Creation of Drone Education Curriculum for Security Guards and Security Officers

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One of the subjects Etelä-Kymenlaakson Ammattiopisto teaches is vocational upper secondary qualification within safety and security. To modernize the teaching at the school a drone has been purchased and a curriculum for the studies had to be made which was the purpose of this thesis. The curriculum is based on semi-structured interviews with open- ended questions with the combination of Finnish laws such as the Aviation Act (2014/864), Criminal Code (1889/39), Public Order Act (2003/612), Constitutional Law (1999/731) as well as the Commission Implementing Regulations (EU) both (2019/947) and (2019/945)

The curriculum was planned to be taught over one year with 2,5 competence points, with one point being 27 hours of teaching. It consists of four main categories in which there is overall 11 subjects to be taught within drones and drone usage in the private security section. To increase credibility three previously done theses of drones and the private security sector were included; Aro (2018), Tuurnianen (2018) and Nuutinen (2018) which enforced the ideas and themes that were found for the curriculum. However, since it is not an official curriculum made by the Finnish National Agency of Education, certain caution has to be taken when used.

Keywords: drone, education, private security, security officer, guard

Contents

1 Introduction

Drones are a somewhat new technology that still is finding its place in the security field. Since it is a system that can be used to observe large areas by one person it could be useful and make the jobs of people working in the industry easier. Due to this technology, there is a lot of interest on how it could be used in private security thus is a growing method to use.

A school located in Finland called Etelä-Kymenlaakson Ammattiopisto has considered taking the drone into use and using it to teach students who are future guards and security officers. The reason for this is to make it easier for the students to be able to use drones in their future jobs so that basic information has been covered by the school.

1.1 Etelä-Kymenlaakson Ammattiopisto

The organization is a school which has 17 different fields in which the students are studying (EKAMI 2020a). The security education programme focuses on the education of future guards and officers, enabling them to learn different physical and theoretical aspects of the security field. Etelä-Kymelaakson Ammattiopisto will be further referred to as EKAMI.

The school was founded in 2005 and has about 350 employees, there are also about 6000 students studying at the different campuses. The organization has two sister companies which are also focused on education among other things. The annual contribution margin is about 3,4 million euros. (EKAMI 2020b)

The school has been operating since 2006 and in the campus of Hamina there are about 400 students in total. For the security section there are three fulltime teachers and two who are outsourced. There are about 3-4 different classes in the security field of which each of them has about 20 students.

1.2 Purpose and goal of thesis

The goals of this thesis are to be able to generate a usable curriculum which then could be used without problems by someone who has not seen the curriculum before. The curriculum will focus on teaching the students of EKAMI focusing on security studies on how to use drones in general as well as in the industry, so that after the three years of studies they are able to use the skills learned in a working environment. Some other goals are also to be able to help develop the education system that the school has and so that it could be used for the future years with small updates when necessary.

The school had in plans to receive a drone and a simulator in the spring of 2020 to incorporate into the studies but due to COVID 19, these plans had to be pushed onto a later date. The research will focus on EU and Finnish laws and regulations as well as an expert opinion on

what should be included in the curriculum. Also, teachers' opinions and the already existing curriculum will be considered in order to be able to assure compatibility with the program already existing.

2 Theoretical framework

The theoretical framework focuses on creating a full understanding of the subject before going into the details of the actual curriculum. Different definitions and ideas around drones and curriculums will be gone through as well as previous studies done on drones in Finland. Lastly the school's current curriculum will also be included in order to get the best results possible.

2.1 Drone definition

In order to be able to make a working curriculum it is important to understand the subject and materials, due to this in the next subsection EU regulations will be gone through which give a definition of what is a drone. The subsection after that pulls that information together and connects it back to EKAMI so that the most accurate information for the school can be given.

According to the Commission delegated regulation (EU) 2019/945 chapter 2, section 1 article 4 the drone is not a toy and should comply with relevant requirements regarding health and safety in Directive 2006/42/EC. The next article (article 5) in the same chapter and section states that drones can only be made available on the market if they do not endanger any people, property, or animals. Every Member State of EU has to comply by these rules. (Official Journal of the European Union 2019b)

In the commission there is also mentioned in chapter 2, section 3, article 17 that there should be technical documentation with the drone which has all the relevant data and details as well as should be understandable in the language of where the drone is sold. The EU regulation 2019/945 states that there are five different types of drones on the market, C0, C1, C2, C3 and C4. Somewhat simplified version of the descriptions has been included below and some of the drone types have similarities to each other. (Official Journal of the European Union 2019b)

2.1.1 C0 - class drones

The C0 drone has to weigh less than 250 grams (take off mass) including the payload, it cannot be faster than 19m/s and should only be able to reach the height of 120 m. The drone should be safely controllable by remote pilot, meaning it follows instructions and has stability

and manoeuvrability as well as data link performance. (Official Journal of the European Union 2019b)

It should be constructed and designed so that it causes the least amount of damage possible e.g. no sharp blades. Electricity powered with maximum nominal voltage of 24 V with direct current or alternating current with equal nominal voltage. If the drone has" follow me" mode, the range should be maximum 50 meters from the remote pilot who should be able to regain control easily whenever. A C0 drone can only be placed on the market with a manual stating all the above information, instructions, any limitations such as weather or night-time use as well as an information notice from European Union Aviation Safety Agency. (Official Journal of the European Union 2019b)

2.1.2 C1 - class drones

C1 category drones should be made of materials which make it so that in contact with a human head it should not have an energy transmitted of more than 80 J or have the take-off mass be less than 900g including the payload. Max speed of 19 m/s and max height of 120 m or a system that limits it to max to 120 m. Some of general requirements are; to be safely controllable even if one of the systems fail, made of material that in case of e.g. crashing the drone is able to continue flying and of material which does not harm people, property or animals. The drone should have a reliable and predictable method for the pilot to regain data link in case there is a loss of it to prevent any accidents or injuries. (Official Journal of the European Union 2019b)

The drone should be powered by electricity with maximum voltage of 24 V, same as the C0 drones, and it should have a unique serial number. It should also have a real-time broadcast to a mobile device which shows the unique serial number, geographical position and the height from surface / take off point, the geographical position of the remote pilot or the take- off point There should also be a geo-awareness system which loads and update data for airspace limitations by geographical zones and a warning system which warns if crossed into such an area. (Official Journal of the European Union 2019b)

If the C1 category drone has a system which limits access to certain zones, it should work so that there is no possibility of risking safety during the flight. Light should be equipped for night-time use and "follow me" mode should have a maximum of 50-meter range. The same manual as in the C0 category has to be included if placed on the market. (Official Journal of the European Union 2019b)

2.1.3 C2 - class drones

The C2 category is the same as C1 except the weight is allowed to be less than 4 kg including payload, and having the maximum nominal voltage of 48 V. In addition to those there should also be a clear warning system for when battery or the control system are at a low level to ensure safe landing (Official Journal of the European Union 2019b). If the drone is tethered, meaning it has a power station at the ground where the drone physically attaches to (Shivamber 2019), the tensile length of tether should be less than 50 meters. The mechanical strength should be less than 10 times the weight of the drone in case of heavier-than-air aircrafts and for lighter-than-air aircrafts 4 times the force exerted by combining max static thrust and aerodynamic force of max windspeed in flight (Official Journal of the European Union 2019b).

