What Happens in Lessons? Risks and Incidents at Schools

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Abstract. According to a safety paradigm that calls for human factors behind the incidents and emphasizes resilience it can be understood that near-miss cases and accidents are in relation to several physical, social, psychological and pedagogical factors. To be able to develop safety culture at schools there is need to record, monitor and analyze incidents, near-misses, accidents and injuries in learning environments. However there are no systematic procedures in regular use that would allow schools as organizations to learn from incidents and implement alterations in practice to develop their safety culture. It is more a question what schools know about their safety and how they understand their safety culture to develop it proactively. In the paper analysis for 168 incidents from three comprehensive schools in Finland, was executed. On the basis of theory driven analysis the incidents were categorized to physical, social, psychological and pedagogical dimensions. Incidents in pedagogical learning environments are introduced more detailed in this paper. This paper gives prior knowledge of incidents in pedagogical learning environments: what happens, where and to whom.

Based on results there is an obvious need to develop methods of reporting incidents in schools as well as the motivation to report, to be able to develop the safety culture. In the future students' role in recognizing incidents should be emphazised.

Keywords: Incident analysis · Learning environment · School safety

1 Developing Safety in Learning Environments

1.1 Background for School Safety in Finland

Changes in society challenge the safety of schools. The safety challenges are for example accidents and incidents, like school fires, bullying, various kinds of near-miss cases, unintentional injuries, and even intentional injuries like school shootings. Safety is a norm that schools should guarantee for pupils and students based on the Finnish Basic Education Act [1]. Safety at work is a norm also for teachers according to Occupational Safety and Health Act [2]. Safety in its various forms is a main issue when considering criteria for a good learning environment [3]. The latest National Core Curriculum for Basic Education 2014 (grades 1–9, students from 7 to 16 years old) in Finland [4] points out safety procedures for learning environments. However, there are

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no systematic procedures to collect incident data in regular use in schools. The only obligatory procedure is to document injuries that needed medical treatment to get the insurance cover for the costs. These injuries are registered on national level, but minor incidents and near-misses are not documented and analysed systemically at all.

It is well known that most of the injuries happen in sports lessons and in brakes [5]. Beside sports, home economics, craft, design and technology education, physics and chemistry are considered as safety critical subjects. There are hazards and risks at schools that should have been solved with proactive procedures [6]. However, we can't say that schools as learning environments wouldn't be safe and secure for workers and pupils. It is more a question what schools know about their safety and how they understand their safety culture to develop it proactively. Somerkoski [7] points out that the risks at schools are unpredictable, connected to human factors and caused by students acting against norms and regulations or using structures or products in a way they are not supposed to be used. The definition of safety culture of schools recognizes diversity of actors at schools. The safety culture is seen in educational context as collaborative actions of staff and students as well as implementation of procedures that develop and promote safe and secure learning and working environment. This definition means that all members of school, as an organisation, must understand the importance of their active roles in promoting safety based on their responsibilities. [8] If principals tell that their school is safe without any incidents or injuries we know well based on earlier research [e.g. 9, 10] that it is more a question of not knowing what kind of incidents there has happened than recognizing dimensions of safety culture and preventing incidents proactively and based on evidence. If there are no incidents reported it usually indicates that incidents are not recognized at all. On this basis there is no relevant risk assessment, monitoring or analysis, that would serve as a basis to learn prevention of incidents and preparedness and proactive actions to develop safety culture.

In the EduSafe- and TUKO -projects 2016–2018 [7] the Green Cross digital application was used in schools to allow school staff to report incidents, injuries, accidents and near-miss cases (Fig. 1). This paper will introduce an analysis based on 168 incidents in three comprehensive schools. The paper is a part of the efforts to understand what kind of incidents happen at schools and to get experiences how to gather the incident data to make it possible for schools to develop their safety culture based on evidence. The overall research question is: What kind of incidents happen in schools in comprehensive education during a school year? The analysis of incidents related to physical learning environments indicates that there are falling risks and incidents inside school building, risks and incidents at the schoolyard, risks and incidents with non-functioning or broken facilities, and incidents outside school learning environments as well as incidents with traffic and parking [11]. In this paper the focus is on presenting the incidents that were categorized as incidents in pedagogical learning environments especially related to lessons. Analysis from this point of view is new.

