic and the parts of the MELODY curriculum that are included in each pilot course.

Module	Topics	Test [HU] 2x police, 8x medical staff, 2x fire/rescue	Test [FI] 30 trainees	Digital test 105 trainees [11 countries]	Digital test [NL/BE] 2x 30 trainees
CBRN Terminology & Basics	1.1 – 2.5	1.1 – 2.5	1.1 – 2.5	1.1 – 2.5	1.1 – 2.5
CBRN Extras	3.1-3.2				
First alert	4.1-4.2	4.1-4.2	4.1-4.2		4.1-4.2
Risk assessment	5.1-5.8	Parts of Topic 5.1	5.1, 5.4-5.7		5.1 – 5.8
Task-specific response	6.1-6.4				
Interagency cooperation	7.1-7.2				

The first test event had originally been scheduled for April 2020 but was postponed to 2 September 2020. When planning this event, the team had two major constraints to consider, i.e. the availability of already produced training material and the availability of trainees. It was clear early on that only material for Modules 1, 2, 4 and some parts of Topic 5.1 would be available for the pilot course. Based on the estimated times for teaching this material, the team decided on a one-day test event. This decision was also compatible with the limited access to trainees during the pandemic. In the end, only twelve trainees and two observers from the medical emergency response and the fire & rescue services, respectively, could participate. All training material was delivered by a single trainer and the entire test event was carried out in compliance with the local pandemic restrictions. Due to the pandemic it was not possible for MELODY members to participate in the event on site. Instead, the evaluation sessions before and after the pilot course were performed via video link.

The second test event was postponed from May to October 2020. It covered the same training material as the first test event plus additional topics of Module 5 that had recently been completed. Two days were reserved for the pilot course and the accompanying evaluation sessions, which again were performed via video link. Trainees were police officers, personnel from the fire & rescue services as well as from various emergency medical services.

The pilot course was delivered by four trainers, who also served as expert observers, when they themselves did not teach. Due to the pandemic, no independent expert observers could be invited. The results from this test event are not available yet.

Early on in the project it was decided to produce an eLearning version of the basic Modules 1 and 2 (in English), as an alternative learning format. While the live test events of the classroom training were suffering from shifting restrictions due to the ongoing CoVID-19 pandemic, the project team experienced a strong interest in the online learning format. Thus, when the team called for an online evaluation of the MELODY eLearning, project partners recruited interested volunteers within a very short time. During one week in November 2020 these volunteers were given access to the eLearning and to an online version of the pre- and post-training questionnaire for trainees. The two parts of the questionnaire together with the eLearning were provided as a "link sandwich" and trainees were referred from one link to the next so that they could work their way through the entire sequence. The links were open throughout the entire week and could be accessed at any time. The eLearning could be accessed multiple times, but for the evaluation tools trainees were asked to complete each questionnaire in one consecutive session.

Initially, 143 volunteers from 13 countries registered for this digital test event. At the end of the week, a total of 105 volunteers representing 11 countries had completed both the pre- and the post-training questionnaire. This digital test did not engage trainers or observers but judging from their contact details many of the participants appeared to be in a leadership position and/or being responsible for vocational training in their organization.

The third and fourth test event were postponed to January 2021 (The Netherlands) and March 2021 (Belgium), respectively, in the hope of fewer pandemic restrictions. However, in the light of recent and ongoing CoVID-19 developments, these two live test events are now being transformed into one 2-day digital online test event scheduled for May. It will be held in Dutch jointly for trainees from Belgium and The Netherlands. The online setting may come with challenges for all involved, but it also bears an opportunity for the two hosting MELODY partners to develop novel learning formats and to push forward the boundaries of traditional vocational training for First Responders.

4 Preliminary results and other observations

The evaluation results from the first test event (Modules 1, 2, 4 and parts of 5.1) show that the pilot course was successful. The trainees were eager to learn how they could be better in handling CBRN incidents and how to strengthen their cooperation with other emergency services. The trainees felt that the pilot course offered good possibilities for learning.

With regard to program logic, the MELODY curriculum was perceived as having the potential to deliver the overall MELODY objectives and as providing possibilities for achieving the specific learning objectives of the pilot course. Even though the overall perceptions of the pilot course were positive, our results also demonstrate the challenge of developing a curriculum that suits all target groups. Some of the medical emergency staff felt that parts of the training material were too basic. This view can however be explained by a higher level of previous CBRN knowledge in these trainees as compared to the rest of the trainees.

