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Mini Risk Analysis -The first step in learning about Risk and Vulnerability Analysis

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Students attending university courses on Risk and Vulnerability Analysis (RAV) often come from different backgrounds, and many lack understanding of both qualitative and quantitative risk analysis. A Mini Risk Analysis (MRA) is an easy method which can be used to overcome the first learning barrier to risk topics.

Using MRA can enhance active learning pedagogy. In our examples we use playfulness and creativity as ways to learn about risk analysis. MRA could serve as a risk assessment in a more limited field or as a starting point to indicate where to drill deeper in more complex situations. The students choose one activity and then divide this into separate tasks. This method concretizes the actual situation. Conducting MRA will help students to more easily understand the process of conducting risk analyses. MRA's simplicity also has the advantage of raising awareness of uncertainty. Using a standard risk matrix is useful for simplification but often leads to the perception of risks as "fixed entities" which are more controllable. Uncertainty is inherent in every prediction of the future, hence also in risk analysis. The uncertainty is often connected to a lack of contextual knowledge. MRA examples from different student groups and experience from municipalities give the students examples of using MRA in different contexts. MRA has the advantage of being simple and not time-consuming. The students get an introduction to the main phases of an ordinary RAV, which makes using MRA a helpful foundation for learning about RAV.

Keywords: Active learning, Risk and vulnerability analysis (RAV), Mini risk analysis (MRA).

1. Introduction

Risk and vulnerability analysis (RAV) is relevant in most areas, in every sector, and at all levels from local to governmental. In Norway the Directorate for Civil Defense (DSB) covers national, regional, and local work in preparedness and emergency planning (DSB 2024a) and reports to the Ministry of Justice and Public Security. The local level is an important cornerstone in the totality of national societal safety work: "society's ability to protect itself against and deal with incidents which threaten fundamental values and functions and put life and health at risk. Such incidents can be triggered by natural forces, by technical or human errors, or by deliberate acts" (White paper 5, 2020-2021). DSB has made a guideline for holistic Risk and Vulnerability Analysis in municipalities on how to follow up the 2010 civil protection law (2022).

RAV is often perceived as inaccessible and difficult to grasp. People with a lack of technical and academic knowledge seem to have mental barriers to understanding how to conduct such an analysis. As teachers and trainers, we have experienced barriers to fully comprehending the methods of even a simple RAV. Prior knowledge, defined as information in a person's long-term memory, prepares the ground for further knowledge in other fields (Bittermann et al 2023). To create a background for further knowledge about risk we introduce mini risk analysis (MRA). MRA is a kind of brainstorming tool which gives an easy introduction to daily risk and is simple, playful and not time-consuming to use. The development of MRA in 2002 was a collaboration between Klepp municipality, the secretariat of Safe Communities and DSB. The focus is on daily activities.

The research question is: How can MRA be a way to prepare students for learning and conducting RAV?

In this paper we will give a brief introduction to comprehensive RAV used in municipalities. This RAV is an overview of risks in the entire municipality (DSB 2022). The RAV will be compared to MRA. Both tools will be described in the next chapter.

The examples used in this article were created by students attending the bachelor's in international preparedness (BIP) at the Arctic University in Norway UiT. Each year 55-70 students attend this gathering-based study. They come from all over the country, and many have work experience from different fields. This study is designed to combine with work and follows up the government's strategies for lifelong learning (White Paper 5, 2022-2023).

2. RAV and MRA tools

Comprehensive RAV gives an overview of a municipality's risk and vulnerabilities and is a decision and knowledge foundation for the municipality's work with societal safety and preparedness (DSB, 2022:11). The students learn about this method after learning about MRA. The comprehensive RAV (DSB, 2022:25) consists of these elements:

(i) Choose unwanted incidents.
(ii) Describe the chosen incidents.
(iii) Assess risk and vulnerability.

The unwanted incidents must be relevant for a comprehensive RAV and must be described. When it comes to point iii, the assessment consists of vulnerability, probability of occurrence, consequences and uncertainty connected to the assessments. DSB also stresses the need for interdisciplinary collaboration in RAV due to the high variety of risks in different knowledge areas.