1.2 Safety in Pedagogical Learning Environments

A learning environment is seen as a place, space, community and/or culture for learning that includes tools, materials, equipment and services, e.g. school buildings, classes,

schoolyards, sport fields, trips, visits. Safety and security in a learning environment can be considered in physical, social, psychological and pedagogical dimensions. The physical dimension is spaces and facilities with tools, materials, machines and equipment as well as the condition of them. The social dimension is about socially acknowledged values, attitudes and behavior and actions based on them. Psychological dimension includes personal values, attitudes, personality, motivation, knowledge and skills as well as experiences that are the basis for individual actions. The pedagogical dimension is about the organization of teaching and the content and organisation of learning opportunities, participation, affection, rules, justice, responsibilities and peer support. [12] The space and equipment can be safe from a physical point of view but without comprehension of proactive actions in lessons it can be an unsafe and hazardous learning environment. [8] Based on the safety paradigm that calls for human factors behind the incidents and emphasizes resilience [13, 14] it can be understood that near-miss cases and accidents are in relation to several physical, social, psychological and pedagogical factors [10]. This safety paradigm requires recording, monitoring and reporting the incidents and near-miss cases systematically and learning from them and making changes based on evidence. To be able to find out and understand the risks, factors and reasons behind incidents and accidents, there is a need to analyse these on a level that is meaningful for schools, staff and students [15]. The first step is to get prior knowledge of what happens, where and to whom to be able to develop and use methods that can open more detailed reasons behind incidents in the future in school context.

2 Materials and Methods

2.1 Data and Study Context

This paper presents a study on incidents, near-miss cases, accidents and injuries, in three basic education schools with elementary (grades 1–6, pupils age 7–12) and lower secondary (grades 7–9, pupils age 13–16) education. All schools are comprehensive education public schools since there are only few private schools in Finland. The number of staff in these schools is altogether 290 persons and 2360 students. Two of the schools are multicultural city schools and one is a town school with mainly students of Finnish origin. The staff in each school was familiar with research and development projects.

The data consists of 168 reports. Almost all the reports were written in Finnish. These were downloaded into Green Cross application system [16] by school staff during years 2016–2017. The Green Cross is a digital application to be used in a quick documentation of incidents at schools. The idea is to make it easy for school staff, teachers and principals, to report incidents as a part of everyday practice at schools. To be able to report incidents the staff had to sign into the system with a password. The Green Cross is not an application that teachers and principals would use normally as a daily practice. The application was offered to schools for use as a part of the Safe school and EduSafe –research and development projects [17]. The projects and researches encouraged school staff a lot, firstly to understand and notify what is an incident and secondly to recognize that even a near-miss case is worth of a report since

the earlier research [18] notifies that all teachers are not committed to promote safety systemically. On a school level it was possible to see all the reported incidents in a monthly view (Fig. 1).

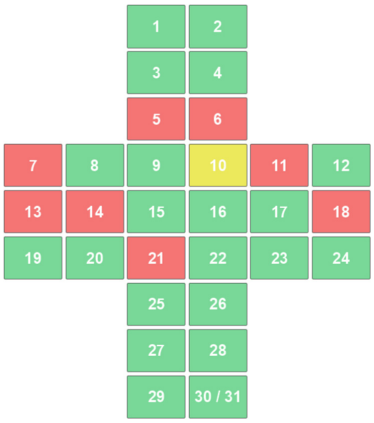

Fig. 1. A monthly view of reported incidents on a school level – Green Cross: School II, October 2016. A green day is a day without reported incidents, yellow colour is a near-miss case day and a red one informs of injuries or accidents. (Color figure online)

While reporting, a short 2–3 min description of the accident, injury or a near-miss case was written into the system. A school safety team or staff responsible for safety had the possibility to analyze reports and implement actions and alterations needed in order to reduce future incidents at their school. However, they treated the incidents like separate cases and did not make any other systemic analysis on their school level. The motivation for the schools to participate in reporting arose from a need to improve safety culture in their school.

2.2 The Analysis

The reports were analysed by qualitative thematic content analysis. The incidents from the reports were collected to a table and coded: a near-miss case or an accident or injury and the school. For example, the incident tagged to the code II/32-NM tells that the incident is report 32 from school II, a near-miss case (Table 1). From all the reported incidents (N = 168) 20% were near-miss cases (n = 33) and 80% were accidents and injuries (n = 135). The seriousness of the injuries varied from light scratches, and/or bruises (minor injury = MI) to accidents in which students or teachers needed ambulance and doctor and hospital visits (serious injury = SI).