Concerning program implementation both the training methods and training material got positive reviews. The trainer and the two expert observers thought that the amount of material to be presented was too much for the available time, limiting the possibilities for interaction between the participants. The trainees did not perceive this as problematic; they rather rated their possibilities for interaction as very high. They did however wish for more practical training elements.

Nevertheless, a good balance between the amount of training subjects and available time should be ensured as interactive discussions and feedback are essential prerequisites of learning. The general opinion of the participants was that the training subjects and the pilot course meet well the end-user's needs and fit the national context of their organizations.

According to our results concerning program effect most trainees felt that they had increased their CBRN knowledge with the pilot course. Only those trainees with high previous experience disagreed to have learned much new. Our quantitative data confirm a small increase in knowledge, with a learning delta of 13,3% for the whole group of trainees. The twelve learning objectives that were assessed during this test event were achieved to varying degree. Judging from the mean percentage of correct answers in the post-training knowledge test, most learning objectives were achieved to a high degree, but for four learning objectives the trainees had less than 50% correct answers. Two learning objectives were assessed through a vignette and here only half of the trainees presented acceptable or relevant solutions.

In conclusion, our results point towards a well-implemented pilot course during which the trainees gained basic CBRN knowledge. As only twelve trainees participated these results cannot be generalized too much. But, both the identified strengths and weaknesses will inform the upcoming improvement of the curriculum and its training material, e.g. a better balance between unidirectional lectures and trainer-trainee as well as trainee-trainee interaction, improved training material and/or training method for a higher learning delta, specifically for those learning objectives that were not or only just achieved.

Many of the trainees in the digital on-line test event (Modules 1+2, eLearning) turned out to be overqualified in terms of their CBRN knowledge. According to the demographic data collected in connection with the pre-training questionnaire 45% of the trainees had a Master's degree or even higher level of education. More than 70% had over ten years of professional experience. A small group of trainees defined themselves as having another profession than one of the six MELODY target groups, and these can even be considered CBRN specialists. When asked about their expectations, trainees stated either that they were interested in learning more about CBRN or that they were curious to see how the eLearning format would work for this kind of subject matter.

The results of the evaluation regarding program logic showed that the trainees believed the learning objectives to be achievable and the overarching logic of the eLearning to be good. Concerning program implementation the trainees were satisfied with the visual and multimedia design of the eLearning, its content and how it fitted into the national context of their organisation. Some participants asked for a version in their national language. The main opportunities for improvement were seen in the voice-over elements and the number of interactive elements, which trainees believed should be increased. Further, the project team learned that the position of this eLearning in relation to the whole MELODY curriculum needs to be explained more clearly. On the background of the rather high level of education and CBRN knowledge, it was probably not too surprising to read comments asking for more in-depth training; the content of the eLearning was perceived as too basic. The educational background of the trainees was also reflected in their overall good performance already in the pre-training knowledge test that we used to assess program effect. Accordingly, our data for the whole group of trainees demonstrated only a small learning delta. If the results for the CBRN specialists are removed from the analysis, the learning delta is more pronounced.

Even though the overall performance of the trainees in the knowledge test was high, our assessment of the learning objectives relating to Modules 1 and 2 shows that the same learning objectives as in the first test event were achieved to a lesser extent than the rest of the learning objectives.

Interestingly, we observed a difference between the trainees' self-reported learning and their performance in the knowledge test. While the trainees believed to have largely achieved all learning objectives, the results of the knowledge test do not entirely confirm this view.

In conclusion, the assessment of the eLearning overall re-iterates the findings of the first evaluation despite the differences between these two test events. It was unfortunate that the project team for the digital online test did not quite succeed in recruiting the intended end-users since this could have improved the usefulness and information content of our evaluation results. Nevertheless, the pool of useful data is still big enough for meaningful calculations. Moreover, with the digital online test event we reached out to a large number of potential end-user organisations. The experienced test participants might be in the position to raise sufficient interest for a future implementation of the final MELODY curriculum in their respective organization.

5 Outlook

The team is currently analysing the data from the second test event (in Finland) and preparing for the joint digital online test in May. Once all test events have been performed and all empirical data are analysed, the summarized findings will be used to further improve and harmonize the curriculum. The final version of the curriculum will then be validated again in close cooperation with end-users in order to ensure that it suits and serves emergency services all over Europe. Thus, a second suite of pilot courses is planned for winter-spring 2021/2022.

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