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Engineering Literacy Online - Teachers as Medium for Change

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IO1 – A3 Needs and Gap Report - Region

Germany

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Need and GAP Analysis Group Germany

The following question give a good overview on where the gaps are and what needs can be identified.

- **How are currently STEM/MINT-subjects taught in Germany?**

The so called STEM/MINT-subjects, which are taught in German schools are structured by a curriculum which gives the teachers a strict guideline on how to teach and which contents have to be dealt with. Due to the fact that there is often not much teaching time left for experiments and that there is also often a general lack of equipment and laboratories at the schools, makes it difficult . However, the curricula nowadays often only deal with the single subject itself (e.g. Biology, Mathematics, Physics) and only give few option to follow the idea of Engineering Literacy. During our Focus Group Interviews, the teachers told us about a lack of continuous education programs which combine engineering literacy in a practical way and teaches them about experiments etc. which could be used in class.

- **Training possibilities for teachers so far?**

The teacher receive input during their general studies. After being a regular teacher at a school, there are often voluntary programs for training offered at each school. On a regular basis, there are training programs which are offered by the local school ministry. However also certain initiatives, such as ZDI or MINT offer training programs. The time frame can be from half a day to up a week. Sometimes also local industry sends out invitations for excursions. Sometime there are also trainings (for learning new subjects) offered, which have been proved to be very effective. However, these trainings last one year and require a one-year job resting phase. The biggest challenge in general is, that there is often no time available due to the many teaching hours, where the teachers are actually able to attend such trainings.

- **Problems of integrating Engineering Literacy into the curriculum?**

Often events for students and teachers, which fit into the engineering literacy field, take place on a voluntarily basis at weekends etc. The Pascal Gymnasium, for instance, offers a kind of weekend program, where pupils from 10th grade can get a better insight view on how the knowledge of STEM-subjects are practically applied. During a two-year program, twice a month's either experts join the school or surrounding universities and companies are visited. The focus is always put on a practical view of the STEM-subjects. This initiative is highly awarded by the school ministry of North Rhine-Westphalia.

To Sum up there is definitely a **Need** for more Engineering Literacy in the classroom. Especially in the area of Energy Management, Cybersecurity and Autonomous Driving it should be explained how energy is created, stored, transported and used to recharge batteries in cars, how cybersecurity is applied in cars and how cars drive by themselves. The need also includes more free time in the curriculum as well as ideas and equipment to do so. The **Gap** on how to bring the training to the pupils and teachers is existing and currently difficult to close. The following ideas as gap fillers have been identified and should be initiated in the future:

- Interdisciplinary projects with university and industry could be initialized for state-of-the-art teaching.
- Short and well prepared course training material for a 2h class (experiments, teaching material etc.).
- Voluntary project classes with resulting project works do exist and could be used for such studies. The interesting point is that the mark will influence the final A-level certificate.
- Special classes und motivational trainings especially for girls should be initialized in order to let rough diamonds shine.