2.1 Description of MRA.

Mini risk analysis focuses on day-to-day work or leisure activities. It covers how to perform an activity while taking care of others and own safety. This kind of analysis takes form as brainstorming, allowing all kinds of expression and thereby nourishing creativity and developing problem-solving skills (Doğan and Batdi 2021). As an open process, MRA expands the reflection necessary in today's risk society (Beck 1992 and Giddens 1991). Brainstorming is a technique which underlines the importance of free expression without judgement. This encourages people to prepare a convenient platform for unleashing imagination (Osborne 1953) which is a prominent skill in risk assessment: imagining ourselves in a future setting. The group conducting the MRA consists of people with different perspectives (MRA 2002).

(i) Which activity/situation are we going to take into consideration?
(ii) This is what we fear might happen.
(iii) What must we do something about?
(iv) What can we do to reduce the chances of these incidents occurring?
(v) What can we do to reduce the consequences if these incidents do occur?
(vi) Evaluation.

MRA is not only mapping of risk but also thinking through what needs to be taken care of if unwanted incidents/accidents occur. When it comes to point (iv) and (v), appointing people to have responsibility is an important part of the MRA. It lays the foundation for acting in different situations.

3. Theory

3.1 Risk

To express a level of risk is to anticipate something about the future. Such statements are meaningful to foresee a negative outcome and choose an action: either skip an activity or carry out risk-reducing measures to prevent the negative outcome.

In earlier civilization, people made risk assessments daily based on experience with accidents and crises due to burdensome physical activities in all kinds of weather. In industrial society we are freed from many of the former burdensome risks and activities, but the introduction of technology which solved some of the former risk issues also introduced new risks (Beck 1992, Giddens 1991). Nowadays the level of uncertainty and risk involved is complex due to the tight global connection between nature, people and various systems.

The classic risk probability calculations are helpful in cases where we have data to calculate

the probability of an outcome. There are problems with using these calculations as input to decision-making in an unpredictable world. We lack the knowledge to make the most accurate and best possible decisions, and we disagree about the best way forward to reach the appropriate goals (Funtowicz and Strand 2011). Additionally, the probability methods lack the more subjective or cultural aspect of risk which adds context to the RAV (Klinke and Renn 2002).

We advocate for a risk analysis which includes both the expert for probability calculations and the layman with their perception and contextual knowledge (Tjorhom 2010). This coupling is well explored in Renn's risk governance model (Renn 2008) where the system perspective is the foundation for complex risk analysis. We must know the past to predict the future, but it is also critical to widen our perspectives to understand the variety of possible outcomes the future may bring (Klinke and Renn 2002). To assess and manage risk, we need to know about history and the limitations of our knowledge (Aven & Kristiansen 2023).

We live in a globalized world where "change is now the stable known" (Birdshall 2022:235). We are in a new age where the level of uncertainty has accelerated (Niinistö 2024, White paper 9, 2024-2025) and there is a call for both knowledge and reflection about decision making faced by risks. This knowledge is called for at every level of society and thereby in need of methods which make it possible to educate the citizens (Birdshall 2022). We argue here for MRA as a method to start educating students to be more reflective in their own risk assessments.

3.2 Active learning

"Active learning is a method for engaging students in higher order thinking tasks (e.g. analysis, synthesis, evaluation, reflection) through various activities so that students achieve more than merely the passive part of learning" (Tabrizi and Rideout 2017, p. 3202).

The main points in Edgard Dale's cone of experience are the difference when using passive and active ways of learning. With passive learning we only remember 10% of what we read, 20% of what we hear, 30% of what we see and 50% of what we see and hear. Active learning has a higher level of involvement, and we remember 70% of what we say and 90% of what we do. The activities in this active learning category consist of participating in a discussion, giving a talk and doing a dramatic presentation, simulating the real experience and doing the real thing (Edgar Dale in: Varchenko-Trotsenko et al. 2019). Former knowledge in a field also prepares the ground for further knowledge as shown by a bibliometric analysis of 13507 studies published from 1980 to 2021 (Bitterman et al. 2023). Børte says this about articles which address active learning: "the most frequently used concepts to illustrate what it means to engage students are [allowing them to] communicate, co-construct, experiment, interact, investigate, produce, and participate. Also, in research on how teaching can be designed to engage students, concepts such as interactive engagement, active learning, collaborative learning, and problem-based learning are used" (Børte et al. 2023: 601).

