Food Safety Learning in Home and Consumer Studies

Teachers' and Students' Perspectives

MARIE LANGE
Abstract

The aim of this thesis was to explore food safety as part of Home and consumer studies (HCS) education in Swedish compulsory school.

Firstly, a nationwide web-based questionnaire was performed among HCS teachers to obtain an overall picture of their knowledge, behaviour and attitudes regarding food safety. The second study was a questionnaire among school Year 9 students, where the data were collected using a student response system. The questions were related to the students’ food safety knowledge and behaviour, as well as cooking habits and sources of food safety knowledge and trust. Finally, qualitative interviews were performed among HCS teachers regarding their didactic choices of teaching content.

The results indicated a routine behaviour connected to cleaning practices and teaching regarding different perishable food to differ between teachers. The students’ food safety knowledge and behaviour were reported to be inadequate, especially among boys, and that students might leave school without having learnt even basic food safety principles. Mothers and thereby the home were reported to be an important as well as a trusted source of food safety knowledge, especially among the girls. Boys reported HCS to also be an important as well as trusted source, especially students that rarely or never reported to cook at home. For those students HCS must be seen as particularly valuable. To increase the students’ learning, the teaching needs to be related to the students’ everyday practices and to be more reflective in order for it to be practiced outside the HCS classroom. The teachers’ didactic choices could imply consequences for the students’ food safety learning and a need for more education and updated information for the teachers was noticed.

In summary, the results indicate that risk areas related to all the Four Cs in Food safety (Cooking, Cleaning, Chilling and avoidance of Cross-contamination) need to be highlighted in HCS teaching and for food safety to become a conscious didactic choice for the teachers. As teaching regarding food safety in HCS seem to differ it needs to be highlighted in HCS policy documents to ensure equivalent food safety learning for all students in compulsory school.

Keywords: Learning, Food safety, Education, Didactic, Risk, Food hygiene, Trust, Students', Teachers', Compulsory school

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To my mother, Marianne
List of Papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.


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The authors’ contributions

Paper I
Marie Lange, Helen Göranson and Ingela Marklinder were actively involved in the design of the study. Marie Lange was responsible for the data collection, the statistical analysis of the data and the drafting of the manuscript. They all provided continuous critical revision and interpreted the data. Marie Lange has a background as a home and consumer studies teacher, Helen Göranson’s a background within nutrition and biochemistry and Ingela Marklinder’s research area is food microbiology and consumers.

Paper II
Marie Lange, Helen Göranson and Ingela Marklinder were actively involved in the design of the study. Marie Lange was responsible for the data collection, the statistical analysis of the data and the drafting of the manuscript. They all provided continuous critical revision and interpreted the data.

Paper III
Marie Lange, Helen Göranson and Ingela Marklinder all helped design the study. Marie Lange was responsible for the data collection, the statistical analysis of the data and the drafting of the manuscript. All three provided continuous critical revision and interpreted the data. Lena Fleig’s research areas are health and consumer psychology and she developed the consumer behaviour perspective via critical revisions.

Paper IV
Marie Lange, Helen Göranson and Ingela Marklinder were actively involved in conception and design of the study. Marie Lange was responsible for the data collection and transcription and conducted most of the thematic analysis, whereas Helen Göranson and Ingela Marklinder provided a recurring discussion and interpretation. Marie Lange also drafted the manuscript, but all the authors provided continuous critical revision. Päivi Palojoki’s research areas are education, home economics and teachers training and she developed the didactic perspective via recurring critical revisions.
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Introduction

‘In the autumn of 2016, an outbreak of the potentially dangerous intestinal bacteria EHEC O157 was reported in Sweden. This particular strain of EHEC is more often associated with severe disease and secondary disease than other strains of EHEC. In September, many counties reported the first cases of this outbreak, and in the end, twenty cases had been reported by various county councils. Interviews with those infected showed an early link to minced meat products. The conducted study indicated that the current source of infection was minced meat skewers cooked at home. EHEC bacteria die when heated; that is why it is important to cook minced meat products thoroughly. There is a risk that the skewers were not heated sufficiently when cooked at home.

Of those infected, four, three of them children, also contracted the severe secondary disease Haemolytic Uraemic Syndrome (HUS). For most people, an EHEC infection goes away within a week, but for about five percent of those affected (mostly children under five and the elderly), it can cause kidney damage and lead to renal failure. Suffering from HUS (which can even be chronic) often requires intensive care and dialysis. The children afflicted by this outbreak made a full recovery, and when the outbreak was summarized in early November, all the children had come home from the hospital’ (The description of this outbreak has been checked by the Public Health Agency of Sweden before publication).

This case illustrates how something as essential as food can involve a risk of serious illness. We do not know why or if these kebab skewers were not heated sufficiently, but it could have been affected by different factors, such as a lack of adequate knowledge or insufficient preparation time. Perhaps the person preparing them at home had been overly optimistic: it does not happen to me. Whatever the reason for the consumption of meat from insufficiently heated skewers, it could have had disastrous consequences for those afflicted and their relatives. In this case, small children became seriously ill, and it is easy to understand what a terrible experience this must have been for their parents. Most people who contract EHEC make a full recovery, but for those in risk groups, as in this instance, small children, it can lead to lifelong complications or even be fatal. The risk of contracting this kind of
foodborne infection can be reduced by sufficient food safety knowledge and behaviour. As a consumer, it is important to realize that even if you are not in a risk group yourself, you will probably cook for someone who is; that is why food safety knowledge must be seen as important for everyone (Abbot et al., 2007). In Sweden, about 500 cases of EHEC are reported each year, which is approximately five cases per 100 000 inhabitants, and of those, about half are thought to have contracted the infection abroad (Public Health Agency of Sweden, 2017).

Foodborne illnesses are common all around the world, and not just in developing countries. The World Health Organization (WHO) has therefore highlighted foodborne illness as a global health problem. Different foods entail different risks, and our food habits are changing very fast, even faster than ever before, and we have now become used to the all-year-round availability of different food items from all around the world, i.e. the food chain has become more global. The global food chain from farm to fork is more complex today than at any time in history (Newell et al., 2010). The consumer is the least studied part of the food chain, but research shows that foodborne illness can be significant attributed to unsafe consumer-level food handling (Byrd-Bredbenner et al., 2013; Jevšnik et al., 2008a; Ovca and Jevšnik, 2009; Redmond and Griffith, 2003a; Worsfold, 1997). Previous studies made by Redmond and Griffith (2004b) and Jevšnik et al. (2008a) have revealed that consumers feel themselves to be less responsible for the safety of the food they consume than other links in the food chain and often act on optimistic bias i.e. it does not happen to me. Other studies indicated that less than 25 % of the consumers believe they can contract foodborne illness through their practices and that food-processing plant and restaurants are responsible for the majority of foodborne illness (Nesbitt et al., 2009; Nesbitt et al., 2014; Redmond and Griffith, 2003a). It has however been estimated that about one in three cases of foodborne illness originates in the home (EFSA, 2015; Noerrung et al., 2012).

We have also changed our cooking habits, as we now for example more frequently have moved the kitchen outside. We tend to grill and cook al fresco more often, especially during the summer. These changes have also led to increased hazards due to a lack of proper storage and temperature control but also a dearth of cleaning facilities (FAO/WHO, 2016). These changes are placing greater demands on the consumer’s handling of new food items. At the same time, new pathogens are appearing, or familiar ones are being discovered in new food items or even in a new mutated form where they may unexpectedly survive in low temperatures (Altekruse et al., 1997; Kjærnes et al., 2007; National Food Agency, 2012; Newell et al., 2010; WHO, 2000). Improperly prepared food can lead to different kinds of foodborne infections, possibly with grave consequences for the individual in the form of acute diseases or serious secondary diseases, and in the worst cases, they can be fatal (Hillers et al., 2003; Kennedy et al., 2005; Langiano et al., 2011).
Armed with adequate knowledge of how to handle food correctly, the consumer can reduce their risk of contracting a foodborne infection. Unfortunately, several studies indicate gaps in consumers’ knowledge of safe food handling (Jevšnik et al., 2008b; Langiano et al., 2011; Marklinder et al., 2013; Raspor, 2008; Redmond and Griffith, 2003a; Taché and Carpentier, 2014).

One way to affect this could be to educate consumers already at an early stage of their consumer life, a time when many of our habits are formed (Bennett, 2010). Unfortunately, people have fewer opportunities to learn safe food handling early in their lives as this kind of instruction in schools has declined, resulting in that teenagers and adults lacking basic knowledge of how to avoid foodborne illness (Byrd-Bredbenner et al., 2010; Byrd-Bredbenner et al., 2007a; Haapala and Probart, 2004).

In Swedish compulsory schools, Home and consumer studies1 (HCS) have remained a mandatory subject. It, therefore, represents a unique teaching opportunity to reach all future Swedish consumers and to educate those already at an early stage of their consumer lives. Due to it having plenty of practical cooking with food as the teaching tool and being linked to the home, HCS could be a suitable forum for teaching the students how to safely handle, prepare and store different food items. In the Swedish HCS syllabus this area is defined as ‘Hygiene and cleaning when handling, preparing and storing food’ (National Agency for Education, 2011a).

Byrd-Bredbenner et al. (2013) has reported in a summary that the greatest proportion of food that we eat is prepared at home but that many consumers (even those in high risk groups’ e.g. as elderly, pregnant or small children) do not perceive themselves or someone in their family to be susceptible to foodborne illness. Sivaramalingam et al. (2015) point out another problem related that high-risk population as e.g. immunocompromised, pregnant woman and elderly do not identify themselves as high risk. Underestimation of risks associated with home preparation might results in that consumers neglect safe food-handling techniques (Sivaramalingam et al., 2015). As reported at least one out of three cases of foodborne illness has its origin in the private household; therefore, the link between HCS with its relation to the home and food safety education is of research interest.

Previous studies made by Abbot et al. (2007); Green and Knechtges (2015); Majowicz et al. (2015) have indicated flaws in food safety knowledge and behavior among young people why HCS students was considered as an important research perspective to include. Related to food safety education Sivaramalingam et al. (2015) have highlighted that limited research has been conducted on the food safety educators why a HCS teacher

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1 HCS is the Swedish abbreviation for what is referred to internationally as Home Economics.
perspective also should be added in this research. No research has been con-
ducted on food safety handling as part of HCS teaching in Swedish compul-
sory school. Given this background the focus in this thesis is on food safety 
learning from teachers’ and students’ perspectives, with HCS teaching in 
compulsory school as the research context.
Aim

The aim of this thesis is to explore food safety as part of Home and consumer studies education in Swedish compulsory school.

The specific aims of the papers included were

- to investigate food safety as part of HCS education and to provide insights into the self-reported food safety attitude, knowledge and behaviour among HCS teachers in Swedish compulsory schools (Paper I).

- to investigate the self-reported food safety knowledge and behaviour among Year 9 HCS students (Paper II).

- to investigate where students acquire their knowledge of food safety and how trustworthy they deem certain knowledge sources to be (Paper III).

- to explore what factors influence HCS teachers’ choices of learning content in relation to food safety (Paper IV).
Background

Home and Consumer Studies (HCS)

Compared to other school subjects, HCS is unique with its link to life in the home and the family. Moreover, it involves plenty of practical cooking with food as the teaching tool why the choice and handling of food is of importance. Earlier HCS research has however indicated that the teaching conducted is often based on recipe rather than on different food choices (Brunosson et al., 2014; Höijer, 2013). The food used during lessons is purchased by the HCS teacher and payed for by the school which is common for the Nordic HCS context. In some other countries (e.g. Malta and the U.K) the students are to bring the different food items from their home. Compared to that, the Swedish HCS context implies greater opportunities for the teacher to choose which food items to include into their teaching content. In Sweden the HCS budget is determined by the school why the conditions may differ when it comes to what food items to use but also for lesson length, group size and classroom design (Lindblom et al., 2013).

HCS is generally taught in a special HCS classroom, usually including different small kitchen units but also a communal area with dining tables. It has often been noted that interior decorations such as cookbooks, tablecloths, napkins and candles are used to relate the teaching to the students’ everyday lives and home environments (Hipkiss, 2014). Of all the Swedish compulsory-school subjects, HCS has the fewest teaching hours (118), which are usually spread over school Years 6 to 9 (i.e. between the age of 12 and 16) (Lindblom, 2016).