Unless the drone is tethered there should be a direct remote identification, meaning identification that can be received by other parties, in case of data link loss an easy a predictable way to connect again to ensure safe landing as well as having the data link protected in order to prevent unauthorized access. There are also rules for drones unless they are fixed wing, meaning drones which look like planes, it should have a low speed mode of maximum 3 m/s and A weighted sound power level with visible marking of it on the drone and / or package. (Official Journal of the European Union 2019b)

2.1.4 C3 - class drones

C3 category drones have a maximum take-off mass of less than 25 kilograms, including the payload, it should have maximum dimensions of 3 meters, and maximum flight altitude of 120 meters like in the previous categories. The electricity should be maximum 48 V in nominal voltage or equivalent AC voltage. (Official Journal of the European Union 2019b)

Everything that is mentioned in C2 category applies to C3 category as well but there are certain things that are more specific for this category. The pilot of the drone should have adequate competency, and the weighted sound power level has to be shown on the packaging. The drone has to have a unique serial number also indicated on the drone itself. Tethered drones have the same qualifications as in C2 category. (Official Journal of the European Union 2019b)

2.1.5 C4 - class drones

Like in the previous section most of what has been said in category C2 and C3 apply to this category as well but for clarity's sake some of the most important parts will be mentioned. The maximum take-off mass should be less than 25 kilograms, the drone should be safely con-

trollable and manoeuvrable in a way which the pilot is able to follow the manufacturer's instructions. The C4 drones should not be capable of automatic control modes except for flight stabilization. And lastly it should include the information notice published by EASA (European Aviation Safety Agency 2018a) as well as all the limitations and obligations under the EU law. (Official Journal of the European Union 2019b)

2.2 EU and Finnish laws regarding drones

There are general regulations from the EU which all the Member States have to follow, due to this it is important to learn these in Finland too. In addition to those regulations the Finnish law also has certain sections about the usage of drones and the data gathered with them.

2.2.1 EU regulation

All the information below is based on the Commission implementing regulation (EU) 2019/947. In article 3 the concepts of the different categories for drones are first introduced as open, specific, and certified, articles 4 to 6 go through in more detail what each of these categories mean in more detail. The open category is for drones which belong in the C0-C4 groups of drones or a privately built drone which meets certain conditions. For this category there does not have to be any prior operational authorization, the maximum take-off mass is 25 kilograms and the maximum altitude from surface is 120 meters. The remote pilot has to ensure the drone is flown safely and not over a crowd of people; they also have to have visual line of sight during flying. The drone should not carry or drop any materials while flying. (Official Journal of the European Union 2019a)

The specific category requires the operator (pilot) to have an operational authorization meaning that people are not able to fly these types of drones without that authorization. The Operator must also conduct a risk assessment, which is based on article 11 of the Commission 2019/947 and will be discussed later on, that also includes risk mitigation during the application process. The authorization can only be granted by a competent authority and only if the risks are mitigated properly. Although it is usually required in cases where operations are done within clubs and associations that have authorization or if the operator holds a light unmanned aerial system (UAS) certificate with the appropriate privileges authorization for operations is not required. (Official Journal of the European Union 2019a)

Certified drones require the operator to have a certification in order to fly during the operation they have planned. Article 40 paragraph 1 points a-c in Commission delegated regulation (EU) 2019/945 (Official Journal of the European Union 2019a) specify the requirements needed to be met in order to belong in this category. First of all, the dimensions of the drone should be 3 meters or more. Drones in this category are used in operations where drones are

flown over crowds, involves transportation of people, carrying of dangerous goods which includes high level of robustness for risk mitigation, or if the risks for the operations cannot be sufficiently mitigated.

Article 7 focuses on the rules and procedures for each of the categories. For the open category in Part A of the Annex in the same Commission (2019/947) there are subcategories of A1, A2, A3 but the general provision are that the UAS must be at the elevation of maximum 120 meter at all times from the closest point to surface. Having a distance of minimum 50 meters when it comes to obstacles that are 105 meters tall. The UAS is able to fly 15 meter above the obstacle if so, requested by the entity responsible for it. (Official Journal of the European Union 2019a)

Operations in A1 category mean Does not fly over people, follow-me mode is active with a max distance of 50 meters. 250 g maximum speed of 19 m/s if it is a privately built UAS or is class C0 or C1. A2 category the operations have to comply with condition such as that the UAS is not flown over uninvolved persons and is at least 30 meters away from them unless conditions such as weather, performance of UAS and segregation do not allow to do so, in these cases the UAS is allowed to be 5 meters from the uninvolved persons. For A2 category the unmanned aircraft has to be class C2 with direct remote identification as well as geo-awareness systems. (Official Journal of the European Union 2019a)

Lastly the A3 category in the Annex states that no uninvolved person is put into danger within the range where the UAS is flown, keep at least 150-meter horizontal distance to commercial, residential, industrial, or recreational areas. If the UAS is privately built it has to have MTOM of less than 25 kilograms or be C2, C3, or C4 class UAS. (Official Journal of the European Union 2019a)

Competency of pilots is gone through in article 8 where mainly the information is on the part A annex and appendix 1 of the document but will be summarized here. For the open category Part A Annex states that the pilot has to have proof of competency, be aware of the environment as well as the geographical zones in the area. One of the main tasks of the pilot is to ensure safety and that can be done with the methods above as well as not operating the drone while under the influence of alcohol or any drugs as well as being in the physical and mental state to be able to opera the drone. (Official Journal of the European Union 2019a)

Continuing with the competencies of the pilot the Annex also states that the drone must be operated according to the manual as well as have visible line of sight at all times. The pilot should stop the flight if there is any risk to human, animal, or property. For specific category, the competencies are having abilities to apply operational procedures and to manage aeronautical communication, to be able to manage the flight path and automation. Have qualities

such as leadership, teamwork, self-management, problem solving, decision-making, situational awareness, workload management as well as coordination or handover. Lastly is a remote pilot is flying under clubs or associations the minimum competency is anything that the competent authority puts into the authorization, so it varies from case to case. (Official Journal of the European Union 2019a)