Dogan and Batdi revisited brainstorming due to the need for creativity in our changing times, and dealt with how this need can be met in learning institutions. In this respect the use of brainstorming can be an important active learning aspect. Brainstorming is a "teaching technique which places learners in the center, and which is based on ready communication of any ideas without fear of being criticized" (Putman and Paulus 2009 in Dogan and Batdi 2021:542). The brainstorming process enables students to produce a variety of different solutions for a problem. The findings from Dogan and Bati's brainstorming literature review is categorized in three parts. The first is the effects of brainstorming on cognitive skills, for instance providing meaningful learning, active learning, helping to develop different points of view, and enabling fun when learning. The second is the effects of brainstorming on affective skills and behaviors, for example providing motivation for learning, providing opportunities to speak freely, allowing flexible thinking, and developing imagination. The third category covers problems when implementing brainstorming, like limitation of allocated time, excessive number of students, escaping from realities, difficulty in self-expression. Similar findings are found in the general literature about active learning (Børte et

al. 2023). They found that inertia in teaching methods was still prevalent in higher academic institutions. Relevant for our article are obstacles like the high number and diversity of students, teachers' workload and commitment, and students' expectations and their own level of responsibility.

4. Method

The students learn about MRA before attending the course in RAV. This is due to collaboration with the RAV teacher and to give students a better starting point. The teacher responsible for the RAV subject saw that prior experience with MRA in 2022 was a useful steppingstone. Therefore in 2023 and 2024 the MRA was conducted before introducing RAV. This was the initiative for this research. The pedagogic design is presented as an introduction in the result chapter.

We have used a case study to answer the exploratory research question (Yin 2009, Seale et.al 2004, Blaikie 2005): what is the value of using MRA as an introduction to RAV? We have chosen one main case consisting of 125 students divided into two classes with 55 students in 2023 and 70 students in 2024. In addition to these main cases, there are written materials from previous classes.

MRA was introduced to examine whether its use could enhance active learning and thereby help to overcome the first learning barrier to risk topics.

In 2024 the 70 students were divided into 14 groups; in 2023 the 55 students were divided into 8 groups. We also included some examples from students in 2021 and 2022 who conducted voluntary MRAs. In these classes the intention was to use MRA as creative and fun groupwork to get to know each other.

The results of the MRAs were measured to see if every step in the template was followed and whether the conducted MRA reflected a comprehensive risk understanding.

4.1 Presentations of MRA

The student groups with the most interesting MRAs won awards and presented their MRAs to the class. These presentations showed us that the students had gained an insight into conducting a simple risk assessment. They presented extensive selections of vulnerabilities in an activity and an overview of solutions to reduce the risks associated with the activity.

4.2 Conducting MRA in an administrative staff

The MRA method was presented and used as a tool for risk assessment for a group of staff at another University in Norway in spring 2024. These employees needed a simple method for conducting risk assessments together. Experience from this process is part of the material in this study.

4.3 Ethical considerations

Before using the MRA examples (MRA 1 2024, MRA 2 2024), a letter was sent to the students explaining the purpose of use and that it would be presented at a conference and used in a conference paper. The students providing the extensive MRA examples have given written permission to use these examples. They thereby know they will be a part of this research. One group did not respond so their example from 2023 is not used. The more general MRA examples are a brief presentation of different kinds of activities. The example from the university staff is anonymous; the intention was to describe the participants' MRA use and to get some further experience.

5. Pedagogic design.

5.1 Introduction

The students learn about MRA through teaching, using the template (MRA 2002) and from examples. The examples are from former student presentations, for instance using a sauna in winter in 2023, and from use in municipalities where for instance Trondheim municipality used MRA in kindergartens (2021). MRA is also described in guidelines for health and social preparedness in municipalities. This is to show that MRA can be useful in a wide range of areas (MRA 2002, Nilsen 2007).

5.2 Use of MRA in student groups

MRA was used informally with groups of new students. They were encouraged to do creative and playful brainstorming. They could think outside the box and make up the wildest scenarios. The students chose one activity, listed which parts of the activity could go wrong, and mapped the unwanted incidents. They then

decided which of the mapped unwanted incidents should be followed up. They chose the most likely ones and decided measures to avoid or limit these unwanted incidents. "What can you do to limit the consequences?" was a central question. They then decided on measures to limit consequences, and which people or groups would be responsible for handling unwanted consequences. The activity was followed by an evaluation. The evaluation considered whether it was safe to continue with the activity and if so, what would be the best measures to reduce unwanted incidents.