The precursor of HCS was introduced as early as the end of the nineteenth century due to industrialization and urbanization; this was a time when many people were moving to the cities, with poor living conditions as a consequence. The cities could not provide good homes for everybody, and many homes in the city were often dilapidated and poverty was rife, particularly among working-class families (Hirdman, 1983). Society devoted considerable attention to infection control and to the poor conditions of the working class, marked by bad food, housing and hygiene but also hard work (Qvarsell, 1993). To remedy this, it was considered that women needed to be trained in how to run a home. A need for some kind of domestic education for future housewives was discovered, together with major advances in nutri-
tional chemistry and physiology of nutrition, which the public should be allowed to learn from (Johansson, 1987).

The first home economics course was theoretical and introduced in Stockholm in 1881. In 1897, home economics was incorporated into elementary school teaching but only for girls and initially not part of regular teaching (Hjälmeskog, 2000; Hjälmeskog, 2006). Enrolling on this course also meant career opportunities for women from higher social classes to become home economics teachers (Johansson, 1987). In Uppsala, home economics teachers had been trained as early as 1895 at the School of Home Economics (Fackskolan för Huslig ekonomi) (Nordin and Barkfeldt, 1995). Now, over 120 years later, renamed the Department of Food, Nutrition and Dietetics (Institutionen för kostvetenskap), it still trains home economics teachers and is the host department for this thesis.

As early as the 1940s, a government proposal for the amalgamation of elementary schools, secondary schools and girls’ schools into a new school form was discussed. In 1962, the unified compulsory school was introduced into the Swedish school system. All students should receive the same teaching, and all school subjects were now mandatory. Home economics was now mandatory also for the boys, which might have affected the progress of equality in Sweden (Hjälmeskog, 2006).

That same year saw the introduction of the first curriculum, which since then has been revised regularly in 1969, 1980, 1994 and 2000 (only new syllabi) and in 2011. Before the introduction of the new syllabus in 2000, a Swedish Government Official Report (SOU 2000:29) noted that the complex consumer society required knowledgeable and informed consumers and that consumer education in schools needed to be improved. To clarify the part of consumer education in home economics, the subject was renamed home and consumer studies in 2000 (Cullbrand and Petersson, 2005).

The Swedish compulsory-school curriculum applies to all students, and besides the overall objectives and the guidelines, it contains the Education Act and subject syllabi. Each subject has its own syllabus that describes specific subject objectives and content. In the HCS syllabus, the core content is divided into three knowledge areas: Food, meals and health; Consumption and economy; and Environment and lifestyle. HCS also has three subject perspectives that should permeate all teaching: Health, Economy and the Environment (Figure 1). The syllabus contains knowledge requirements, i.e. various goals the students have to achieve to gain a certain grade. The students are graded from A to F, where A is the highest and F is a fail (National Agency for Education, 2011a).

2 Renamed home and consumer studies teachers in 2000.
A curriculum is to be understood in its own historical context since it is based on current societal conditions (Lundgren, 1989). The first HCS syllabus (1962) were by far more comprehensive and detailed, with a noticeable focus on food, living conditions, hygiene, consumer education, equality but also on, for example, dental health, which was highlighted in Sweden in the 1960s. Even if these syllabi have changed over time, their focus on domestic life and activities and the family has remained (National Agency for Education, 2011b). HCS teaches the students to develop an awareness of the consequences of making different domestic choices. Through acquiring knowledge, the students develop their ability to make conscious choices as future consumers (National Agency for Education, 2011a).

In Sweden, girls generally achieve higher grades than boys in virtually all school subjects (Wernersson, 2010). This was confirmed in an earlier evaluation of compulsory schools indicated that girls obtained higher grades also in HCS (Cullbrand and Petersson, 2005). That girls often assume traditional gender roles in the HCS classroom and thereby reproduce this has been observed in other Swedish HCS research made by Petersson (2007). The purpose of HCS teaching is to create an environment where the students can reflect upon their everyday practices. Even if the aim is to reflect upon everyday practice in household, studies have shown that students often find it difficult to see this connection between their home and HCS teaching (Höijer, 2013; Palojoki, 1997).

This thesis focuses on the knowledge area *Food, meals and health* in relation to the handling of food and how that can affect an individual’s health, which can be defined in different ways, but the most common definition is probably the one the WHO put forward in 1948: *Health is a state of complete physical, mental and social well-being and not merely the absence of*
disease or infirmity. This definition has, however, often been discussed and criticized, for example, for using the word complete and changes in population demographics as well as in the nature of diseases. This definition of health must be seen as a target goal. There have also been discussions about how and whether health can be measured, and one suggestion for a new definition of health is the ability to adapt and to self-manage (Huber et al., 2011). In HCS, teaching health is discussed in relation to food and what impact different food choices can have on an individual’s health (National Agency for Education, 2011b). In this thesis the focus is on how the student could influence their future health by learning some basic food safety principles.

Knowing in practice in HCS

Facts, understanding, skills, familiarity and accumulated experience are all examples of how the Swedish National Agency for Education (2011a) describes knowledge. In HCS, all these various examples of knowledge can be included on account of the subject’s holistic view of knowledge. HCS is a multidisciplinary school subject and HCS teaching combines theory with practice. Moreover, the epistemology of HCS is based on knowing in practice. Here knowledge comes to life through instruction in realistic situations. The students are to reflect upon and problematize everyday practices. They reflect upon the actions, i.e. the students work in the classroom and then contemplate on their actions from different perspectives (National Agency for Education, 2011b). The HCS syllabus emphasizes for all teaching the link between school and everyday life, but through its link to the home and the family, it can be particularly visible in HCS teaching, with the students’ everyday knowledge versus the teachers’ expertise (Hipkiss, 2014). This may involve a conflict as the school often tends to have an ‘academically correct solution’ (teachers expertise) to a problem while the students in everyday life have to solve problems from many different angles without a correct solution (Palojoki, 2003; Palojoki and Tuomi-Gröhn, 2001). This lack of connection can cause problems for the students learning although HCS teaching today focus more on the process during the lessons rather than the product at the end of the lesson (De Ron and Feldt, 2013).

According to a Swedish Government Official Report (SOU 2008:109), HCS has a considerable theoretical element but is, together with Physical Education and Health, Handicraft, and Technology, classed a practical subject, probably due to its large practical cooking component. But as with other practical school subjects, the teaching risks merely becoming a reproduction of daily practices, which might then result in a gap in the students’ learning process (Hedenborg, 2016; Johansson, 2002). Claiming that a subject is only
practical might contribute to recreating and maintaining limitations and misconceptions in the school (Johansson, 2002). Dividing school subjects into theoretical and practical simplifies reasoning seeing as they all can be considered to contain both practical and theoretical elements (Hipkiss, 2014). Molander (1996), one of the proponents of knowing in practice, has criticized Western knowledge traditions for separating theory from practice, claiming that participating in practical activities is no different to putting theoretical knowledge into effect. By applying an exploratory, comparative and reflective approach to practices, these activities can become knowledge. HCS teaching should problematize different household choices without being normative. The students are to develop knowledge of different choices so that they will learn how to make conscious decisions. Theory and practice are hereby seen as connected to complete units (National Agency for Education, 2011b).

HCS research
Domestic science became a research subject in Sweden as recently as 1992, which, from an international perspective, is late. HCS research in Sweden as well as in the other Nordic countries is quite limited. A lot has, however, happened in recent years, and in Sweden, HCS research made great strides when a Swedish Government Official Report (SOU 2007:28) noted that some compulsory-school subjects, including HCS, needed to have a more fundamental research-based teaching. This report served as the basis for the foundation of the Graduate School of Home and Consumer Studies (Nationella Forskarskolan i Hem och Konsumentkunskap (NFHK) in Sweden in 2011. This was collaboration between the universities of Uppsala, Umeå, Gothenburg and Kristianstad, which also provide HCS teacher training. The Department of Food, Nutrition and Dietetics at Uppsala University was primarily responsible for the Graduate School of Home and Consumer Studies, with six PhD students involved in the project based at the four collaborating universities. This project is run by this graduate school, and the first doctoral dissertation was defended at Umeå University in December 2016.

I, myself, am an educated HCS teacher, but with quite limited working experience. That might have been as a disadvantage, but as researcher I consider it to have been an advantage. My knowledge regarding food safety has been developed during these years and has been incorporated with my knowledge as a HCS teacher in order to study food safety learning in HCS.
Didactic research

Using such words as stimulating, creativity or curiosity, the curriculum characterizes learning as creating a desire and a will to learn. The students are to acquire different and unvarying knowledge and a lifelong desire to learn (National Agency for Education, 2011a). The curriculum contains many fine and well-chosen words about the importance of learning, but what do we actually mean by learning, a very complex concept as it has no generally accepted definition. It is characterized by complexity and is used by many practitioners in numerous scientific fields (Illeris, 2009). As the concept lacks specification, it is often clouded in confusion and frequently used in sentences without further explanation, like they have not learned or failing to learn or that someone has learned. The description of learning often needs to be clarified and put into a context (Gray and MacBlain, 2012). The focus of this thesis is on food safety learning in HCS, where the students are to reflect upon their actions in knowing in practice. Based on that, learning here is inspired by Marton’s definition that learning implies a qualitative change in a person’s way of seeing, experiencing and understanding something rather than a quantitative change in the amount of knowledge a person possesses (Marton and Tsui, 2004). This definition on learning could be related to Knowing in practice in HCS teaching.

Marton also describes two approaches to learning, deep and surface, that will be used here. The deep approach is characterized by a critical interaction with the learning content, i.e. learning with understanding. The other approach (surface) is more of a temporary learning, with a focus on memorizing facts without further reflection. Both approaches can be suitable for different learning contents (Beattie et al., 1997; Marton and Booth, 1997). The original research on different approaches to learning examined students in higher education, but the research here looks at compulsory school teachers and students. For their learning, compulsory school students’ learning processes are more dependent on the teachers compared to students in higher education; therefore, the focus is on their choices of teaching content and how this might impact students’ learning, but with the theory of different approaches used as an analytical tool.

Didactic research has various traditions. This thesis uses the concept didactic based on the German/Nordic tradition, the focal point of which is a holistic view of the teaching and learning process, and all research has to be seen and analyzed as a special social context in order to reflect on the relationship between theory and practice (Hudson, 2007; Moreno Herrera, 2015; Uljens, 1997b). Didactic research focuses on learning and how learning is organized, which is affected by different factors, e.g. political decisions, curricula, parents, teaching traditions and frame factors, i.e. factors that limit and, to a certain extent, determine the teaching process (Lindström and Pennlert, 2012).
Didactic research is of importance to study as it focuses on the educational content, different traditions and approaches regarding the choice of content and teaching in a specific subject area according to Englund (1991). Each teaching session is didactically based on a number of choices of, for example, lesson content, lesson organization and teaching methods. All these choices will have consequences for what the students learn and how their socialization develops (Svedner and Säfström, 2000).

These choices can be affected by the teacher’s personality, education, experience, interpretation of the syllabus, subject knowledge and, of course, their own personal interest (Lindström and Pennlert, 2012). A choice of teaching content means that something else risks being omitted from the teaching, which might affect the students’ learning (Molin, 2006). A didactic interaction like teaching means that certain values, knowledge and insights are to be communicated between teacher and student. There are, however, gaps between what is taught and what is actually learned (Svedner and Säfström, 2000). Assimilate teaching is an active process where the content is identified differently depending on the student’s previous experience, and trying to reduce these gaps is a challenge for the teachers. By having a primary teaching purpose, with a specific goal for each lesson, the gaps in learning might decrease (Svedner and Säfström, 2000).

In didactic research, teaching and learning are seen as two sides of the same coin, two aspects of a whole but at the same time not interchangeable (Uljens, 1997a). Teaching is often conducted without further reflection on either its content or its method. Some subject traditions seem to dominate and can often be seen as taken for granted in the particular subjects (Uljens, 1997a). As every learning situation is unique, didactic research, therefore, needs to be made contextual (Molin, 2006). Within didactic research, the concepts What, How and Why are of importance, together with the teaching goal (Which) (Lindström and Pennlert, 2012; Svedner and Säfström, 2000; Uljens, 1997a). The goals are based on what kind of learning you want the teaching to produce in terms of knowledge and personal development, i.e. what will characterize the learning process. The syllabus describes What the teaching should include and very little about Why and almost nothing about How (Emsheimer et al., 2005).