The remote pilot also has to be familiar with the manual provided or in the case of C1 class drones has gone through the appropriate training course and passed the examination when it comes to A1 operations. For C2 class UAS online training course or self-practical training as well as passing the examination for operations in A2 and A3 categories. (Official Journal of the European Union 2019a)

According to article 9 for the open and specific categories the minimum age of the operator is 16 years old for all other operations expect for the operation is category A1, a privately built drone of a maximum of 250 grams take off mass, or when it is done under strict supervision of a competent remote pilot. Member States are able to lower the minimum age if all risks are considered in that specific territory and deemed acceptable. For the open category, the minimum age can be lowered by 4 years and the specific category by 2 years. (Official Journal of the European Union 2019a)

Risk assessment is specified in article 11 and how it should be done in order to be able to fly the drone in that specific operation. First the characteristics of the UAS operation have to be described, this includes explaining the nature of activities to be performed, environment and geographical area, complexity of operation, technical features, and competence of personnel. Complexity of operation means the planning, execution, competences, experience, and features of the UAS. (Official Journal of the European Union 2019a)

In the risk assessment there should also be a proposal for adequate operational safety objectives, risk identification, possible risk mitigation measures, level of robustness determination, and target level of safety. Since there are some unmitigated risks for the operation there are certain things that should be included in the risk assessment, these can be divided onto two groups of risks on the ground and risks in the air. (Official Journal of the European Union 2019a)

On the ground the things that should be included are; if the drone is operated with visual line of sight or beyond visual line of sight, the population density of overflown areas, if there is a plan to fly over people, and the dimension characteristics of the UAS. In the air some entities that should be specified are the exact airspace volume, class of airspace, impact of other air traffic which includes altitude, controlled or uncontrolled airspace, aerodrome on non-aerodrome drone, urban or rural area and the separation from other traffic. (Official Journal of the European Union 2019a)

Lastly in article 9 the mitigation of risks should include at least these; the containment measures of people, strategic operational limitations meaning the restricting geographical volume, duration and schedule, common flight rules, competency and experience level and lastly the risk of human error. (Official Journal of the European Union 2019a)

In the EU regulation in article 14 registration of UAS operator and certified UAS rules and conditions are gone through. The Member States have to have a registration systems that they also maintain for UAS that are designed so that can be certified or UAS operators whose operations can cause different risks when it comes to safety, security, privacy and protection of personal data or the environment. In the registration system for UAS operators information that has to be found are the full name and date of birth for natural persons and for legal persons the name and identification number. In addition to those the address, email, phone number, insurance policy (if required by law or Union), confirmation that all people involved in the operation are competent to perform the tasks assigned to them and the UAS will only be operated by remote pilots with the required level of competence, and lastly operational authorisations, declarations and certificates needed. (Official Journal of the European Union 2019a)

UAS operators have to register themselves when in the open category they any of the following: have a unmanned aircraft with MTOM of 250 grams or more, can transfer human kinetic energy that is above 80 Jules, or is equipped with a sensor which is able to capture personal data. They have to register in the Member State of their residence for a natural person or for a legal person where their principal place of business is. The information provided has to be accurate and one operator cannot be registered in more than one Member State at the time. The operator will then receive a unique digital registration number which they then have to display on every unmanned aircraft to allow identification. (Official Journal of the European Union 2019a)

For the UAS that can be certified in the registration system things that should be included are manufacturer's name, designation of UAS, and the serial number. The natural or legal persons for whom the UAS is registered to their full name, address, email address and phone number have to be in the register as well. All the information that goes into the registration has to be digital, interoperable and allow for exchange of information. The owner of the UAS has to register the aircraft and it cannot be registered to more than one Member State at the time. (Official Journal of the European Union 2019a)

In the article 15 of the same EU regulation operational conditions for the geographical zones are gone through for this safety security privacy and or environmental reasons must be considered. When it comes to the safety security privacy or environmental reasons the Member States may prohibit certain operations request conditions for certain or all the operations or

request prior operational authorization for certain UAS operations. The Member States can also subject the operations to specified environmental standards allow access to certain classes only allow access only to unmanned aircrafts that are equipped with certain technical features particularly when it comes to remote identification systems and/or Geo awareness systems. The Member States are also allowed to exempt UAS operations from one or more of the open category requirements on basis of risk assessment. Lastly the Member States must ensure that the information of geographical zones including the period of validity is made publicly available to all in a common unique digital format. (Official Journal of the European Union 2019a)

Next in the implication in article 17 it states that the Member States must have one or more entities as competent authorities for the tasks that are listed below belonging to article 18. The Member States must state clearly which responsibilities belong to which entities, ensure coordination between these entities as well as effective oversight of all organizations and persons whom this may concern. In article 18 tasks of the component authority are gone through. There are about 13 different tasks that their competent authority must operate first of them being enforcing this EU regulation. Another is to issue a suspend and revoke certificates off UAS operators as well as the licenses of remote pilots operating within the certified category. (Official Journal of the European Union 2019a)

The competent authority also must issue Prove to remote pilots who have completed the examination needed. Issue amend suspend limit or revoke any operational authorizations and LUC's as well as verifying comp completeness of declarations which are needed to carry out UAS operations in their specific category. All of these must be kept as well as other documents records and reports. The authority also must make sure to give out information of geographical zones identified by the Member States and have been established within the national airspace of its State. (Official Journal of the European Union 2019a)

Some other tasks the authority has are issuing a confirmation of receipt and completeness when it comes to specific category operations, developing a risk-based oversight system for model clubs, associations and UAS operators that have submitted a declaration, or they hold an LUC or and operational authorization. For operations that are not within the open category the authority must create an audit based on the risk profile compliance level and safety performance of the operators who have submitted a declaration. They also must carry out inspections for those same operators who have submitted the declaration or hold a certificate issued this is to ensure that the operators and remote pilots comply with the EU regulations provided. (Official Journal of the European Union 2019a)

Lastly the authority has two implement a system that detects and examines incidents of noncompliance of the operators operating in either open or specific category. To ensure safety

and promote safety to operations the authority has to provide the UAS operators with information and guidance as needed as well as maintaining and establishing the registration system that has been mentioned above belonging in article 14 of this same regulation. (Official Journal of the European Union 2019a)