6. Findings

The examples used in this article were created by students attending the bachelor's in international preparedness (BIP). The MRA groups comprise three to six people from geographical areas to be able to meet in person. The reason for doing so is to let the newcomers socialize and learn about MRA.

6.1 Learning outcomes

The MRAs were divided into three categories: the funniest, the most serious and the most unexpected. The MRAs were evaluated according to how the groups followed the template and showed an understanding of risk analysis. The best group from each category presented their analysis and received a group reward. Students presented the MRAs to other students in the same subject and some employees.

Although, or maybe because, the process was playful, a limited MRA analysis gave a foundation for understanding RAV. The process of reflecting in a creative way, in a diverse group of people, built the foundation for comprehension of RAV. It also showed that the students had appointed personnel to handle any unwanted incidents.

The participants learned the main points of the process which makes it easier to understand the more formal and extensive RAV. The evaluation and redesign of an activity according to outcome is a positive learning outcome of MRA.

Even if the template (MRA 2000) is followed, there are some obstacles. When it comes to MRA phase iv (assessing the probability of which incidents will occur), there have been "hang ups" about the probability. This was the experience of the administrative staff. The one activity chosen is limited and therefore phases (iv) and (v) can be a little bit blurred. In some cases, the timeframe for conducting MRA has been too short, and the groups did not manage to finish and needed to continue the work online later.

The diversity of types of risks and suggested measures is demonstrated with presentations of the following MRA cases. Two examples will be explained in detail. These examples have also been performed as a group presentation. There are some additional brief examples of activities.

6.2 Imaginative and playful MRA

This example is ten people at a Saturday dinner party in the middle of Norway (Trøndelag). The historic traditions have been moonshining (Karsk), cooking a traditional dinner course made of meatballs (called Sodd) and the characteristics of men's moustaches and leather vests.

The two main unwanted incidents relate to the meal and the party afterwards. There is a danger that the Sodd doesn't meet legal requirements (it is true that there is a Norwegian law for this meal!). Some people might suffocate because of the dry flatbread, and others might start throwing Sodd balls. Quarrels can occur over different Sodd recipes or that the Sodd is not prepared properly, being boiled instead of simmered. The hazards of the party could be many uninvited guests or being blinded by the Karsk spirit. The main fear at the party is that someone would cut moustaches or steal some leather jackets.

There are preventive measures and appointed responsibilities. There is a lot of spirit to soak up the dry flatbread. The sheriff is already at the party and will test the Karsk before anyone else drinks it and he can prevent intruders from entering. There is a sober driver in case somebody gets poisoned by Karsk. The preparedness measure is to put on a false moustache. The evaluation shows that parties in Trøndelag never go according to plan (MRA 1 2024).

Other imaginative MRA examples are a student party in sauna in winter, a hike and overnight stay in a glass globe in winter, Christmas parties, and wedding parties.

6.3 Serious MRA

The chosen activity was driving 140 kilometers on a mountain plateau, from Alta to Hammerfest in severe winter weather.

The student group considered all the hazards that could be met when driving this distance. The brainstorming listed being stuck on the road due to bad weather, driving in a convoy, bad ploughing, hypothermia, hunger, icy roads, collisions with Northern lights tourists, electrical cars needing power, snow avalanche, being buried in snow, blocked road, panic and engine failure.

The prioritized elements were icy roads, stuck on the road, electric car and engine failure.

These were the elements to reduce the probability: the Norwegian public road administration should have enough ploughing facilities and have one ploughing vehicle on both sides of Sennalandet (the most hazardous stretch) and to close the roads if conditions are too severe. Driving without studded tires should be forbidden, heated rest areas with first aid facilities, dedicated viewpoints for northern light tourists, routines for closing the roads.

The students listed their own responsibilities: Always check the weather forecast before driving, good, studded tires, fully charged mobile phone, full tank of petrol and 1000 meters light to more easily detect obstacles in the road.

They had measures for different actors on different levels to reduce consequences. The Norwegian public road administration: Have personnel with first aid competence to handle injuries. Have agreements beforehand with local entrepreneurs with extra facilities, and the Red Cross. Each autumn the whole preparedness group should have a meeting to go through the preparedness plan and have a course in how to handle hypothermia.

The students listed their own measures: Always have warm clothes, food and a spade in the car and first aid material.