The frame factor theory was introduced in the late sixties and has ever since been a relevant tool for understanding and investigating school activities (Broady, 1999). Teaching is a process limited by different frames. In frame factor theory, it is important to connect the macro level (e.g. syllabus) to the micro level (e.g. lesson length) as they will both have a marked influence on the teaching. At the same time, the factors can be seen through, for example, syllabi and teaching hours as reflections of societal interests and national ambitions (Abrahamsson et al., 1999).

Initially, the theory was used to evaluate how long it took students from different school forms (before the creation of compulsory schools) to attain a
specific teaching goal, then after that, time and the curriculum became the focus (Lundgren, 1972). The theory has been used in different ways in teaching-related disciplines and in various research contexts (Broady, 1999). Nevertheless, the essence of the theory is how different factors frame and limit the teaching, and in this thesis discussed in the HCS context.

From hygiene to food safety teaching

The word hygiene comes from Greek and means health. Hygieia in Greek mythology was the goddess of health and from whose name the word hygiene originated. She was the daughter of Askelpios, the god of medicine, and they seem to have been closely associated with each other (Compton, 2002). This is no coincidence because hygiene and medicine have been linked throughout history, and as early as antiquity, it was suggested that improved hygiene reduced infectious diseases (Johannisson, 1990). Based on the advances in international hygiene research, the end of the nineteenth century saw the Swedish government wanting to invest in preventive medicine.

A public health institute specializing in public health prevention measures was founded to organize the field of hygiene research. One of the main prioritized areas was food hygiene and food control. In 1941, the National Institute of Public Health was established at Karolinska Institutet, and food hygiene had its own department, which was abolished in 1971 and instead became part of the newly founded Swedish National Food Agency (Orrenius and Persson, 2010). They are, together with the Public Health Agency of Sweden (formerly the Swedish Institute for Communicable Disease Control), the government agencies responsible for foodborne infection issues in Sweden, and this thesis uses them as suitable sources for reports, facts and statistics. It is, however, important to separate hygiene from cleanliness, which is something different and created by our culture. Taking the right cleanliness measures implies a kind of status, and most people in the Western world are aware of different norms for, for example, regular showers or not having unwanted hair growth. Hygiene is more about keeping clean to prevent various infections and is often linked more to hospitals (Douglas and Kallrén, 1997). According to the European Food Legislation (EC No 852/2004) food hygiene is defined as ‘The measures and conditions necessary to control hazards and to ensure fitness for human consumption of a foodstuff taking into account its intended use’.

Further on in this text, the concept of food safety will be used. Food safety measures might be as old as human history seeing that we started to recognize and avoid naturally toxic foods as early as the beginning of time (Griffith, 2006). The term food safety was coined in the United States over a hundred years ago and represents a variety of food- and risk-related areas.
Food safety is to protect consumers from different risk areas, such as allergens (e.g. peanuts), chemical (e.g. pesticides), physical (e.g. pieces of glass in the food) or microbiology (e.g. pathogens). Present thesis will focus on how to mitigate microbiological risks when food handling in HCS. Ensuring food safety is paramount as consumers affect it directly through their storing, handling and preparation and that might affect their health.

The importance of highlighting food safety consumer education has been observed (National Food Agency, 2012; Noerrung et al., 2012; WHO, 2015). Unfortunately, attempts to embrace a food-safe behavior have often turned out to be unsuccessful (Redmond and Griffith, 2004a; Verbeke et al., 2007). Historically, the home has been a place where food knowledge has been passed down the generations. It has been reported that the opportunities for children to learn food handling through observations at home have, however, decreased due to lifestyle changes, such as women working outside the home and an increased consumption of pre-prepared convenience food (WHO, 2000; Byrd-Bredbenner et al., 2007; James et al., 2009; Raspor et al., 2008; Byrd-Bredbenner et al., 2010). These opportunities may not have become fewer due to deliberate choice but rather as a consequence of our need to save time in order to organize our everyday lives (Warde, 1994).

Food handling processes that can be linked to safe food handling, for example how to wash different food items and the importance of using separate utensils, are no longer part of cooking as we now often use pre-washed and pre-chopped vegetables (Kjærnes et al., 2007). Education is important to food safety knowledge (Jevšnik et al., 2008a; Mullan et al., 2013; Sumeet et al., 2005; Taché and Carpentier, 2014), and as many children do some kind of food preparation and cooking, it is important already from an early age (Byrd-Bredbenner et al., 2010; Haapala and Probart, 2004; Jevšnik et al., 2008a; Ovca et al., 2014).

Part of the core content of the 2011 HCS syllabus, as defined in the area: Food, meals and health, is ‘Hygiene and cleaning when handling, preparing and storing food’ (National Agency for Education, 2011a). Hygiene has been part of the HCS syllabi since the first one in 1962, where hygiene was divided up into three types: personal, housework and food. The 1994 and 2000 syllabi made no reference to the concept of hygiene, but it was reintroduced into the 2011 syllabus. As mentioned earlier, a syllabus is to be understood based on its own historical context, and according to the Swedish National Agency for Education, the implementation was due to an increasing number of foodborne infections in Swedish society and this knowledge being important from a health perspective (National Agency for Education, 2011b).
The four Cs

There are several examples of abbreviations or key messages to illustrate the importance of different hygiene steps for consumers. The WHO uses ‘five keys to safer food’ (WHO, 2016) and the U.S. Partnership for Food Safety Education Fight BAC! uses the core four practices (Fightbac, 2016). Inspired by the British Food Standards Agency (FSA), this thesis employed the four Cs: Cooking, Cleaning, Chilling and Cross-contamination (to avoid). They all represent areas closely connected to an increased risk of foodborne infections and have been used successfully in school campaigns. Moreover, the four Cs were easy to use in the written text in order to clarify these areas.

The FSA employed the four Cs as a communicating strategy to promote safe food handling in the home. The aim was to improve the awareness and application of the four Cs, with a special focus on the school context. Concentrating on schools was viewed as a future investment, and this approach seems more likely to achieve a long-term behaviour change (FSA, 2016). The four Cs are used in a food safety perspective and will here be put into context based on information from the Public Health Agency of Sweden and Lantz et al. (2009) and with the FSA’s key messages in parentheses (Table 1).

**Cooking** (Cook food properly): it is important to cook food properly as undercooked food poses a greater danger. Chicken and minced meat, often used in HCS teaching, are both considered risk foods for containing the pathogens *Campylobacter* (chicken) and *Enterohaemorrhagic E. Coli* (EHEC) (minced meat), which are both dangerous with a low infectious dose. As for EHEC, even <100 bacteria cells can cause serious illness. The Swedish National Food Agency recommends that raw minced meat should not even be tasted as even a small amount of contaminated minced meat can lead to serious illness and suffering an EHEC infection, especially among young children and the elderly (National Food Agency, 2007).

**Cleaning** (Wash hands and keep them clean): washing hands is the most important factor for preventing foodborne illness but is still sometimes neglected (Angelillo *et al.*, 2001; Bloomfield *et al.*, 2007; Chittleborough *et al.*, 2012; Kendall *et al.*, 2004). Washing up dishes, cleaning surfaces and using dishcloths also address this C. Norovirus (the winter vomiting disease) is an example of a disease that can be prevented through improved hand hygiene as it is contracted directly or indirectly by infected persons or contaminated food. Another common form of foodborne illness is caused by *Staphylococcus aureus*, which is linked to bad cleaning practices when handling food and where the illness is intoxication. It is often due to the food having been contaminated by the hands in combination with storing in abuse temperatures. The person cooking might have had a sore on their hand or poked their finger up their nose or in their ear. According to Kluytmans *et al.* (1997) is
about 20% of people persistent carriers and 60% intermittent carriers of Staphylococcus aureus.

**Chilling (Chill food properly):** a quick food cooling process is important for preventing foodborne illness. Cooling food down at room temperature, i.e. allowing the cooling to take too long, can lead to an increased risk of foodborne infection, especially of spore-forming bacteria, such as Bacillus cereus, where some form toxins that penetrate the colonic wall.

Rice and starchy dishes are here seen as risk foods. Cold food storage is also to do with chilling and is important for preventing foodborne illness. One risk here is the pathogen Listeria monocytogenes, which can be transmitted through long-shelf-life foods like smoked salmon, charcuterie products and soft cheese. Of importance here are storing food at the right temperature and ensuring that the expiration date has not passed. Contracting Listeriosis is not only more common among at-risk persons, such as pregnant women, the elderly and people with a weakened immune system, but also poses a greater danger to them.

**Cross-contamination (to avoid):** controlling cross-contamination is key to preventing foodborne diseases. By keeping raw and cooked food separated and always using different cutting boards and utensils during food preparation, many risks can be avoided. If the same cutting board is used for raw food such as chicken and then for salad vegetables, there is an increased risk of contamination and thereby a risk of contracting Campylobacteriosis.

Table 1. Different bacteria and viruses relevant to HCS in relation to the four Cs.

<table>
<thead>
<tr>
<th>The four C</th>
<th>Bacteria or Virus</th>
<th>Food handling</th>
<th>Various information regarding bacteria or virus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cooking</strong></td>
<td>EHEC</td>
<td>Raw or undercooked minced meat</td>
<td>Low infectious dose.</td>
</tr>
<tr>
<td></td>
<td>Campylobacter Jejuni</td>
<td>Undercooked chicken meat</td>
<td></td>
</tr>
<tr>
<td><strong>Cleaning</strong></td>
<td>Norovirus</td>
<td>Unwashed hands</td>
<td>Norovirus causes the winter vomiting disease, low infectious dose</td>
</tr>
<tr>
<td></td>
<td>Staphylococcus aureus</td>
<td>Unwashed hands</td>
<td>Found, for instance, on the skin, in noses and in wounds and can easily end up on food made with their fingers</td>
</tr>
<tr>
<td><strong>Chilling</strong></td>
<td>Bacillus cereus</td>
<td>Food not cooled down quick enough</td>
<td>Spore-forming bacteria</td>
</tr>
<tr>
<td></td>
<td>Listeria monocytogenes</td>
<td>Long-shelf-life food in the refrigerator and eaten without being heated up, ready-to-eat food</td>
<td>Risk for pregnant women and vulnerable groups with reduced immune systems</td>
</tr>
<tr>
<td></td>
<td>Staphylococcus aureus</td>
<td>Food not cooled down quick enough</td>
<td>Produces heat-stable toxins in food</td>
</tr>
<tr>
<td><strong>Cross-contamination</strong></td>
<td>Campylobacter Jejuni</td>
<td>Contamination caused by using the same utensil for more than one food item</td>
<td>Low infectious dose.</td>
</tr>
<tr>
<td></td>
<td>EHEC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

24
Foodborne illness

The WHO definition of a foodborne outbreak is at least two cases of illness transmitted through the same ingested food item. Foodborne infections can be divided into two groups: infection and intoxication. In the case of infection, the ingested food contains harmful microorganisms that multiply in the intestine and cause illness, e.g. Campylobacteriosis. In contrast, intoxication is when the food is contaminated with toxins primarily formed by bacteria, the result of bacterial growth in the food item, e.g. Staphylococcus enteritis. The pathogen Staphylococcus aureus can form a heat-resistant toxin, i.e. it acts even if the pathogens die when cooked properly, which can cause food poisoning.

When investigating foodborne outbreaks, the Swedish government agencies have found that the causes have often been a lack of knowledge, carelessness or other food safety deficiencies such as improper cooling, incorrect storage temperatures, neglected hand washing, insufficient cooking but also infection carriers that have contaminated the food. As noticed all these issues were closely connected to the four C. It is often difficult to find what causes a foodborne outbreak, and cases involving an unknown source are becoming more common (Public Health Agency of Sweden, 2017).

Improperly prepared food can lead to different kinds of foodborne infections, possibly with grave consequences for the individual, namely acute diseases, serious secondary diseases or even fatality (Hillers et al., 2003; Kennedy et al., 2005; Langiano et al., 2011). Foodborne illness can also result in high societal costs in the form of sick leave and hospitalization but also in various inquiries that government agencies conduct in order to trace the sources of different outbreaks (Redmond and Griffith, 2007). In Sweden, the estimated yearly cost of the five most common foodborne diseases (Campylobacteriosis, salmonellosis, yersiniosis, shigellosis and EHEC) exceeds SEK 1 billion (≈ €100 000 000). The most expensive and most common infection is Campylobacteriosis. However, calculated per illness, an EHEC infection is the most expensive; one EHEC infection costs Swedish society more than twice as much as a case of any of the other diseases (Agrifood economics centre, 2015).