Safety information regarding the UAS are gone through in article 19 the authorities in the Member State, market surveillance and control of authorities have to all cooperate when it comes to safety matters, they also have to establish procedures that allow for exchange of safety information. The UAS operators must inform the competent authorities of any security/safety related occurrences and exchange information when it comes to their UAS in compliance with a different EU regulation; 376/2014. EASA must collect analyze and publish any safety information when it comes to any operations. EASA and the competent authority of the Member States must together take necessary measures to address any safety issues that have come up while doing this any differences with aviation safety cyber security and other technical domains have to be taken into account when it comes to aviation regulations. When doing this EASA and the competent authority must notify all relative relevant parties off any changes that are possible to come that have to comply with the changes. (Official Journal of the European Union 2019a)

2.2.2 Finnish laws

The most important law in the case of drones and flying them is Aviation Act (864/2014). From this law the general rules and regulations when it comes to flying a drone are discussed and made clear. According to section 11 of this law the flying of drones can be restricted or completely denied in zones where for example the national defence or border control could be affected, due to this around or above these types of zones the flying of drones is not allowed (Aviation Act 2014).

In the Aviation Act in sections 3a, 4, 11, 11a, 11b and 11c which were added to this law on 26.6.2020 (2020/534) further details on how drones in Finland should be used, regulated and the processes involved with drones, these will come into effect in January 2021 (Aviation Act 2014). The Finnish Transport and Communication Agency, further referred to as Traficom, is by their own definition "an authority in permit, licence, registration, approval, safety and security matters." (Traficom 2020). This is relevant since Traficom is in charge of anything involved with drones and the permits required for them.

Within section 3a it is defined that Traficom is in charge of the market involving drones, as well as the different rules and regulations when it comes to drones. Traficom is also making sure that the Finnish law complies with the regulations made by the European Union Aviation Safety Agency and are in charge of announcing any irregularities as well as analysing and monitoring the drone usage when in civilian usage. (Aviation Act 2014)

In section 11 of this same law, the government can restrict or deny the flight of UAS in zones where Finnish Defence Forces (FDF), The Finnish Border Guard, rescue services or preparedness can be affected. For any of these as well as for maintaining public safety and order, Traficom can restrict or deny flying above the zone for a maximum of four weeks. Also, areas in where the nature is to be preserved the flight of UAS' can be restricted or denied. (Aviation Act 2014)

When it comes to special cases Traficom is able to give a permit to fly in these zones if deemed necessary. If the permit is given Traficom has to inform the owner or occupant of the property within the flight zone. If the zone is involved with the FDF, permission from them has to be received and any specific terms that they might put up have to be met. If The Finnish Border Guard is also involved in the zone the FDF has to involve them in the decision making and make them aware of any special conditions that are to be met in order to fly in the zone. (Aviation Act 2014)

The administrative unit of the airspace has to restrict or prevent flight over any zones that have been proposed by the rescue services, police, The Finnish Border Guard, Radiation and Nuclear Safety Authority, or aviation authority for a maximum of seven days if it is deemed necessary for flight safety, research when it comes to safety, national defence, border control, policework, rescue missions or for the good of public safety and order. In a case where there is a situation which might affect the flight safety or national security by a significant amount, the unit whom this may concern can make the decision themselves to shut down the zone for a maximum of one day. The administrative unit of airspace has to inform Traficom of all the restrictions and preventions they have applied into place. (Aviation Act 2014)

Section 11a states that a zone for flying an UAS can be approved for a maximum of three years or based on the application for a year. In addition to the previous restrictions mentioned other places or situations where the flying could be restricted or forbidden completely are where there is flight safety research going on, in industrial areas, at harbours, terminals or railway stations. (Aviation Act 2014)

If FDF is using a zone, be it permanently or temporarily, they can claim it for a maximum of three years or a year if asked so in the applications. In general, even if Traficom has made certain zones "no-flight" zones they usually do not apply to FDF, The Finnish Border Guard, police, rescue services and so forth unless specifically stated so. (Aviation Act 2014)

Traficom is able to create a zone for commercial, hobby or research purposes for a maximum of three years or for a year based on the user's application. In these zones they can be private for the user who applied for the zone, public or used in cooperation. The one condition for making the zone is that there would not be any danger added to flight safety in the zone. Before these zones are made Traficom has to be in contact with the FDF in order to ensure

there will not be any conflict or disturbance for the FDF for their own activities, also in some cases The Finnish Border Guard has to be involved in the discussion as well and once again the property occupant or owner has to be informed of the decision. (Aviation Act 2014)

When making flight zones certain conditions can be applied to the aircraft itself or the user of the aircraft. These conditions would be things like flight safety, general public order and safety, ensuring the FDF is able to do their tasks, the actual users of the zone meaning who is allowed to use the zone for flying, conditions on how the procedures go as well as reporting to the officials. Also, weather conditions and time specific conditions will apply. Lastly the zones own environmental and altitude conditions are something that can be applied. (Aviation Act)

The decision or conditions made can be changed by either Traficom itself or by the user for a reasonable reason, or if the circumstances while making the decision or condition have changed. To cancel the decision or condition there are two cases, the first is that the circumstances have changed so much that it is not possible to continue operations as usual without changing the conditions previously agreed upon. The second case where the user of the drone has violated the Aviation Act or the conditions that have been applied to the zone on multiple occasions. In section 11c the concept of "danger-zones" is gone through, Traficom is able to create this type of zone for a time period of less than a year. In "danger-zones" there would be activities which could affect the flight safety in the zone therefore flying would be dangerous and should be prevented. (Aviation Act 2014)

Chapter 5 section 52 states that any aircraft has to have a captain who is decided by the owner, possessor, or user of the aircraft. The responsibilities of said captain are defined as such: before flight making sure the aircraft is in condition to fly, the flight is planned to follow all rules and regulations and that the rules and regulations are followed during the flight. The captain's responsibility is also the general safety of the flight. Also, in chapter 7 section 76 it is mentioned that in any emergency cases when it comes to take off and landing there does not have to be a specific area where the aircraft would usually take off or land, this applies to unmanned aircrafts as well. (Aviation Act 2014)

Section 136 in the Aviation Act expresses that the owner, possessor, and user are all in charge of the damage caused to any humans or property while during flight and all costs have to be paid. In cases where the aircraft has been used without permission the damage will be paid to the victim but not to the owner, possessor, or user. If the aircraft has been rented, then the responsibility lies on the user and not the owner. (Aviation Act 2014)

Any activity that would cause danger to the flight safety or would disturb the air traffic is forbidden, section 159 in chapter 15 goes into detail about this. In any situations where there is

a possibility for this, Traficom has to be informed and they can then decide whether or not the flight should be allowed. (Aviation Act 2014)

In the Finnish Constitutional law in section 10 there is there are statement which declare that the protection of privacy, meaning that the domestic premises, honour, and domestic peace of a person should not be interfered with (Constitutional law 1999). This can be applied to the usage of drones in which it is important to remember to not disturb any of these if the purpose of the drone is for example, to film.