The aim was not to compare the schools and incidents. The main aim was to organize the incidents under the themes of theory-driven understanding of learning environment that considers safety and security at school from physical, psychological, social and pedagogical perspective [12]. Content analysis was used to be able to make replicable and valid inferences by coding and interpreting the incidents. After several

readings the incidents were organized under the themes. The lower and upper categories were formed under the themes through careful consideration of all the incidents. During this process several incidents were reconsidered and moved to a better fitting category. After all lower and upper categories were finalized, the main categories were formed and named (Table 1).

Based on the analysis four main categories were formulated. These were (1) Risks and incidents in physical learning environments (28% of all incidents), (2) Risks and incidents in social learning environments (36%), (3) Risks and incidents in psychological learning environments (16%) and (4) Risks and incidents in pedagogical learning environments, especially related to lessons (20%). In the main category, which is the focus of this paper, Risks and incidents in pedagogical learning environments, were included the incidents that had direct relation to lessons: teachers were either preparing lessons or teaching, and students were joining in these.

3 Results

In the main category of Risks and incidents in pedagogical learning environments, especially related to lessons included those incidents that were not considered in the physical, social or psychological learning environments point of view. The main category was formed by three upper categories. These are (1) Injuries to teachers while teaching and preparing, (2) Incidents to students during lessons, and (3) Risk management in teaching (Table 1).

Injuries to Teachers While Teaching and Preparing. In the analysis there was noticed incidents that were reported from teachers' part in relation to their own work, either preparing lessons or teaching (Table 1). The reported injuries that happened to teachers in preparing lessons consisted of various types of incidents. Most typical incidents in this category happened as teachers were preparing their lessons and were due to take materials needed using ladders or somehow climbing to reach out to the material boxes. In the incidents teachers either fell down or were hit by falling boxes or other kinds of falling materials. Also, when teachers were carrying teaching materials or equipment in their arms in a way that they could not see their legs was reported to cause falls. *'I had a pile of iPads in my arms on my way to next lesson and could not see my legs properly. That's why I fell down and my ankle was hurt.'* (III8-MI, Table 1), was a typical example. These incidents caused minor injuries. The other lower category was about Injuries to sport teachers during lessons. *'A teacher fell down while skating during a sports lesson. The arm was hurt.'* (I/49-MI). The incident of a teacher falling and hurting oneself represents a typical description of an incident in the category.

Injuries, Accidents and Near-Misses to Pupils During Lessons. The upper category Injuries, accidents and near-misses to pupils during lessons was formed with four lower categories: Injuries in craft, design and technology education lessons, Incidents in home economics lessons and Incidents to pupils during sport lessons. The fourth lower category was Incidents and injuries with things falling from shelfs that was not subject teaching specific than the three first lower categories.

Table 1. Examples of risks and incidents in pedagogical learning environments in lessons in primary and lower secondary education in comprehensive schools: I-III = school, number of the incident, MI = minor injury, MOI = moderate injury, NM = near-miss incident.

Incident	Authentic example of an incident in categorization	Lower category	Upper category	Main category
I/8-MI	A teacher got a cut from a knife while emptying a dish machine before a home economics lesson	Injuries to teachers in preparing lessons	Injuries to teachers while teaching and preparing	Risks and incidents in pedagogical learning environments in lessons
I/24-MI	A teacher reached out to some material from a material box on the upper part of a cupboard. He fell and hit his mouth and teeth to the material box			
III8-MI	A teacher had a pile of iPads in his arms on his way to the next lesson and could not see his legs properly. That's why he fell, and his ankle was hurt			
I/49-MI	A teacher fell while skating during a sports lesson. The arm was hurt	Injuries to sport teachers during lessons		
I/67-MOI	A pupil sawed with a metal saw in CDT lesson. He wounded his hand. There was a need for first aid at the school and doctoral aid at health center	Injuries in craft, design and technology education lessons	Injuries, accidents and near-misses to pupils during lessons	
II18-MOI	A pupil cut a piece of his finger while cutting with scissors and talking with mates at the same time in CDT lesson. First aid was needed and a health center visit after the pupil passed out			
II/14-NM	A pupil put a baking tray into an oven. The baking paper was too close to a heating resistor and the paper went on fire	Incidents in home economics lessons		
II/12-MI	Two pupils collided and fell in sports lesson	Incidents to pupils during sport lessons		
I/25-MOI	In Finnish baseball pupil A caught a ball in his hands while pupil B was trying to hit it. He hit the wrist of the pupil A. The wrist was fractured			
I/13-MI	A basket fell from a shelf while pupils were reaching for something from a shelf	Incidents and injuries with things falling from shelfs		
II/60-NM	Not enough first aid bags for the pupils visiting a forest	Preparedness for incidents	Risk management in teaching	
III/16-NM	Too many pupils in one area at the same time	Prevention of incidents		

The reported incidents in Craft, design and technology were moderate injuries that needed a visit to health center. These incidents were caused by hand tools and were kind of slips and slaps in using hand tools. *'A pupil sawed with a metal saw in CDT lesson. He wounded his hand. There was a need for first aid at the school and doctoral aid at health center.'* (I/67-MOI).