Statistics however indicate that approximately one in three cases of foodborne infections originates in the home (EFSA, 2015; Noerrung et al., 2012). But as many cases of foodborne illness are believed to be sporadic, mild, unconfirmed, cured at home and thereby unreported to the responsible government agencies, experts estimate that the actual number of cases that arise from incorrect food safety actions in the home is much higher (Agrifood economics centre, 2015; Byrd-Bredbenner et al., 2013; Nesbitt et al., 2009).

In Sweden, relatively few foodborne infections are reported to the responsible government agencies, but it is believed that there are many unreported cases. Three studies have, however, estimated that approximately 500 000
cases of foodborne illness occur each year in Sweden (Lindqvist et al., 2001; Norling, 1994; Toljander and Karnehed, 2010). It can be concluded from the results that about five per cent of the Swedish population of approx. 10 million are diagnosed with some form of foodborne infection each year. The difference between the estimated and the reported number of cases indicates that the reporting system has had problems; however, like other reporting systems, it has improved in recent years because the notification of foodborne infections can be made more easily online. This will hopefully lead to fewer unreported cases and thus a more significant foodborne infection statistic that can benefit public health work.

In Sweden, the health care system must report cases of foodborne diseases to the Public Health Agency of Sweden. The five aforementioned most common diseases (Campylobacteriosis, salmonellosis, yersiniosis, shigellosis and EHEC) are all examples of notifiable diseases in Sweden. Foodborne diseases caused by *Staphylococcus aureus* and *Bacillus cereus* are among the foodborne diseases that do not have to be reported to the government agencies. It is not certain that diagnoses will be reported to authorities and problems with the sampling system has also been noticed (Agrifood economics centre, 2015).

As mentioned before it has been estimated that approximately one in three cases of foodborne illness originates in the home (EFSA, 2015). As HCS teaching has its starting point in the home, food safety as part of HCS thereby is of research interest. This thesis does not aim to give an exhaustive description of the entire spectra of foodborne illnesses but of those of relevance and linked to the Swedish context and the research area of HCS teaching of food handling (Table 1).

**Risk communication**

The HCS teacher can be considered a risk communicator to the students but that requires the former to have knowledge as well as risk awareness. Teaching food safety among students could be a balancing act between information but at the same time not creating anxiety for food. Even though the students do not belong to a vulnerable group themselves they will probably soon as future caregivers prepare food for a person more at risk with foodborne illness (e.g. elderly, young children and pregnant woman)(Abbot et al., 2007). Food safety knowledge can have benefits and might reduce the risk of being influenced by media reporting which can be biased and more focused on attention instead of information (Jin and Han, 2014; Kjærnes et al., 2007).

Risk communication is about conveying and transmitting information about risks and hazards and often involves an estimation of the likelihood that a hazard will result in something undesirable happening or the extent of
the damage it might cause. The communication is effective if it alerts the target audience to the hazards and what to do about them without arousing anxiety (Breakwell, 2000). Different audiences view a risk from varying perspectives based on their experiences or different demographic backgrounds, e.g. women perceive food hazards to entail a greater risk than men do (Breakwell, 2000; Verbeke et al., 2007). People tend to act according to optimistic bias i.e. foodborne illness are more likely to affect someone else (Joffe, 1999; Weinstein, 1984). People are frequently over-optimistic about their own risks and often tend to rate their own personal risks as being less when they compare themselves to an ‘average’ member of society (Verbeke et al., 2007). Optimistic biases might be a barrier to processing risk information about promoting risk-reducing behaviour (Breakwell, 2000; Joffe, 1999; Weinstein, 1984).

Traditionally, it has been up to science and experts to answer questions and to government agencies to provide the public with answers in the form of warnings and recommendations. This rests on the premises that the experts, taking their science-based risk assessments as the starting point, can determine what really is hazardous to our health and that a majority of the public will follow their advice and that of government agencies. This is not always the case in reality, where experts and the public have often-conflicting risk perceptions (Breck et al., 2002; Verbeke et al., 2007).

Risk communication is part of the risk analysis framework, which also includes risk assessment and risk management. Risk assessment is where experts identify and characterize different risks, more related to natural science. Risk management entails selecting options and introducing controls to ensure a suitable level of protection and apply mainly to politics and legislation (FAO/WHO, 2016; Verbeke et al., 2007). Risk communication should convey the various risks and benefits associated with particular food choices and actions and is typically considered within the domain of social sciences (Verbeke et al., 2007). The overall goal of risk communication is twofold: (a) to protect people’s health by providing information that enables them to make informed food safety decisions and (b) to increase their understanding of the reasons for needing to follow these practices (FAO/WHO, 2016).

Trust is important when relying on a source of risk communication (FAO/WHO, 2016; Krystallis et al., 2007; Lofstedt, 2006; Wickenberg et al., 2004). Trust is built on culture and participation, and people tend to trust those they are close to (e.g. family and friends) the most (Hawley, 2014; Sztompka, 1999). The consumer might regard, for example, the local butcher’s meat as less of a risk than supermarket-bought meat (Joffe, 1999). People are more motivated to trust a credible source of information that they perceive to have adequate knowledge and expertise of. People may not believe or listen to information they distrust, which can have potential health consequences (FAO/WHO, 2016). Distrust is a problem for risk communicators if it interferes with the message and general aim. Both the communicator
and the message can be distrusted. To create trust in risk communication messages, they need to be correct and understandable in order to establish a more realistic perception of risk and thus reduce worries, otherwise people tend to worry too much or too little (Kjærnes et al., 2007).

Knowledge is important for the risk perception, and it can be a challenge to communicate risk information to a consumer who does not look for information themselves. Kornelis et al. (2007) gives example of how the use of milk cartons might be a valuable information source to reach this group of consumers. In Sweden, dairy products, especially milk cartons, often include, together with facts about them, a fun text that many consumers find amusing to read. Their packaging also contains a recommendation that their storage temperature should be +8°C or lower. That is four degrees warmer than the National Food Agency recommend for minimizing the risk of microbiological growth (National Food Agency, 2011).

Research among students

To gain an insight into students’ perceptions, we have to conduct research with children (<18 years) and find a part in their daily situation. Children’s participation in studies increases our theoretical understanding of the inclusion and exclusion that have a large impact on their lives. Children are individuals with their own social experience, but historically, research has been on children instead of with children. They were often marginalized and only viewed as unfinished adults, whose ability to participate in research was limited due to, for instance, their undeveloped cognitive ability. Researchers were considered the best children’s experts, and during the research, the children’s parents, teachers or other people close to them were used (Christensen and James, 2008).

Most childhood researchers seem to agree that the last few decades have witnessed a paradigm shift within the research area, even though some see the shift as exaggerated (Ryan, 2008). One reason for this shift was that children were now seen as actors in their own context. During the 1980s and 1990s, the view of children’s participation in research changed in many fields of research (Christensen and James, 2008; Clark, 2011; McLeod and Thomson, 2009). Today children are part of the research, i.e. researching with children. Children thereby participate in research as children’s experts. This development in research with children has contributed to another in many children-related areas, such as school, child care, teacher training, but also in politics and psychology (Christensen and James, 2008). It is important for child research to include children’s views and perceptions because they are the only ones who can provide insights from that perspective. It is also important to respect the children and to take their opinions seriously, for their ability to describe their world and their actions are much more
developed than previously thought. The same research methods can, with some small adjustments, be used in child research, and, for instance, most children older than eleven are mature enough to participate in surveys if the language is adapted for them (Christensen and James, 2008).

Delimitations

Food handling, food preparation and food storage knowledge may, especially due to the reduced food waste, benefit several important areas in HCS, such as the economy and the environment. But as the area of research is so extensive, it has been necessary to narrow the research focus down to food safety learning in HCS from a didactic perspective.
Method

This thesis was started in 2011. Its three studies produced four papers (Table 2). In Paper I, a web-based questionnaire was used to collect data among HCS teachers (Appendix 1). Study 2 included a questionnaire distributed to Year 9 students, the results of which were used for Papers II and III (Appendix 2). Different parts of Study 2 were statistically analyzed in each paper. In the last study, qualitative interviews were conducted with HCS teachers and analyzed using a thematic content analysis with different themes identified and presented in Paper IV. In all the papers, we have employed the four Cs: Cooking, Cleaning, Chilling and Cross-contamination (to avoid), which represent areas closely linked to an increased risk of foodborne infection (Table 1) (FSA, 2016). Chicken and minced meat served as examples of food that could imply a risk, as highlighted by the Swedish National Food Agency. An overview of the studies and papers is presented below.

Table 2. An overview of Studies 1–3 and Papers I–IV.

<table>
<thead>
<tr>
<th>Study</th>
<th>Paper</th>
<th>Material</th>
<th>Design</th>
<th>Data collection</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I</td>
<td>335 HCS teachers</td>
<td>Quantitative</td>
<td>National web-based questionnaire, April–June 2012</td>
<td>Descriptive and chi-square tests</td>
</tr>
<tr>
<td>2</td>
<td>II</td>
<td>529 Year 9 students</td>
<td>Quantitative</td>
<td>Questionnaire using a student response system, September 2013–January 2014</td>
<td>Descriptive, cross-tabulation and chi-square tests</td>
</tr>
<tr>
<td>2</td>
<td>III</td>
<td>529 Year 9 students</td>
<td>Quantitative</td>
<td>Questionnaire using a student response system, September 2013–January 2014</td>
<td>Descriptive, cross-tabulation and chi-square tests</td>
</tr>
<tr>
<td>3</td>
<td>IV</td>
<td>10 HCS teachers</td>
<td>Qualitative</td>
<td>Individual interviews, 2015</td>
<td>Thematic content analysis</td>
</tr>
</tbody>
</table>
Data collection and respondents

Paper I

To gain an overall picture of food safety teaching in HCS, a number of HCS teachers were surveyed. The questions were based on the four Cs and food safety information from the Swedish National Food Agency. Other similar research studies were also used as inspiration and redesigned for the Swedish context. The web-based questionnaire in Paper I consisted of thirty-two self-reported questions about the teachers’ food safety attitude, knowledge and behaviour. Four questions contained sub-questions (the total came to sixty), and the questionnaire included different kinds of questions: matrix questions with ranking options, closed questions with defined response options and demographic questions at the end of the survey (Appendix I) (Trost and Hultåker, 2007).

Four questions described different fictional lessons and had various suggestions for the teaching levels of four important food safety areas: Best-before date and Use-by date, Refrigerator temperature, Handling chicken, and Handling minced meat. The teachers were to indicate which level corresponded best to their teaching. The option I don’t teach this was the lowest level, while the highest problematized the subject area the most, for example handling chicken: I give out the food items cooked according to the recipe, we talk about handwashing, how the food items should be cooked, they have separate cutting boards, I provide facts about dangerous bacteria. The questionnaire was pre-tested at different stages by twelve HCS teachers to ensure that they found the questions intelligible and suitable for the HCS context. After some modifications, the final questionnaire was distributed online using the questionnaire program Questback 9.6 (Bridgeport, CT, USA). The time for completing the questionnaire was estimated to about 15 minutes and the only including criteria was that they were working as a HCS teacher. All questions needed to be filled out in order to submit the responses.

As there is no available register of active HCS teachers in Sweden, the participants had to be recruited elsewhere. Statistics Sweden provided a list of e-mail addresses, as did two HCS teacher networks; in total, 2,678 e-mail addresses were on the recipient list. Some were incorrect, so the e-mails bounced back immediately, and some went, for example, to municipalities or registrar’s offices at independent schools. The e-mails, with the attached survey invitation, were sent to the schools and then forwarded by the recipient to the HCS teacher. A total of 335 teachers participated in the survey, which can be seen as a low response rate compared to the number of addresses on the electronic mailing list. But given the difficulties contacting the teachers without a list of names and the 335 respondents correspond to a participation rate of about 20% of all active HCS teachers in Sweden in 2012 (n = 1752), the response rate must be deemed acceptable considering the
circumstances. When discussing this, it is important to also take into account the similarities between the demographic statistics in this survey and those published by the Swedish National Agency for Education (Table 3).

Table 3. Demographic data of the responding HCS teachers compared with statistics from the Swedish National Agency for Education (May 2012).