The Criminal Code of Finland is something that has to be considered when it comes to unmanned aircrafts. In chapter 23 section 1 it states that if an aircraft breaks any laws on the Aviation Act one can get fined or be sentenced to a maximum of 6 months imprisonment. In the same chapter section 11a general disturbance of traffic is also punishable by law meaning if the aircraft causes significant disturbance to any traffic, they can be sentenced to 6 months imprisonment or be fined. (Criminal Code 1889)

In chapter 24 of the Criminal Code section 1 defines invasion of domestic premises as something that could be caused by things such as loud noises, which drones can cause. In section 5 and 6 the cases of eavesdropping and illicit observation are gone through in which they relate to places which are protected by domestic peace or places, such as toilets, can be sentenced to a maximum of a year or be fined. Lastly the section 7 states that planning of eavesdropping or illicit observation can also cause you to be fined or sentenced to a maximum of 6 months. (Criminal Code 1889)

The Public Order Act in chapter 2 section 3 says that disturbing the public order and safety can be things such as making loud noises, threatening behaviour, and attacking with any sort of weapon (Public Order Act 2003). This is important to remember as a drone user since drones can cause a lot of damage to the order and safety in a public place if used improperly.

2.3 Previous studies / thesis

There are no other thesis or studies done on this same exact subject but in order to create credibility for this thesis, research papers with the similar subject of drones and private security will be gone through. The studies focus on the laws and regulations in 2018, so not everything is still applicable, but examples can be used in order to gain further understanding.

Aro (2018) wrote a thesis on Use of Unmanned Aerial Vehicles in the Private Security Sector, which connects very much to this thesis them both having focus on the private security sector. In his thesis he focused on many Finnish laws due to the EU regulations not yet existing.

He also mentions the Trafi OPS M1-32 which was done due to the quick changes in drones and them getting more and more popular, it is based on the laws for drones.

The purpose of the Trafi OPS M1-32 is to have a "set of rules" which can be applicable to all drones weighing over 250 grams, except when flown indoors or used as a military aircraft. The rules do not apply for autonomous drones which have a set route and therefore cannot be controlled during the flight. (Aro 2018)

Aro also wrote in section 12 of his thesis examples of in what kind of situations the drones could be used within private security. His examples included using drones for perimeter control, especially in large industrial scenes where guards could use drones to help them make rounds faster and more effective. The second example was about event safety where it would be useful to use drones to see the overall situation in a large area where there are many people. Lastly, he mentioned having guards use the drone in patrols as a support tool, but there were some negatives to this which he defines as the battery running out, wind affecting the controllability of the drone and in Finland having cold weather during winter which also could affect the drone. (Aro 2018)

Torniainen (2018) wrote the thesis for the police academy focusing more on the prevention of misusage of drones and supervision of drones from a police officer's point of view, including this will still give a good understanding of the difficulties and risks of using drones in private security. In Section 5 the different threat models were drones being a physical threat, a threat to air traffic, possibilities for modifications, and the visions of future of future, namely that drones could be used for terrorism via drones being used as tools for dropping bombs as well as other methods of terrorism.

The prevention methods are gone through as well, according to Torniainen (2018) there are several methods to prevent drones from for example entering certain zones with the use of jamming equipment. This would be necessary as shooting the drones down would be too difficult. Examples of different jamming equipments are radio waves, electromagnetic pulse, and microwaves, all of these would make it so that the drone would lose connection to the pilot therefore allowing the police to take the drone and eliminate the threat. Torniainen (2018) also mentions that there have also been examples of police using trained hawks in the Netherlands to take down drones and Michigan technological University having developed a drone catcher with the same purpose.

Nuutinen (2018) wrote a thesis called The Utilization of a Drone in Vilppula Open Prison in which she went through how drones could be used in the prison in order to aid the work of guards. Although this is not exactly the same subject it is a good thesis to complete some of the points made in Aro's (2018) thesis. Nuutinen states that drones are a tool which could

help save in expenses and to help to see into blind spots where mounted cameras cannot reach.

The drones used by prison guards could also be used in order to prevent drones from the outside coming into the prison. Another point she bring up that the drones could be used for would be less about guarding the prisoners but also to check up on the building so costs with inspections would go down, as well as using the drones for marketing which in turn helps the prison to possibly gain more funding. (Nuutinen 2018)

By having a different perspective of the subject which still relates to drones in the private security field, including some of the risks and benefits it is easier to understand the usage and meaning of drones in the industry, thus allowing the curriculum to have a broad and reliable information.

2.4 Curriculum definition

According to the Glossary of Education Reform a curriculum is something used for lessons where academic content is taught. In the curriculum there are different skills and knowledge which students are expected to learn and know by the end of the studies. They also state that in many cases the teacher might adjust the curriculum to suit their style and pace of teaching. (The Glossary of Education Reform 2015)

When looked up from the Merriam Webster dictionary and Cambridge dictionary they seem to agree with this definition of curriculum with their own definitions of " Subject studied in a school, college etc and what each subject includes" (Cambridge), "The courses offered by an educational institution" (Merriam Webster) and " A set of courses constituting an area of specialization" (Merriam Webster).

2.5 Current studies at EKAMI

In Finland, the curriculum is decided with the Finnish National Agency of Education and relevant working life committees (Opetushallitus 2020). Because of this, all schools teaching the same subject have the same curriculum, the teachers make their own materials for the classes which best suit their style and enables the students to gain the most out of it.