In the evaluation they recommended the following: Never drive over Sennalandet alone, drive during the daytime, ask yourselves if this trip is necessary and be critical of your own driving skills (MRA 2, 2024).

Some other serious MRA examples from the students are nighttime care for dementia patients, climbing in mountains, canoeing in wintertime under Tromsø bridge and a trip with children in town.

6.4 To sum up the different MRAs

Going through the twenty-two MRA assignments from 2023 and 2024 shows that the students have followed up every step of the method. The students in 2024 wanted to know in advance whether they would give a presentation so they could use more time for preparation. Even if some groups put less effort into the power points, the main finding is that they gained an overall understanding of the process. The student presentations contained all elements of the MRA and showed a good understanding of the process. The overall impression of the presentations is that they were informal with a lot of humor. Some also appreciated the timing of the group work - as in this quote: “It was very good that we had group work early in the semester. That resulted in good relations and a safe working climate. Everybody could talk freely even those who usually find this unpleasant”.

7. Discussion

This discussion has two main topics. We will first discuss various themes connected to risk and thereafter active learning.

In times with a higher level of uncertainty it is essential to educate people to expand their mind and reflect on risks. To do so there is a need for simple and different kinds of risk analysis. A new expectation from the government is to take care of one’s own personal preparedness for a week (DSB 2024 b).

Municipalities have limited resources and will only take care of the most vulnerable individuals in society. MRA can be a tool to understand the consequences in one's own life if a crisis or war occurs, and you must provide for yourself for a while. When it comes to the municipality's preparedness a comprehensive RAV is needed. The municipality has responsibility for its inhabitants and people in their geographical area, like tourists, visitors and others.

The RAV and MRA methods have differences and similarities. A comprehensive RAV covers the whole municipality at an institutional level. It is an overview of the risks

and vulnerabilities and has included a brainstorming and filtering process before it is completed (Leonhardsen et al. 2018). One potential pitfall in municipal RAVs is the danger of being a copycat (from other municipalities, governmental templates, County governor's RAV) which can have limitations related to emergent and unexpected incidents. Also, if the RAV does not include worst case scenarios, limitations of the municipality's own risk handling ability might not be uncovered.

RAV is comprehensive, covering a variety of unwanted incidents and is a broader risk analysis than MRA. It is more demanding, requiring knowledge of many risk fields. MRA concentrates on one activity and looks at what can go wrong with it. This makes it easier to analyze the activity's different parts.

The similarities between RAV and MRA are the main points in the process, mapping risks and understanding vulnerabilities/consequences and providing countermeasures. Understanding the basics of the risk analysis process in MRA can be an asset for further understanding of a more extensive risk analysis, as Bitterman et al. (2023) found in their research. Mapping one specific activity can increase the understanding of mapping more risks. MRA is a way to enhance brainstorming about risks and can be an asset for reflecting on risks at a higher level. Since the students are encouraged to make a hilarious or worst-case activity, they have in this respect started "thinking outside the box". Appointing responsibility is a main hallmark in the MRA, if something happens it has been thought about in advance and the people carrying out the activity will know what to do.

7.1 Active learning

MRA work contains *higher order elements* in active learning due to collaboration, discussion in groups and doing presentations.

In this respect, the empirical evidence suggests that a brainstorming technique positively affects students' academic achievement, confidence, motivation and engagement, and concept learning (Doğan and Batdi 2021). Although diversity in student groups can be a challenge in teaching, it can also provide an asset. Students with different kinds of work experience can provide valuable examples for co-students. The groups rated for MRA presentations in 2024 wanted to know in advance to put more effort into the presentation. In this respect the students took a high level of responsibility (Børte et al. 2023).

In academic institutions using MRA as an introduction to the various methods of risk assessment is positive because it lowers the threshold for doing a "perfect analysis". The students learn to conduct the MRA in a playful way and thereby gain general knowledge about how to assess risks to avoid or mitigate unwanted consequences.

8. Conclusion

MRA as a group activity is an interesting and playful way to explore a diversity of risks. By making a creative process, the participants enhance their imagination and thereby open for an abundance of possible outcomes. The use of an active learning method makes it easier also to remember both the process and the results. The findings show that the students understood the main process in doing a simple risk analysis. It can be useful for other academic institutions to conduct MRA as preparation for the more advanced RAV. Additionally, we argue for MRA as an introduction to risk assessment, understanding and reflection at all levels in society.

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