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>This study % (n)</th>
<th>Statistics from the Swedish National Agency for Education % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal HCS education</td>
<td>80 (269)</td>
<td>80 (1395)</td>
</tr>
<tr>
<td>No formal HCS education</td>
<td>20 (66)</td>
<td>20 (357)</td>
</tr>
<tr>
<td><strong>Gender:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female:</td>
<td>94 (316)</td>
<td>93 (1622)</td>
</tr>
<tr>
<td>Male</td>
<td>5 (19)</td>
<td>7 (130)</td>
</tr>
<tr>
<td><strong>School form:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal school</td>
<td>84 (280)</td>
<td>84 (1463)</td>
</tr>
<tr>
<td>Independent school</td>
<td>16 (54)</td>
<td>16 (289)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100 (335)</td>
<td>100 (1752)</td>
</tr>
</tbody>
</table>

The survey received responses from all twenty-one Swedish counties and matched well with the distribution of schools in Sweden as the highest number of respondents came from the three counties where most schools are located (Stockholm, Västra Götaland and Skåne). A failure analysis could not be performed because there was no information about the number of questionnaires forwarded to the teachers i.e. how many teachers’ that were invited to participate in the questionnaire.

Papers II and III

The same questionnaire with twenty-six self-reported questions was used for Papers II and III. To allow for comparison it was created based on Paper I’s questionnaire, which took the four Cs as its starting point. The questions concerned the students’ food safety knowledge and behaviour as well as the sources of knowledge and trust they drew on. The questionnaire included closed questions, statements with the response options Yes, No or Don’t know, and demographic questions. The questionnaire ended with three questions about how often they cooked at home and their sources of knowledge of and trust in food safety information (Appendix II). The demographic questions were at the beginning of the questionnaire to ensure the method, and it opened with some trivial questions, for instance what day it was or
which school year they were in. This was in order to get the students used to the instrument.

A new data collection tool, a student response system (SRS), was introduced at the students’ schools. All questionnaire questions were inserted into their respective *PowerPoint* lecture slides displayed on a projection screen using the response program Turning Point 2008. When a *PowerPoint* slide with a question appeared, the students answered using a small wireless clicker. Each response option had a corresponding letter, and the students pressed their clickers to select a multiple-choice answer. The target group was Year 9 students (in their last year of compulsory school); Year 9 is when the students should have received most of their HCS instruction.

To adapt the language of the questions to the ages of the participants, four students in the prospective age group (15–16 years old) pre-tested the questionnaire (Christensen and James, 2008), as did two HCS groups in order to verify the technique and check that the respondents would find the questions intelligible. To test the feasibility of the method, twenty-one students in the prospective group answered a paper version of the questionnaire. These surveys were compiled, and the response distributions correspond well to the study carried out using the SRS system; however, these results were not included in the findings. Forty-six schools were contacted from a convenience selection in different parts of Sweden. Of those, eighteen schools from central, northern and southern Sweden participated. A total of 533 Year 9 students attended these eighteen schools, two of whose students declined the invitation and two dropped out during the survey, thus resulting in 529 participants.

**Paper IV**

Based on the results of Studies 1 and 2, qualitative interviews were conducted individually with ten HCS teachers (eight female and two male) about their food safety teaching. To ensure that all the interviews included the same lines of questioning, a mind map with four different predetermined topics was used (Figure 2) (Patton, 2002). A pilot interview was conducted, followed by some small changes of the topics. A second pilot interview was planned and conducted, but as we considered no changes necessary, it was included in the study.
All the interviews were conducted in Swedish, recorded on a Dictaphone and then transcribed verbatim. The interviews lasted between thirty minutes to one hour. In total, the transcriptions produced 124 pages of text. All interviews took place at the participating schools except for one, which was held at a café due to time constraints and the location of the school. The respondents were recruited through a convenience selection from a local network of HCS teachers. We tried to achieve a variation of different working years and gender (≈ 7% male HCS teachers in Sweden). At the time of the interviews, all the teachers worked as HCS teachers; they had received formal HCS training but had different professional experience.

Data analysis

Statistical analysis (Papers I–III)

All the statistical analyses in Papers I–III were conducted using the latest version of SPSS (IBM Statistical Package for Social Sciences). The analyses were undertaken separately for different demographic groups, and the level of significance was set at \( p < 0.05 \). Descriptive statistics, cross-tabulation and chi-square tests were used for the statistical analyses. In Paper I, the teachers’ responses were analyzed in terms of a Total group, a Group with a certain number of working years (10 years or less compared to over 10 years of professional experience) and a Group with or without formal HCS education.

Paper II focused on the students’ food safety knowledge and behaviour, and the results were analyzed based on the following aspects: the total group, gender and their cooking habits. In Paper III, the students’ gender, cooking habits, sources of knowledge and trust, were used in the analysis. Moreover, different response options were collapsed into larger groups to make statistical testing possible (Djurfeldt et al., 2010). The response options Internet and TV were put into the group Media, and the response options Other person/relative, Books and Others became the group Others.
Thematic content analysis (Paper IV)

A thematic content analysis was conducted in several qualitative steps (Braun and Clarke, 2006; Bryman, 2012; Yin, 2011); the first was to thoroughly read and reread all the data. Then comments about the four Cs (Cooking, Cleaning, Chilling and Cross-contamination (to avoid) were marked in the text, as were the subsequently identified key concepts (Seidman, 1998; Yin, 2011). The papers were manually coded using different colored pens and notes. In addition, the qualitative software program NVivo 10 (QSR International Pty Ltd., Australia) categorized the transcripts. Finally the key concepts were then thermalized and structured (Table 4)

I, performed the preliminary analysis, but to improve interrater coding reliability and confirm the findings, Helen Göranzon and Ingela Marklinder were involved throughout the process, namely they repeatedly read and categorized the transcripts. At the end of the analysis process, it was agreed to categorize three themes for the teachers’ didactic choices of teaching content.

Table 4. The analysis process for the Thematic content analysis.

<table>
<thead>
<tr>
<th>Text from interviews</th>
<th>Key concept</th>
<th>Sub-theme</th>
<th>Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘If you are short on time, of course there will be carelessness…’</td>
<td>Time</td>
<td>Frame factors</td>
<td>Frame control</td>
</tr>
<tr>
<td>‘I have many routines that I don’t understand, because they are carried out automatically’</td>
<td>Automatic</td>
<td>Routines</td>
<td>Traditional HCS learning environment</td>
</tr>
<tr>
<td>‘There is no danger related to the minced meat I use’</td>
<td>Risk unawareness</td>
<td>Experience</td>
<td>Subjective selection</td>
</tr>
</tbody>
</table>

Ethical considerations

All the studies in this thesis have followed the Swedish Research Council’s ethical guidelines, which are based on the Declaration of Helsinki (Swedish Research Council, 2002). Referring to the Act (2003:460) on Ethical Review of Research Involving Humans, the Central Ethical Review Board has stated that this kind of research does not require ethical vetting (Central Ethical Review Board, 2015).

However, for Study 2 we took the conscious decision not to pre-inform the teachers that food safety was the research focus; this was so as to reduce the risk that the teachers would influence the students in advance. This study
contains no personal data of the kind referred to in § 3 in the aforementioned Act (2003:460) (Swedish Code of Statutes, 2003), thus causing the students very little inconvenience; consequently, this should be seen as an acceptable procedure for obtaining accurate results. All the students were however informed of the study focus before it began; the concept of food safety was explained, followed by the ethical guidelines and the overall research plan and objective before the students gave their consent to participate. The questions were answered individually and anonymously; we could therefore neither see who gave which answer nor make any comparisons between the different schools.

The respondents in Paper I gave their informed consent by answering the questionnaire. The participants in the three studies were informed that all the data would be handled confidentially, that their participation was completely voluntary, and that they could withdraw at any time. To ensure their anonymity, the teachers were referred to by a Roman numeral (and by a fictitious name in Paper IV) in all the transcript interviews. The participants in the two questionnaires received no incentives, but the interviewed teachers in Study 3 were given books as a token of our appreciation for their participation.
Results

Paper I

Almost all the teachers (96%) reported that food safety was an important part of HCS education and that a lack of knowledge could mean a health hazard. A vast majority (88%) also stated that food safety was part of the school’s mission to provide good health for young people. A majority (70%) of the teachers reported that they used the Swedish National Food Agency for updating their food safety knowledge; however, despite that, just over one HCS teacher in four (27%) stated that they were unaware of the extent of foodborne illness in Sweden. Of the group of teachers, 7% reported that they had contracted a foodborne illness during the last year. This experience however, did not indicate to have an impact on their teaching.

As a starting point for lesson planning, the syllabus was used by 82% of the teachers and 48% used the textbook. Cleaning practices, i.e. handwashing, washing up dishes, using dishcloths and cleaning the work surfaces, were reported to be included in the teaching to such a large extent that they were considered HCS routines. For example, 89% reported that washing up dishes was seen as important knowledge to include in their teaching content (Figure 3). Almost as many (83%) made sure that the students had cleaned their kitchen units after every lesson. Virtually all the teachers (91%) stated that they changed their dishcloths at least once a week. Cooking, Chilling, and Cross-contamination prevention practices all risked being ignored in the teaching. The responses regarding Cross-contamination produced a different spread, and 12% answered that they did not know whether they included it in their teaching (Figure 3).

Based on the exemplified fictional lessons, we can conclude that in relation to Cooking, differences were noted between perishable food as chicken and minced meat. The surveyed HCS teachers reported that they discussed and problematized in a food safety perspective handling chicken to a much greater degree than teaching about minced meat, i.e. besides cooking, the lesson included mostly information on the importance of handwashing, separate cutting boards, proper cooking but also on dangerous bacteria. Chilling practices risked being ignored too, for example the process of cooling down food or the storage of leftovers. The same was noted for cold food storage, and based on the fictional lessons, almost one in five HCS teachers (19%) reported that they never included the refrigerator temperature in their teach-
ing content, and more than a third (35%) only discussed it in theory. This means that less than half of the teachers (46%) teach about the refrigerator temperature in practice. There were similarities between the teachers with long working experience (> 10 years) and those with no formal HCS education (n=66), as teachers from these groups were reported to be more aware of cold food storage but also to include it more often in their teaching. They stated too that they problematized the best-before date and cold food storage to a greater extent in their teaching. Several of the teachers with no formal HCS education said that they had a background in the food sector (there they had presumably worked on food laws and legislation).

Figure 3. HCS teachers’ didactic choices when asked this question: ‘To what extent are the following issues included in your hygiene teaching?’ (n=335)

Paper II
The girls reported that they were more involved in cooking practices at home in comparison with the boys. The girls also responded more positive to the questions about their food safety knowledge and behaviour. The boys’ self-reported food safety knowledge and behaviour indicate that food hazards pose a greater risk to them (Table 5). In relation to Cooking, almost half of the students (49%) claimed that it was okay to taste raw minced meat, especially the boys who said they never or rarely cooked at home. Nearly one in five students (17%) claimed not to be aware of that it is important to cook chicken meat thoroughly; this view was also more common among the boys. The reheating of food was something the students, especially many of the
boys, reported that they frequently did in their everyday lives, often several days a week (Table 5).

In addition, more than half of the students (52%) reported that they were unaware of the risks of reheating food in the microwave oven. In relation to Cleaning and to avoiding Cross-contamination just over a quarter of the students (26%), and more commonly among the boys, noted that handwashing was only of importance before cooking. It was also more common for the boys to never clean their work surfaces in the HCS classroom (15%). The same percentage of students (more commonly boys) did not consider that dishcloths can spread foodborne illness, and 20% responded Don’t know (Table 5).

With regard to Chilling and the issue of cold food storage, we noted that among the students +8°C was more commonly reported (45%) as a good refrigerator temperature than +4°C (37%). A vast majority of the students (86%) said that the refrigerator temperature affected the shelf life of food, and 67% reported that they would use their senses (smell and taste) to determine whether the milk was drinkable or not instead of just looking at the best-before date. We noted that the students’ food safety behaviour could be linked to a risk of Cross-contamination: one in four students (25%) reported that it was okay to use the same cutting board regardless of what food had previously been prepared on it.

Table 5. Significant gender differences related to various response options. Total (n = 529), Girls (n = 236), Boys (n = 293).