In EKAMI the curriculum used is for the vocational upper secondary qualification within safety and security (Turvallisuusalan perustutkinto) which was founded in 2016. There are 18 optional subjects from which the student chooses 90 competence points worth of studies, 1 compulsory subject worth 45 competence points, 4 common units which together make up 35

points and some free choice options which give the last 10 points. All together the studies will comply of 180 competence points. (Opetushallitus 2016)

In the curriculum there is pattern of having first the vocational competence requirements listed, next there is the grading and what is needed for a certain grade. The grades are sectioned into three categories from 1-3, three being the best. In the grading there are four categories; mastering the work process, mastering methods, tools, and materials, mastering the basis of information for the work, and lifelong key skills learned. Each of these also have subcategories, depending on the subject there are differences on which of the four categories is emphasized. (Opetushallitus 2016)

For the sake of clarity, very short descriptions of the already existing subjects in the school within security are gone through as well as where the drone curriculum would fit in the most. *Turvallisuusalan toiminta* which translates roughly into activities within security field, focuses on introducing the students to the field. They start with concepts such as risks, fire safety, first aid, what is a guard and so forth. This is the largest section of the curriculum and usually takes up a whole year to teach. The next subject is *vartiointitoiminta*, which means activities for guards,and in this subject the students will go into further detail on the laws and different activities which affect guards. (Opetushallitus 2014)

Pelastustoiminta which mean rescue activities, is the next subject that is taught. This teaches the students on how to take preparedness into account as well as how to plan a rescue plan and just taking different fire and exit risks into account, how to spot them and what they are. After this there is *vartioinnin ja järjestyksevalvonnan perustoiminta*, basic activities of security officers and guards, in which the law and actual training of them is gone through. This includes learning what kind of people are able to become guards, what kind of training do they need and what is included in the training. (Opetushallitus 2014)

Kiinteistötekninen toiminta is activities within building technology which is more about the different systems that are used within the field, such as cameras, alarms and so forth. This is the section where the drone curriculum is very involved in since using drones and drones themselves are very technical, so it will most likely be somehow incorporated with this course. Lastly there is *uhkatilanteiden hallinta*, threat management, in which again some law is gone through, as well as teaching the students how to recognize warning signs and own reactions in stressful situations. (Opetushallitus 2014)

3 Methodology

A lot of the research will be done through interviews of the teachers at the school and a professional within drone usage. Analysis will not be quantitative since it is not important for this case but more of the contexts of the interviews is valued. The interviews will be open-ended questions in order to be able to gain most out of them as well as have more of a discussion on the subject which then would benefit the further understanding of how to develop the curriculum.

The interviews (Appendix 1) were used to interview the three different teachers at the school as well as a drone expert to gain perspective on how the curriculum should look like, so in total there are four interviews. These questions are based on the background research done on the subject as a whole. The questions for the teachers and the expert would be somewhat different focusing on the different aspects of the curriculum, for the teachers more about the teaching style and timings and for the expert focusing on the contexts of the curriculum.

In addition to these, the EU regulations will be used to get the knowledge for the actual curriculum and to increase the credibility of it. What should and should not be included in the curriculum the teachers shall be consulted as well as my own opinions and judgement, which is based on all the information gathered, will influence the decisions that are to be made regarding the curriculum development.

The actual curriculum would be somewhat visual based since then it would be easier to teach and to understand. Lastly after the interviews the idea would be to combine what has been found there and the things that were based on the research materials. The reason these methods were chosen is due to the lack of materials for this subject, there are some previous theses on a similar subject which could be utilized to some extent when making the curriculum but not enough where further interviews and research is not necessary.

Semi-structured interviews are interviews in which open-ended questions are used so that the subject does not feel confined to having to give one right answer. These types of interviews are only done once per subject and are maximum an hour long. The interview is usually somewhat conversational but there is a set of questions prepared which in all the questions are to be answered. (Jamshed 2014)

The reason for using this type of interview is since there are only three teachers who could be consulted and a quantitative method for such a small pool would not be efficient. Another reason for using semi-structured interviews is to be able to discuss anything that was not in the questions that might have been missed but the teacher finds important.

Analysis of interviews will be thematic to see if the teachers all have the same opinions and which of the themes are coming up more. The reason for this is to be able to see what should really be included into the curriculum. To avoid any bias all the interviews will be done separately so most accurate results can be achieved.

According to the University of Auckland thematic analysis is a method that can be used in many different fields with qualitative data. In thematic analysis the focus is to find different themes from the data of multiple people so that the results can be compared. For the data from the interviews a deductive system was used in which the data existing was put together after which themes were found, such as finding what they all found the most important. (university of Auckland 2012)

4 Interviews

The interviews ended up being done over the phone which was not the original plan but due to the circumstances over the phone was the most efficient way. The length of one interview was about 30 minutes long focusing about drones, most efficient ways of teaching and most important materials. The questions used can be seen in Appendix 1.

4.1 Analysis of interviews

During the interviews it became apparent that visual way of teaching is something that the expert as well as the teachers preferred, having power points with many exercises and tests after each section / every few sections is a way which the teachers all use. Flying on the simulator should at an acceptable level before actual flying of the drone so that the student is able to use the drone in a state of emergency, for example losing GPS control or without the automatic pilot.

It is very important to know the technical side of things such as where the drone can be flown, the different conditions of the flight and safe behavior for storing the drone. For exams there should be some on the simulator where the student is asked to perform a technical showing of skills, where the students would use the drone while showing the teachers how they would go about that, filming something at the target point and bringing the drone back safely.

The Aviation Act being the most important law in Finland when it comes to drones is very important to learn to know how to safely operate the drone. By going through the Finnish laws, the EU regulations will also become familiar due to the Finnish laws complying with them. Also knowing the exceptions to the law when it comes to different officials is important to be aware of. (Piispa 2020)

The order of importance according to the expert (Piispa 2020) for the curriculum. He stated that knowing the information is the key to starting to learn about drones and how to use them.

1. mastering the basis of information for the work
2. mastering methods, tools, and materials
3. mastering the work process
4. lifelong key skills learned

During the interview it came up that since this is such a new subject there is not many examples of what the vocational competence requirements, and it could be being such a broad subject with different types of drones and usages it is difficult to answer the questions asked. The goals of the course would be to understand the different laws and regulations, basic use of a drone and the base of operations and flying as well as the basis of safety. In addition to that making of flight plans as well as the knowledge on how to apply for different permits should be taught so that at the end of the course the student is able to do this without assistance.

The curriculum should be more theory based rather than practical due to wide spectrum of laws, about 60-70 % theory and 30 - 40 % practical with 1-2 hours at the time (lessons) and this would be a course for one year. Using materials such as videos where students could analyze why something happened / what went wrong is an option but having more interactive teaching for practical learning is important. The AVIAMAX app is something that the expert (Piispa 2020) suggested to include on the curriculum since it is an app that tells the drone user where you can fly the drone. It would be useful for the students to learn how to use the app and use it as a tool to learn.

Something else Piispa (2020) also recommended having was days where there would be a feeling of an event where learning about different kinds of drones and brands as well as learning more about the career of drones and drones used in private security from real life experience. Also having other brands of drones on the simulator to gain more experience and being able to use different brands and not being limited to only one. This would help the students further their vocational competences and overall knowledge of drones.