In home economics a small fire in the oven was reported as the baking paper caught fire. This was a near-miss case and did not cause any injury or bigger fire accident. However, the near-miss case is one example of the fire risks that are met in schools.

The lower category of Incidents to pupils during sport lessons was the largest lower category. The incidents were unintentional and happened while doing various exercises in sports lessons. The incidents were near-misses or minor and moderate injuries. An example of a moderate injury is the following: *'In the Finnish baseball a pupil A caught a ball in his hands while pupil B was trying to hit it. B hit the wrist of A. The wrist was fractured.'* (I/25-MOI).

Risk Management in Teaching. The third main category in the analysis of incidents in pedagogical learning environment was named Risk management in teaching (Table 1). These reports to the Green Cross system were near-misses. The teachers reported incidents that they recognised as risks to pupils and teaching. The incidents were related to preparedness e.g. for first aid in outside school building learning environments. Also the big amount of students in certain learning environments was seen as a risk and can be seen as a prevention of accidents and injuries.

4 Discussion

In this paper the category of Risks and incidents in pedagogical learning environments, especially related to lessons presents a systematic incident analysis as an example to be able to discuss how the further research could focus on and how the result could be used in improving safety culture of schools. In this main category three upper categories describe the data: Injuries to teachers while teaching and preparing, Injuries, accidents and near-misses to pupils during lessons and Risk management in teaching. The result of the analysis based on qualitative data from three schools is not generalizable. However, we know about incidents in schools now more than before. In the future study there is a need to monitor more individually, if there could be found groups that are subjects of incidents more or less often than others and why some teachers report the incidents and some don't do. Also focusing on each safety critical subject would reveal the risks of the subject more detailed.

Based on the analysis it is possible to consider the results from teachers and students point of view. The result reveals the analysis that the researcher made but not an analysis that the schools had made. The next step in finding a more detailed knowledge about incidents could be a quantitative data based on qualitative results [11, 19]. The other possibility could be an ethnographic research design that could focus on teachers and students behavior according to incidents.

The incidents with teachers and students are partly different, partly the same. The incidents in safety critical subjects were not a big surprise. Falling things at classes

from shelfs were a little surprise as well as the moderate injuries in craft, design and technology even the amount of incidents was the largest in sports. This might have something to do with the unpredictable risks at schools and students behavior to act against norms and regulations or use of structures or products in a way they are not supposed to be used [7].

Nobody says that safety is not important on school level. However, considering the number of the reports (N = 168) and the number of students and staff, it indicates a low rate of reporting despite of the researches' several visits at schools and encouragement of teachers to identify incidents. The individual teachers might consider differently what is worth to report and what is not. This observation together with the fact based on earlier research that all teachers are not committed to promote safety systemically [18], makes the development of safety culture challenging at school level. How would it be possible to learn from near-miss cases and incidents if they are not even reported. On the other hand solutions based on evidence might be simple. For example teachers could use baskets or trolleys in carrying their materials and equipment to learning environments to avoid falling incidents.

One question is the usability of Green Cross application or some equivalent system that could be updated to a more usable mobile application without separate signing to the system [E.g. 19]. The other question is students' role. On the basis of the definition of safety culture in schools [8] students should also have an active role in recording, reporting, monitoring and analyzing incidents and being part of implementation based on lessons learnt.

As a conclusion there is an obvious need to develop methods of reporting incidents in schools as well as the motivation to report to be able to develop the safety culture of schools and lessons learnt from incidents [9]. In research there is also a need to understand more deeply the mechanisms of incidents and human factors around them [13, 14]. Since schools are very unique organisations, diversity with students and staff and altering learning environments make some of the risks unpredictable. The positive from the safety culture point of view this analysis was that some teachers recognized risks in pedagogical learning environments (Risk management in teaching, Table 1) even if they didn't use these terms while reporting the incidents.

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