<table>
<thead>
<tr>
<th>Questions</th>
<th>Response options with a significant gender difference</th>
<th>Gender differences</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is dangerous to taste raw minced meat</td>
<td>No, 49 (260)</td>
<td>Girls % (n)</td>
<td>Boys % (n)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35 (86) 65 (174)</td>
<td>(p =.000)</td>
</tr>
<tr>
<td>Chicken meat should always be cooked thoroughly</td>
<td>No or Don’t know, 17 (90)*</td>
<td>29 (26) 71 (64)</td>
<td>(p =.000)</td>
</tr>
<tr>
<td>Do you reheat food in a microwave oven?</td>
<td>Yes, every day, 25 (133)</td>
<td>35 (46) 65 (87)</td>
<td>(p =.004)</td>
</tr>
<tr>
<td>Handwashing is only important before you starting cooking?</td>
<td>Yes or Don’t know, 26 (138)*</td>
<td>35 (48) 65 (90)</td>
<td>(p =.001)</td>
</tr>
<tr>
<td>When do you clean the work surfaces?</td>
<td>I never clean it, 15 (79)</td>
<td>30 (24) 70 (55)</td>
<td>(p = .014)</td>
</tr>
<tr>
<td>Dishcloths can spread germs that can cause food poisoning?</td>
<td>No, 15 (79)</td>
<td>28 (24) 72 (55)</td>
<td>(p = .003)</td>
</tr>
</tbody>
</table>

* Two response options were analyzed together as they were both considered to have the same risk.
Paper III

The most common answer given by this group of students was that they rarely or never take part in cooking activities at home (58%). Moreover, they felt that HCS was an important trusted source of food safety knowledge. The students reported that HCS and Mother were by far the most popular sources (Figure 4).

Almost 70% (69%) of the girls and 56% of the boys answered that Mother or HCS was their favorite source of food safety knowledge. Among the students, Mother was the most important source of knowledge (38%) and trust (36%), but a higher percentage of girls (50%) ranked their Mother as their most important source of food safety knowledge. The same percentage also considered her the most reliable information source. Of those girls who reported that Mother was their most important source of knowledge, 75% trusted her the most too. The girls ranked HCS as a more trustworthy source (29%) than a source of knowledge (19%). The boys ranked HCS and Mother equally as their most important source of food safety knowledge (28%). We observed the differences when comparing their trust in these sources: 36% found HCS trustworthy compared to 22% for Mother.

Besides HCS and Mother, Father was ranked as an important source, and more favorably among the boys (16%). Among all the girls, 57% reported that their source of trust and their source of knowledge were one and the same; the corresponding percentage of boys was 47%. The girls’ responses were more homogenous compared with the boys’ responses, which were more greatly distributed over all the response options, especially others than HCS and parents.

Figure 4. Students’ responses to the questions: “My knowledge regarding food safety comes mainly from:” and “Which source of information do you trust the most when it comes to food safety?” (n=529)
Paper IV

The analysis of the transcribed teacher interviews resulted in three themes: Frame control, Traditional HCS learning environment and Subjective selections; all can affect the students’ food safety learning due to the teachers’ didactic choices of teaching content. The frame control was characterized by different frame factors that could influence and thereby limit the teaching. The lesson length and thus time but also the budget and the classroom design were all examples of frame factors observed during the interviews. For example, limited time could impact the Cleaning practices:

’If you are pushed for time, of course there will be carelessness, and you have seen in this kitchen that they have been pushed for time, and then it immediately gets dirty and greasy; you have to spend time cleaning... ’ (Patricia, 16 working years).

’Ja alltså har man kort om tid så är det ju klart att det bli slarv och det har man ju som sagt sett i det här köket att de har haft ont om tid och då blir det ju genast skitigt och igengrott man måste lägga tid på rengöring... ’ (Patricia – 16 working years).

Another frame factor that might influence the teachers’ didactic choices is the syllabus. The syllabus contains three teaching perspectives, which should permeate all HCS teaching: health, economy and the environment. They were noted during the interviews as they were mentioned recurrently, and their importance in the teaching was clearly pointed out.

Many routines and similarities characterized theme Traditional HCS learning environment. The teaching focused on the freshly cooked meal eaten during the lesson. The teachers could easily show What the lessons taught and How this was done but found the question Why more difficult. For example, recurrent routines for washing up dishes were observed; they often followed a certain chant or order in which utensils were washed in the kitchen sinks, while porcelain, glasses and cutlery were routinely washed in the dishwasher without giving it any thought.

’I don’t know, because it is boring? When you mentioned it, I don’t know, I have no idea, because it should be done in next to no time, I guess... I have many routines that I don’t get, because they are done automatically’ (Camilla, 7 working years).

’Jag vet inte för att det är tråkigt? Nu när du säger det ja jag fattar inte heller, jag har ingen aning för att det ska gå fort att bli klara tror jag... jag har många rutiner som jag inte riktigt tänker på, de gör sig automatiskt’ (Camilla – 7 working years).
According to the interviews, HCS teaching seems to follow many routines that are often performed without giving them a second thought. This indicates that these practices could be recurring routines in the HCS classroom and not conscious didactic choices. These routines were often discussed in relation to Cleaning practices. Within unreflective, routine-like practices as described in this theme, the learning risks being superficially connected to the HCS learning environment.

The teachers’ subjective selections were characterized by their individual experiences, knowledge and risk perception. Risk unawareness was observed among the interviewed teachers, which could influence the food safety knowledge they choose to transfer to the students.

‘There is no need to worry about my minced meat as I buy good locally produced meat from a good store nearby the school. It would be a completely different thing if I had to buy from a large retailer’ (Monica, 22 working years).

‘Det är inte någon risk kopplat till köttfärs eftersom jag köper bra lokal producerat kött ifrån en bra affär här i närheten av skolan. Det skulle vara något helt annat om jag var tvungen att handla det ifrån någon stor grossist’ (Monica – 22 working years).

Looking at whether they had ever contracted a foodborne infection, we observed that those who had were not consciously influenced in their didactic choices of food safety. There were, however, examples of using that experience in teaching, which made visible the difficulties when communicating risk to the students, i.e. the balancing act between on the one hand informing the students and providing them with knowledge of the risk and on the other not putting them off and creating unnecessary anxiety.

‘I tried once to talk about my food poisoning and then go into detail about campylobacter and risks, yes, everything like, but then the students didn’t want to eat the chicken at all, so it was not so good...’ (Emma, 9 working years).

‘Jag provade en gång att berätta om min matförgiftning och sedan ingående om campyllobakter och risker och ja allt liksom men då ville eleverna inte äta kycklingen alls så det gick väl inte så bra’ (Emma – 9 working years).

Based also on their experience, each teacher prepared their lessons differently: some measured out the ingredients and put all the food items out in advance for the students, while others let the students collect them from the refrigerators and pantries.
Discussion

This thesis aimed to explore food safety as part of HCS education in Swedish compulsory school. To gain a further insight into this subject area, the research was conducted from both a teacher and student perspective and the methods used were two questionnaires and qualitative interviews. The results from the first survey of HCS teachers indicate that Cleaning-related food safety issues routinely became part of HCS teaching, while Cooking, Chilling, and Cross-contamination prevention practices risked being ignored in the teaching. The HCS teachers with long experience of the subject (>10 years) or without formal HCS education reported that they had adequate knowledge, but they also included food safety issues in their teaching more so than teachers with less working experience. Risk foods were introduced to the students with completely different levels of risk information provided (Paper I).

The girls’ answers suggest that they were more involved in domestic cooking practices than the boys. Moreover, they also gave more positive answers to their food safety knowledge and behaviour questions compared to the boys, whose answers regarding the four Cs indicated that they were more at risk of contracting a foodborne illness. A conclusion was that students risk leaving school without having learned even basic food safety principles (Paper II).

The girls stated that their mothers, and thereby the home, were an important and trustworthy source of food safety information. Some boys viewed their mothers and fathers as well as HCS as important. They also acquired their knowledge from the media and other sources and trusted them more than the girls. HCS education is an important source of food safety knowledge for students who rarely or never cook at home, which was more commonly reported among the boys (Paper III).

Three themes that can all affect food safety teaching and thereby students’ food safety learning process were discovered: (i) the teachers’ didactic choices of teaching content for food safety was influenced by frames as time, budget and syllabus, (ii) the traditional HCS learning environment was characterized by routines, similarities and unreflected teaching traditions, and (iii) the teacher’s subjective selection of teaching content was based on experience, knowledge and risk awareness (Paper IV).
Food safety knowledge and perception

People do not always act based on their knowledge; however, it might affect their behaviour (Angelillo et al., 2001; Yiannas, 2015). Some instead act based on optimistic bias, i.e. they are aware of the risk but nevertheless assume that nothing will happen to them. Optimistic bias can prevent risk information from being absorbed when promoting risk-reducing behaviour (Breakwell, 2000; Joffe, 1999; Weinstein, 1984). When predicting food safety behaviour, knowledge is important, but as Mullan et al. (2013) point out, other factors such as risk perception, subjective norms and attitude can also have an impact.

It was observed among the teachers and students that they had gaps in their food safety knowledge and their food safety behaviour was flawed. As for their knowledge of Chilling food, the results show that a majority of the students stated that +8°C was a good refrigerator temperature (Paper II), i.e. four degrees warmer than the recommended +4°C. This four-degree difference might seriously affect the refrigerated food as the risk of pathogen growth increases sharply between these two temperatures. Food will decay rapidly if not refrigerated properly (National Food Agency, 2011). A reason for that might be the information of +8°C that is common on food packages in Sweden, but proven to have a negative effect on the shelf life as well as pathogen growth (Söderqvist, 2017). Paper IV highlights that teaching about the refrigerator temperature could be based on the refrigerator model in the HCS classroom, which might be problematic as refrigerators distribute cold air differently (James et al., 2008).

Based on the fictional lessons in Paper I, it can be concluded that one HCS teacher in five reported that they did not include the refrigerator temperature in their teaching at all, and another 30% only taught it in theory. Adequate cold food storage is, according to Hillers et al. (2003), an important step in the food chain from farm to fork, but unfortunately it is often mismanaged by many consumers (James et al., 2016; James et al., 2008; Marklinder and Eriksson, 2015; Marklinder et al., 2004). Cold food storage must thereby be seen as an important food safety area that needs highlighting and problematizing in HCS teaching to ensure the students’ learning. This finding indicates a relationship between on the one hand gaps in students’ food safety knowledge and flaws in their food safety behaviour and on the other hand teachers’ didactic choices of teaching content.

This kind of relationship was noted too in the results from the handling of perishable foods such as chicken and minced meat. Also based on the fictional lesson, 81% of the teachers reported that how they taught handling chicken corresponded to the highest level (i.e. it included all the food safety steps), whereas the equivalent percentage for minced meat was 44%. In Paper IV, it was noticed to be okay to taste raw minced meat during the HCS lessons, and in Paper II, almost half of the students (49%), more commonly
boys, claimed likewise. This is despite the Swedish National Food Agency’s warnings against even tasting raw minced meat, the reason being an increased risk of EHEC infection, and as early as 2007 a report highlighted EHEC as a public health hazard (National Food Agency, 2007).

The consumer might consider meat from a known butcher to be less of a contamination risk (Joffe, 1999), as noted in Paper IV, where minced meat from the local store was perceived as less of a contamination risk. This could be linked to that people often tend to trust those they are close to or perceive to have the adequate knowledge and expertise (FAO/WHO, 2016; Hawley, 2014; Sztompka, 1999). But in this case it might have an impact on the students’ learning related to risk, as no risk related to minced meat would be transferred to the students’.

Cooking minced meat can be extra problematic, for example it has been observed that oxygen packaged minced meat (≥ 60% O₂) browns prematurely, i.e. the minced meat looks like it has been cooked thoroughly despite at a temperature way below the recommend 71°C (Boqvist et al., 2015). Undercooked food has been summarized by Byrd-Bredbenner et al. (2013) as a common reason for foodborne illness and was linked to the EHEC infection described in the Introduction, where undercooked minced meat was suspected to be the source of the outbreak. This demonstrates why thermometers are useful when cooking, but consumers use them all too infrequently (Anderson et al., 2004; Brewer and Rojas, 2008; Fein et al., 2011; Lazou et al., 2012; Phang and Bruhn, 2011).