4.2 Using the interview for the curriculum

Using the interviews to base the curriculum on them is somewhat difficult since there could be bias as well as difficulties in interpretation. The main focus has been on what the expert

within drones has said and thinks are the most important things to learn. For teaching methods the goal was to keep it in a similar spectrum of what the teachers already have used before and what they thought would be the most efficient way for them to teach, all three have their own distinct styles but in general the curriculum is made so that they are able to adapt it to their liking while still being able to teach the same material.

5 Curriculum

The final curriculum is mainly based on only the interview of the expert on the field due to the results of the interviews showing that the two different perspectives cannot be compared to such a degree where thematic analysis would be efficient. This is due to the teachers not having the same level of knowledge of the drones and what would be the most important themes for the curriculum, saying this the teaching methods suggested will be more to suit the teacher's old methods and suggestions.

The drone which the school will have is DJI Mavick 2 Enterprise Dual and will have a DJI simulator so the curriculum for practical learning will mainly focus on these drones but there should be some practice with other brands as well. The reasoning for this is since there is no guarantee that any future employer will have the same exact drone, so it is best to learn an overall of how to use different drones. Teaching materials have also been provided with this curriculum to make it more clear on how and what is to be taught. The curriculum will follow the already existing system for consistency and clarity for the teacher to use in the future.

5.1 Schedule

The course will be done over one school year starting in the fall semester. The course would be done alongside of other courses so that the students would have about 1-2 hours of lessons at once. For the sake of the curriculum being more understandable an example of having Fridays be the days in which drone lessons would be taken. To order of subject within drones as well as how many hours each subject should take can be seen below.

What is a drone – 4 hours

Finnish law – 5 hours

EU regulations – 4 hours

Drone directives – 6 hours

Risks related to drones – 4 hours

Making of flight plans – 5 hours

How to apply for permits – 3 hours

Practice on the simulator – 15 hours

Actual drone flying- 15 hours

Drone as a career- 2 hours

Repetition – 4,5 hours

The division of the hours is since this course would be 2,5 learning points in which 1 point is 27 hours. All together there are 67,5 hours which then were divided by 11, since there are 11 subjects in the curriculum, after the hours were moved around to make sure the most important parts would have most hours on them the above result was come up with. The pace would be slow enough in where the teachers have time to teach as well as give assignments to the students. The hours do not reflect only teaching but also going through materials and the students doing assignments.

A clear hourly plan is provided but there will be some leeway as to possibly missing some days or if the student needs more practical practice. This is to ensure the best possible results for the students. By calculations there should be 39 days in the year dedicated for this curriculum and each lesson will be 1-2 hours long. If wanted the plan can also be condensed into a 6-month long education program if that is ever needed in which case there would be 17 days in half a year with 4 hours each week

5.2 Vocational Competence Requirements

These are the requirements that must be met for the students to be able to say they are competent within the subject when it comes to the security field.

- Know how to use drones efficiently and properly
- Know how to prepare a flight plan which includes a risk assessment
- Be aware of own safety as well as others'
- Behave according to orders and instructions
- Report accordingly to the situation
- Know the law when it comes to drones

- Understand what categorizes as a drone and the different categories for different drones

- Which authorities must be considered when it comes to using drones?

5.3 Grading

The grading of the course will be done with the regulations already existing, each of the sections below will go through their specific requirements for each the goals for that section. The grades go from 1-3

5.3.1 Mastering the work process

Making Own Plans and Applying for Permit	
Satisfactory 1	Makes plans and applications for permits supervised
Good 2	Makes plans and applications according to the instructions
Commendable 3	Makes plans and permit applications independently that are executable and relevant to the subject

Table 1 Making own plans and applying for permit (Opetushallitus 2014)

Work Integrity Management	
Satisfactory 1	Needs guidance occasionally
Good 2	Does given assignments independently
Commendable 3	Progresses smoothly in their work, adapting it to other activities in the work environment

Table 2 Work integrity management (Opetushallitus 2014)

Economic and High-Quality Actions	
Satisfactory 1	Operates in accordance with the set quality objectives under supervision
Good 2	Operates in accordance with the set quality objectives

Commendable 3	Operates in accordance with the set quality objectives and develops own activities to achieve the quality objectives.

Table 3 Economic and hihgh-quality actions (Opetushallitus 2014)

Assessment of Own Work	
Satisfactory 1	Notices any mistakes made
Good 2	Can assess their own work in such a manner that they know what should be improved
Commendable 3	Can assess their own work and adjust where necessary

Table 4 Assessment of own work (Opetushallitus 2014)

5.3.2 Mastering methods, tools, and materials

Actual Drone Flying	
Satisfactory 1	Can control a drone without causing any hazards or further risks under supervision
Good 2	Can control a drone without causing any hazards or further risks
Commendable 3	Can control a drone without causing any hazards or further risks Is aware of the rules and regulations that apply while flying a drone

Table 5 Actual drone flying

Drones as Machines	
Satisfactory 1	Have knowledge on what defines as a drone
Good 2	Is aware of different types of drones in the field and how they differ from each other

Commendable 3	Is aware of different types of drones in the field and how they differ from each other Knows the functions of a drone in where they can recognize any malfunctions or repairs needed

Table 6 Drones as machines

Flight Plans and Permits	
Satisfactory 1	Can make a working flight plan and applications for a permit under supervision
Good 2	Can make a working flight plan and applications for a permit
Commendable 3	Can make a working flight plan and applications for a permit considering the environment and different conditions that may apply during the flight

Table 7 Flight plans and permits

Preparing a Drone for a Flight	
Satisfactory 1	Can inspect a drone to ensure it is in a flying condition under supervision
Good 2	Can individually inspect a drone to ensure it is in a flying condition as well as taking a test flight
Commendable 3	Can individually inspect a drone to ensure it is in a flying condition as well as taking a test flight Suggesting any improvements to be made in the flight plan based on conditions or condition of the drone

Table 8 Preparing a drone for a flight

Controlling a Drone in Different Circumstances

Satisfactory 1	Can control a drone in different circumstances during a simulation under supervision
Good 2	Can individually control a drone in different circumstances during a simulation
Commendable 3	Can individually control a drone in different circumstances during a simulation in where they are able to come up with alternative solutions

Table 9 Controlling a drone in different circumstances

5.3.3 Mastering the basis of information for the work

Finnish Laws Regarding Drones and Their Usage	
Satisfactory 1	Is aware of the Finnish laws that regulate drone usage in Finland
Good 2	Understands the different laws and what they imply when it comes to drone usage
Commendable 3	Can use the different laws in their planning and during flight to ensure proper usage