The participating teachers considered chicken a far more dangerous food item to handle than minced meat. Moreover, they perceived putting extra focus on hygiene practices when chicken was used as the teaching aid to be taken-for-granted knowledge (Papers I and IV). Despite that, nearly a fifth of the students (17%), more commonly boys, reported that they were unaware of the importance of properly cooked chicken (Paper II). Chicken must be thoroughly cooked; otherwise the campylobacter jejuni might not have been killed. Campylobacteriosis is the most common foodborne infection in Sweden, with the estimated societal cost exceeding SEK 600 million (≈ €60 million) each year (Agrifood economics centre, 2015). These results indicate that the students’ (especially the boys’) handling of chicken and minced meat displayed risk behaviour. This was despite the teachers reporting that hygiene practices for handling chicken were very much included. These results indicates the impact that the teachers’ didactic choices will have on the students learning by including/excluding thing in their teaching content (Molin, 2006). But also the gaps that there is between what is taught by the teachers and what is learnt by the students (Svedner and Säfström, 2000).

Another similar gap between what the teachers reported that they taught and the students’ food safety knowledge and behaviour was noted in relation to Cleaning and to avoid Cross-contamination. The teachers reported that Cleaning practices were included as routines (Paper I). However, in Paper II,
the students’ answers, especially the boys’, indicated that they lacked knowledge of these Cleaning routines and their Cleaning behaviour was flawed. They did not consider handwashing during cooking or cleaning the work surfaces to be important. Nor did they see any risk of cross-contamination when using the same cutting board for different food items. This thinking corresponds to the findings of Abbot et al. (2007) and Green and Knechtges (2015), namely that the risk of cross-contamination needs to be highlighted in all food safety education, otherwise this risk could increase. Also linked to this was the use of colored chopping boards for different food items. That could work well provide that risk related to the avoidance of Cross-contamination also were included otherwise the learning risk ending up at a surface level of learning. If risks related to Cross-contamination became a part of the teaching content then the teacher would strive for a deeper level of learning. This is of importance as outside the HCS classroom, in the students’ everyday life, there might be only one chopping board, or in other colors or even made out of wood.

Even though we cannot overgeneralize these results, they do, however, indicate that teachers’ didactic choices are influenced by their own risk perception, knowledge and experience. Important food safety areas related to the four Cs risk to be neglected and need to be highlighted in HCS teaching in order to raise the risk awareness of teachers and students and thereby increase the students learning. Food safety education is an essential step to take for preventing foodborne illness. When teaching, there will always be, as mentioned earlier, gaps between what is taught and what the students actually learn. We might, however, be able to reduce these gaps by having a primary teaching purpose, with a specific goal for each lesson but also with continuous reflection on the whole teaching process (Bronäs and Runebou, 2010; Postareff, 2007; Svedner and Säfström, 2000; Uljens, 1997a).

Risk awareness is based on knowledge but also on experience (Krystallis et al., 2007; Yiannas, 2015). These students probably lack this experience due to their young age. Yiannas (2015) suggests how this experience can be gained if teachers introduce earlier cases of foodborne outbreaks into their teaching and discuss them. This could be a valuable way for students and teachers to accumulate their experience and thereby increase their risk perception. Risk perception can be difficult to handle among the students. In Paper IV it was noticed that a discussion regarding dangerous bacteria in raw chicken caused a fear of eating the food.

In the first study, the teachers with Long working experience (>10 years) reported that they not only had adequate food knowledge but also very much included food safety issues like the refrigerator temperature and the best-before date into their teaching. The teachers without Formal HCS education answered in a similar fashion. Several of them came from the food sector (they had probably worked on laws and legislation) and had most likely been trained in hygiene programs, e.g. Hazard Analysis and Critical Control
Points (HACCP). The teachers with long experience might have completed the old three-year HCS teacher training course, which has now been shortened to less than one year. This naturally has implications for the teachers’ opportunities to develop their food safety knowledge and skills. These results indicate the importance of training for HCS teachers. Lindblom (2016) highlights the great value of educated HCS teachers, and only teachers with Formal HCS education are allowed to mark students’ work, which poses a problem as more than one in five HCS teachers in Sweden lack Formal HCS education (National Agency for Education, 2015).

Sources of food safety knowledge and trust

In Paper II, the boys were more at risk of contracting a foodborne illness due to their reported food safety knowledge and behaviour. The increased risks were related to their handling of perishable food, reheating of food and different cleaning practices. Other research has noted among adolescents a lack of adequate food safety knowledge and behaviour due to perhaps their young age or lack of cooking experience (Kennedy et al., 2011; Kitamoto et al., 2009). The girls’ responses in the food safety knowledge and behaviour questionnaire indicated the contrary: compared to the boys, they often gave more positive answers, which is consistent with other findings (Byrd-Bredbenner et al., 2007b; Byrd-Bredbenner et al., 2007; Lazou et al., 2012; Ovca et al., 2014).

As discussed earlier, food safety knowledge is important and comes from different sources (Krystallis et al., 2007). HCS teaching could serve as a source of knowledge that extends beyond the classroom as research have indicated that HCS knowledge also might be transferred forward to the parents (Palojoki and Tuomi-Gröhn, 2001). The girls stated that their mothers, and thereby the home, were their most important and trusted source of food safety knowledge (Paper III), which suggests the home remains a place for transferring domestic knowledge despite indications that this is decreasing due to lifestyle changes (Byrd-Bredbenner et al., 2010; Byrd-Bredbenner et al., 2007a; James et al., 2009; Raspor, 2008; WHO, 2000). The boys also stated that their mothers were an important source, although compared to the girls, the percentage was slightly lower; however, the same percentage thought HCS was an important source (Paper III). The results indicate that the home seems to be an important source of food safety knowledge, and regarding the girls’ more positive responses; it is even an adequate source. It has been noted that the home and the mother in particular have an important impact on the knowledge and risk perception of young children (Kang et al., 2010; Ovca et al., 2014).

However, Lazou et al. (2012) have noticed the home to not be the optimal place for transferring food safety knowledge. Moreover, many cases of
foodborne illness are suspected to have originated in the home (Byrd-Bredbenner et al., 2013; EFSA, 2015; Nesbitt et al., 2014; Noerrung et al., 2012). It might, however, be easier for students to absorb the knowledge transferred in HCS if they have prior knowledge from home (Medeiros et al., 2004; Sudershan et al., 2008). Girls reported to cook at home more often and that prior knowledge might be linked to the girls’ more positive answers but also confirmed by the fact that girls tend to achieve higher grades in HCS (Cullbrand and Petersson, 2005). At the same time, studies have indicated that HCS teaching often fails to connect with students’ everyday understanding and their use of everyday language (Hipkiss, 2014; Höijer, 2013).

Among the participating boys, the father was a more popular and trusted source of food safety knowledge. It is the case that we often tend to trust those family members we are close to (Hawley, 2014; Sztompka, 1999). This finding could also be because men in Sweden not only cook more frequently (Neuman, 2016) but also more often live as single parents (Statistics Sweden, 2014). The boys’ answers indicated that they were more at risk of contracting foodborne illness (Paper II), and they used the Internet and TV as sources of food safety knowledge (Paper III). We can surmise that these sources might not be the most reliable. The Internet is perhaps not perceived as a reliable source as it can be difficult to separate information from subjective opinions. TV programs fronted by celebrity chefs have been noticed to be popular among younger people and reason for watching was entertainment. They also reported a positive view on celebrity chefs (Lane and Fisher, 2015). Even if we do not know what TV programs the students have watched, it is worth noting that TV cooking shows are not deemed an adequate source for transferring food safety knowledge, if anything the opposite (Borda et al., 2014; Maughan et al., 2016). For these boys, HCS needs to become an adequate source of food safety knowledge and more trustworthy in order to act as a counterweight to other sources that can be more unreliable.

Unfortunately, the results of this thesis indicate that there are gaps in teachers’ food safety knowledge and flaws in their food safety behaviour, which might weaken students’ confidence in HCS teaching (FAO/WHO, 2016). HCS teaching can, based on these results, be seen as extra beneficial for students who rarely or never cook outside the classroom, which was more commonly reported among the boys (Paper III). This finding can be viewed as obvious but still important. In the early 1990s, before the major reorganization of Swedish compulsory schools, it was suggested that HCS be removed from the compulsory school curriculum (Hjälmeskog, 2006). The reason discussed was that the subject content could be learned at home instead, which these results indicate is not the case for many students.

Almost half of the teachers reported that they used the textbook for planning their lessons (Paper I). The textbook can be a source of food safety knowledge, but Sweden no longer has a government agency that reviews
teaching material before it is distributed to schools (National Agency for Education, 2006). This means that there is no fact checking and the authors’ personal interests and opinions may dominate the literature. According to Lindblom et al. (2013), the textbook is of great importance in HCS teaching and is used by more than 90% of the teachers. Moreover, one textbook in particular is very commonly referred to. In this HCS textbook, for example, the text on handling chicken is surrounded by detailed hygiene information, but in the corresponding text on minced meat, hygiene is almost invisible. Learning how to think critically about information sources is very important for making future consumers risk aware. A textbook can be a good teaching tool, but as Hipkiss (2014) as well as Eriksson and Hjälmeskog (2016) point out, it is also important that teachers critically reflect upon the content and teach students to do the same.

Most of the participating teachers reported that the Swedish National Food Agency was an important source of food safety knowledge, but they were unaware of the number of cases of foodborne infection in Sweden each year (Paper I), which could influence their risk perception. The Swedish National Food Agency should in the interest of the consumer actively work to ensure safe food, but based on these results, we can surmise that its risk communication to the public might need adjusting.

HCS traditions and routines

A traditional HCS learning environment where food was prepared according to the recipe and eaten during the lesson was noted in Paper IV. Such a learning environment might affect students’ food safety learning. Other research on HCS has highlighted this lesson tradition (Bohm, 2016; Brunosson et al., 2014; Höijer, 2013; Lindblom, 2016). Teaching traditions and subject routines are not specific to HCS but are reproduced in all school subjects (Uljens, 1997b). Southerton (2013) describes how routines are performed quite automatically in a special context in a given situation. The results of the studies indicate that HCS classroom routines, especially Cleaning ones, seem to be common. Actions like handwashing, washing up dishes, cleaning surfaces and using dishcloths often became part of the teaching content as routines (Paper I).

This finding was supported by the qualitative interviews in Paper IV, but also that routines often was made without further reflection. Moreover, some washing-up chants were observed, such as wash, rinse, turn over or a chant that typically explains the order of things: glasses, plates, cutlery and pots (Paper IV). Yiannas (2015) has described how useful these chants or rhymes can be when learning food safety behaviour; this is because we often find them easy to remember. It is, however, important to also reflect upon the dishwashing process because there could, for example, be a risk of pathogen-
ic bacteria contamination if the water is not hot enough (>48°C) (de Jong et al., 2008; Kennedy et al., 2011; Mattick et al., 2003).

Routines can be useful for organizing the teaching and thus making it easier for the teacher, but reflection is extremely important within the didactic perspective. Teachers have to be aware of their didactic choices and the whole teaching process in order to reflect upon how it might affect students’ learning process (Bronäs and Runebou, 2010; Uljens, 1997a). HCS teaching should, according to the current policy documents, strive, without being normative, to engender an awareness among students of the consequences of various domestic choices (National Agency for Education, 2011b). Food safety teaching must, however, be seen as an area which steps outside that and needs to become normative. Improperly handled food can lead to serious complications; hence, a right and a wrong way of thinking must be added here, e.g. chicken must always be cooked properly. This normative thinking does not totally exclude discussing and problematizing food safety. On the contrary, students need to become aware of why actions are performed so they can obtain a deeper understanding of what the risk might be if they neglect them. Students are thereby able to consider different options through reflection (Emsheimer et al., 2005).

Hands have for a long time been regarded as an effective means of contamination transfer (Bloomfield et al., 2007; Chittleborough et al., 2012; de Jong et al., 2008; Phang and Bruhn, 2011). One group of students was not aware of the importance attached to repeated handwashing during cooking (Paper II), which Kendall et al. (2004) have emphasized as important. Claiming that handwashing is always important is normative, but we still need to discuss why these actions are of importance and are performed. Washing hands and putting on aprons are both examples of HCS routines. But, for instance, the use of aprons needs to become more than a routine. The apron should symbolize hygiene. Yiannas (2015) describes how tests have shown that clothing and what they symbolize can have a positive effect on hygiene behaviour. When students put on their aprons, they must know that hygiene is important.