Table 10 Finnish laws regarding drones and their usage

EU Regulations	
Satisfactory 1	Is aware of the EU regulations and how they affect drone usage in Finland
Good 2	Knows the EU regulations and how they affect drone usage in Finland
Commendable 3	Knows the EU regulations and how they affect drone usage in Finland Can differentiate between the EU regulations and Finnish laws when it comes to drones

Table 11 EU regulations

Risk Management and Preparedness	
Satisfactory 1	Can do basic risk management for drones including analyzing risks
Good 2	Can do risk management for drones including analyzing risks and prevention methods. Can make a basic preparedness plan
Commendable 3	Can do risk management for drones including analyzing risks, prioritizing the risks, and prevention methods Can make a preparedness plan which takes different situations and conditions in the environment and season into account

Table 12 Risk management and preparedness

Drone Directives	
Satisfactory 1	Can cite the directives with materials provided
Good 2	Can cite the directives with the help of materials they have found individually
Commendable 3	Can cite the different directives without the help of any outside sources

Table 13 Drone directives

5.3.4 Lifelong key skills learned

Learning and Problem solving	
Satisfactory 1	Evaluates their own work under supervision
Good 2	Evaluates their own work and makes necessary reports of it

Commendable 3	Independently evaluates their own work, makes necessary reports, and directs its activities on that basis

Table 14 Learning and problem solving (Opetushallitus 2014)

Work Ethics	
Satisfactory 1	Operates within working hours and follows given instructions under supervision
Good 2	Operates within working hours and follows given instructions
Commendable 3	Operates within working hours and follows given instructions Is aware of any rules and regulations when it comes to using drones and adjusts their working to those

Table 15 Work ethics (Opetushallitus 2014)

Interaction and Cooperation	
Satisfactory 1	Can cooperate with different people as well as different organizations
Good 2	Can cooperate with different people as well as organizations in a constructive environment Consider stakeholders and their needs
Commendable 3	Can cooperate with different people as well as organizations in a constructive environment Build a plan based on the needs and wants of different stakeholders

Table 16 Interaction and cooperation (Opetushallitus 2014)

Health, Safety and Performance	
Satisfactory 1	Takes safe actions into account

	Avoids any risks, follows safety instructions given and does not cause danger to themselves Uses safety methods, actions and working procedures given in the instructions
Good 2	Oversees the safety implications of their operation Considers others in the working community and follows any instructions given by them Ensures the safety of the materials used and takes any malfunctioning drones to be repaired
Commendable 3	Actively develops their actions and operations to become safer Observes and recognizes any risks related to drone usage and can report on them efficiently Ensures the safety and any needs for repairing malfunctioning drones, as well as including any other materials needed to increase or ensure safety

Table 17 Health, safety and performance (Opetushallitus 2014)

5.4 Methods of demonstrating competence

The student or graduate demonstrates his / her competence in the demonstration of professional competence at a degree event by participating in logistical security work tasks in real workplaces to the extent that the coverage of the demonstration of competence is ensured. The demonstration of professional competence or degree may be continued in another workplace / workplace or in initial vocational training at another place designated by the training provider so as to ensure the coverage of the competence demonstration. If the competence required in the part of the degree cannot be comprehensively demonstrated by performing the work in a proof of professional competence or at a degree event, it is supplemented by other assessment of competence. (Opetushallitus 2014)

6 Conclusion

For the conclusion results, discussion and evaluation are to be gone through to gain the most perspective. As the project has been very research based the actual results are minimal compared to the theoretical aspect of this thesis, however this does not mean that there are no results to look over.

6.1 Results

To show the results there is the actual curriculum that has been made. The actual curriculum was based on the already existing curriculum that the school uses, and due to this it was made so that it would blend in well so that the teachers as well as students could use the curriculum as well as possible. Some of the sections of the curriculum such as the mastering work process and lifelong key skills learned were taken from the already existing curriculum and just minimally adjusted to what is needed for when it comes to drone usage. Reasoning for this was due to looking at the already existing curriculum that most of them had similar or the same sections for when it came to these two, so it was concluded that it was best to just minimally adjust them and keep the focus on the other two sections which are completely new and made so that the curriculum can fit in as well as possible. Materials for teaching, assignments as well as a more detailed version of the schedule have not been included since they were not the primary subject for the thesis and for they are only for the usage of EKAMI.

6.2 Evaluation

There are some concerning things regarding the credibility of the curriculum which is why it is important to use the sources carefully and make sure the curriculum is not just based on own judgement or opinions. Having done the interviews it was apparent that they could not be used like originally planned, this showed a lack of planning abilities causing unnecessary time consumption. Most of the curriculum as well as the interviews is based on the expert's opinion this can cause issues with having only one person being a source for the information provided.

To combat the issue of reliability and credibility a lot of background information on already existing thesis on the subject of drones were included so that it would be seen that the information was still relevant as seen by others as well. Since there is not that much information and research / projects done on this subject it is very hard to find information relevant to this, that is also something that the expert in the field had warned about.

For the actual curriculum as much time was not needed as first thought and the theoretical knowledge took longer than expected. Luckily, this allowed the two to exchange places so that there was no huge clash within the schedule. Due to the Covid-19 new regulations which

were supposed to come out this summer have been delayed, this caused the curriculum not being able to focus too much on that aspect since it was not sure when they would update the information and it is something which should be considered when updating the curriculum. There are also some sections in the EU regulations that come into account in the year 2021 but these are so minimal that they were not seen as an issue.

6.3 Discussion

To further research on this subject, it would be interesting to see how on a technical level drones could be used for safety even further or rather than making a curriculum and teaching there would be interest in making different plans for the students. For example, different flight plans that they would have to go through in order to gain more learning experience so that they would be ready for when it comes to working for an employer who uses drones for the same purpose. As the technology improves and more and more drones are being used in the future it would be interesting to see other aspects of drones and security/ safety used together and see the development of them as a unit.

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8 Tables

9 Appendices

Appendix 1: Questions for interview

1. What type of drone will the school have?
2. How much should the students work on the simulator before starting with the actual drone?
3. How important is it to learn the technical side of things and what about it should be learned?
4. What type of tests should there be and how often?
5. How much should the focus be on the laws and regulations?
6. Is it more important to focus on the Finnish law or the EU regulations?
7. Which of these categories is the most important?

    1. mastering the basis of information for the work
    2. mastering methods, tools, and materials
    3. mastering the work process
    4. lifelong key skills learned

8. What should be the goals of the course?
9. What should be the Vocational Competence Requirements?
10. How much of the course should be theoretical and how much practical?
11. How long should the course be?
12. What type of teaching would you recommend?
13. Anything else you would like to add?