Even if food has always been the important teaching tool in HCS, an increased focus on food choices has been noted in the latest syllabi. The students are to reflect upon different steps in the food chain all the way from production to recycling (Gisslevik et al., 2016). Students should during their 118 hours of HCS teaching develop their ability to understand the consequences of different choices related to everyday practices (National Agency for Education, 2011b). According to Emsheimer et al. (2005), the curriculum states What is to be included in the teaching but seldom anything about How and Why, which will then be each teacher’s responsibility, and it is hugely important to reflect upon why different teaching content is offered to students (Svedner and Säfström, 2000; Uljens, 1997a).
Without introducing reflection, the teacher risks becoming a kind of role model whom the students uncritically imitate, and the actions might not be fully understood. That is despite Bandura (1977) having described observational learning as a valuable learning technique to use, especially when promoting new behaviours such as food handling. But this assumes a beneficial imitated behaviour, because, according to Wills et al. (2005) and Eves et al. (2006), once habits are established, they tend to be long-lasting and difficult to alter in later life stages. There is, however, a risk that this imitation, in combination with routines, is being superficially learned without further reflection, and the importance of these routine-like actions might not be fully understood (Bandura, 1977; Marton and Booth, 1997). With a focus on why, the teacher’s approach will be to achieve a deeper level of learning, i.e. learning for understanding, and thereby hopefully a more applicable knowledge that will be used outside the HCS classroom (Marton and Booth, 1997; Postareff, 2007). There is a possibility of stagnation if the school fails to reflect upon its teaching, which might affect the students’ learning (Andersson and Carlström, 2005; Emsheimer et al., 2005; Janhonen et al., 2016; Venäläinen, 2015).

HCS teaching traditions and routines might be transferred already during the teacher training. During the didactic part of the training, i.e. the practical training in various school settings, student teachers learn how to choose teaching materials and methods. The advantages are that student teachers get a grasp of how HCS lessons can be planned and taught; however, one disadvantage is that many teaching traditions might be transferred without further reflection. It is important that teachers reflect upon whether they want to change the domestic work or just reproduce old traditions (Palojoki, 1997).

Food safety learning about the Four Cs

HCS can be linked to the use of food as a teaching tool and should, according to its syllabus, educate students about food safety. However, the findings of this thesis indicate that the subject may not fully utilize its potential to educate future consumers to be risk aware. This is despite the teachers stating that food safety teaching was extremely important, as other research has also noted (Fordyce-Voorham, 2011; Ronto et al., 2016).

Time, or rather a lack of it, was observed as a frame factor that affected food safety teaching often related to Cleaning, e.g. the teacher cleans the work surfaces after the lesson has ended (Paper IV). The Swedish National Agency for Education (2016) has stated that food safety education should not strive for progression but to be incorporated into teaching when suitable. This places a great demand on the individual teacher. Moreover, the findings of this thesis highlight that there are shortcomings in food safety teaching and that teachers’ choices might differ and might thereby affect students’
learning. The teachers’ didactic choices might be affected by their personal interest (Lindström and Pennlert, 2012), which was noticed by Höijer (2013) as she reported the HCS teacher’s interests to greatly affect their teaching content. Food safety thereby risks being neglected or minimized, and to ensure its place in HCS, it needs to be more clearly written in the policy documents.

Food safety and the use of different food items have to become conscious didactic choices for teachers when planning their teaching content in order to increase the students learning. A lack of time cannot be cited as a valid argument, especially for missed or carelessly done cleaning practices. But Lindblom et al. (2015) discovered through their observations during HCS lessons that the lack of time was not due to the lesson length. The influencing factor was the teachers’ didactic choices of lesson content, as the end of the lesson was just as stressful despite the lesson length.

In HCS teaching, food is an important teaching tool, which is why the subject is suitable for food safety teaching. But this requires teachers to make informed choices about which food items to use instead of letting the recipe become the focus of the lessons, which Brunosson et al. (2014) and Höijer (2013) have noted. As the teachers’ purchase the food themselves they could also plan their teaching based on them. It might also be beneficial if students become involved in the entire food handling process. The results in Paper IV show that some teachers put out, measure and prepare all the different food items in advance, while others let the students collect them. This didactic choice can be made for several reasons, but knowing how to handle, prepare and store different food items is important knowledge for the students’ everyday lives, where no one else will be preparing the food in advance for them. This applies also after the lesson: if the teacher puts away all the food and cleans, then the student might miss a learning opportunity but also does not notice that these actions have been done at all.

An important part of many students’ everyday lives that Paper II highlights is the repeated reheating of food. Both cooling and reheating food are examples of food safety risk areas in danger of being neglected due to teaching traditions where a meal is cooked and eaten together during the lesson (Bohm, 2016; Brunosson et al., 2014; Höijer, 2013; Lindblom, 2016). Students reported that they lacked knowledge of the risks of reheating. They also stated (25 %) to reheat food in the microwave oven everyday (Paper II). Undercooked food has been viewed as a common reason for foodborne illness (Byrd-Bredbenner et al. (2013), but also many microwave ovens are unclean and thereby increase the risk of cross-contamination (Byrd-Bredbenner et al., 2007b). HCS teaching needs to be better linked to students’ everyday lives. Other research has highlighted that students had difficulties relating their HCS teaching to their own everyday lives, and if students are able to connect their learning to their everyday lives, it can be easier to understand why it is taught (Höijer, 2013; Palojoki, 1997).
It might be beneficial if food safety education in HCS has more updated discussions, comparative tests and an experimental approach than the traditional learning environment might offer. The more pluralistic view of teaching encourages students to discuss and problematize the teaching content (Kronlid, 2010; Postareff, 2007). The resolving of problems could thereby be more related to the students’ everyday life and not so locked to a predetermined solving related to the HCS context. This could benefit the students learning process, but also create an awareness of how they might use their newly learned skills in their everyday life (Palojoki, 2003; Palojoki and Tuomi-Gröhn, 2001).

Thermometers are useful for preventing foodborne illness, but as reported earlier used infrequently by consumers (Anderson et al., 2004; Brewer and Rojas, 2008; Fein et al., 2011; Lazou et al., 2012). Using thermometers could be a valuable tool when including and discussing, for example, cold food storage and cooling and reheating food. Based on the results presented here, actions related to the four Cs risked being omitted from the HCS teaching. Then the teaching would strive to achieve a deeper level of learning that was more applicable in another context than the HCS classroom (Marton and Tsui, 2004). The subject’s combination of theory and practice enabled the students to reflect upon everyday practices. Connecting theoretical and practical knowledge, as in knowing in practice, is often valuable when teaching students food safety (Bielby et al., 2006; Egan et al., 2008; Eves et al., 2006; Haapala and Probart, 2004).

Methodological considerations

The aim of this thesis was to explore food safety as a part of HCS education in the Swedish compulsory school. The purpose has never been to carry out a comprehensive study as the results come from a restricted population based on non-probability samples and thus do not imply any form of generalization but rather indications (Bryman, 2012). A common problem for all studies that require voluntary participation is that they mainly reach the individuals who are most interested in the research topic. In these studies, this may certainly have influenced the teachers’ willingness to participate but probably not their responses or those of the students.

In this thesis the Four Cs (Cooking, Cleaning, Chilling and avoidance of Cross-contamination) have been used to visualize and delineate the research area. These represent well-documented areas that are related to an increased risk for hazards regarding the food handling process. Although the risk areas might be abbreviated and named differently (e.g. Fightbac: The core four practices) they all represent the same important areas.

Responses in all surveys were self-reported and it is important to remember that surveys often give a more positive picture of food safety that does
not correspond with later observations (Eves et al., 2006; Miles et al., 1999; Redmond and Griffith, 2003b)

Questionnaires (Papers I-III)

As a starting point for construction of the questionnaires, other similar studies regarding food safety were reviewed and discussed giving extra focus to their methodological considerations. Studies made in a school context were discussed regarding their transferability to the Swedish HCS context. Questionnaires have known disadvantages, one of which is that a whole research area cannot be covered by asking a limited number of questions with predetermined response options (Bryman, 2012). However, we considered the use of questionnaire to be a suitable method in order to reach a large number of HCS teachers and create an overall picture of food safety as part of HCS teaching.

All questionnaire data were collected using computer programs which has not only been time-saving but has also reduced the risk for input errors (Djurfeldt et al., 2010). As deficiencies have been noticed regarding consumers’ knowledge and behaviour regarding food safety (Jevšnik et al., 2008a; Langiano et al., 2011; Marklinder et al., 2013; Tachë and Carpentier, 2014), it was decided that food safety knowledge and behaviour should be included in the questionnaires. The teachers attitudes towards food safety were also of research interest as these could influence their didactic choices (Uljens, 1997a).

Different questions were therefore created for the teacher questionnaire, firstly related to knowledge, behaviour and attitude, and then categorized under the Four Cs to ensure that all these aspects were covered and related to the HCS context. It has been proven to be advantageous in this kind of research to focus on specific topics rather than on food safety in general (Kendall et al., 2004).

The questionnaire was discussed and reconstructed several times by the research group and also discussed with a statistician. One limitation may have been that the questionnaires were not checked by anyone outside of the research group to ensure validity, but this is perhaps compensated for by the fact that everyone in the research group has different backgrounds and could therefore interpret the questions from different perspectives. The questionnaire was pre-tested by twelve HCS teachers at different stages in the process, all with good insight in the HCS context.

To allow for comparisons between the teacher and the student surveys, the teacher questionnaire was the starting point for creating the student questionnaire. As the data collection among the students needed more time, the number of questions was limited to 26 and an additional focus was given to the language since the study group was younger (Christensen and James, 2008).
Paper I

An obstacle in paper I was that there was no register of HCS teachers in Sweden available so they were quite hard to reach. However, since the demographics match well with statistics from the National Agency of Education and the participants comprised about a fifth of all HCS teachers in Sweden and were represented from the entire country, the results may be seen as representative (Table 3). Since there is no register of HCS teachers, the use of a paper survey would probably not have increased the level of participation. In addition, without available data regarding how many teachers received the invitation to participate, a failure analysis could not be performed.

The concept of knowledge, behaviour and attitude might mean different things to different people but also for different research areas. These three concepts are often used in food safety research. We have chosen to, for example, to interpret questions related to how to handle dishcloths or how often to change it to be related to knowledge as well as behaviour.

Previous research regarding teachers’ working experience has categorized them into different groups and, based on these results, teachers were divided in Paper I into those with Short working experience ($\leq$ 10 years) and those with Long working experience ($>10$ years). Since the teachers’ didactic choices can be affected by their own experience and education (Lindström and Pennlert, 2012), the questionnaire also analyzed whether they were formally educated or not as HCS teachers.

Papers II and III

In the second study it was necessary to use a limited number of questions since each question took some time to answer using the chosen method of data collection (SRS). However, this was also a disadvantage in that it made it difficult to cover all the Four Cs. When pre-testing the method it was noticed that the students’ concentration began to wane after about 25 questions. Nevertheless, the advantages with the method outweighed the disadvantages and the students were very motivated to participate; this can be seen from the external loss, which was less than one per cent. When SRS has been used and evaluated several positive aspects have been presented. It was reported to be fun, easy to use, instant feedback and it was considered as a good alternative for students who often do not respond to questions (Blood and Gulchak, 2012; Friedline et al., 2013; Keough, 2012).

According to Trost and Hultäker (2007), demographics questions are preferably placed at the end of a questionnaire. However, in this study they were placed at the beginning. This was a deliberate decision to ensure that the response system was functioning correctly and that the participants understood how to use it, and also to be able to discuss how important each response was. The questionnaire started with some trivial questions and the
first one was *What day is it today?* This question should reasonably achieve the same answer from all students, which is why the responses were openly discussed together. I collected all the data, which could be of benefit in that all students received the same information and had the same opportunity to ask questions, which otherwise tends to be a disadvantage with surveys (Bryman, 2012; Trost and Hultåker, 2007). Another advantage was that all the questions and answers were read out loud, which might have helped students with literacy problems to participate.

Habitual cooking has been noticed by Fischer and Frewer (2008) to be linked to better adherence to food safety guidelines and, since girls have been reported to cook more often (Ovca *et al.* , 2014; Statistics Sweden, 2012), gender and cooking habits were used as variables in the analysis. In relation to the questionnaire, it could be concluded that questions regarding the students’ cooking habits probably needed a follow up question asking what they actually considered as cooking. In addition, in HCS teaching the students often work together in their kitchen units and therefore peers might have needed to be included as a response option regarding sources of food safety knowledge and trust. Even though, their working partner often differs between lessons.

**Paper IV**

The low number of participants might have been a limitation, but rather than several short interviews the focus was instead on longer and more in-depth interviews. The use of mind-map instead of structured questions could have been a disadvantage when performing individual interviews, since predetermined topics rely on a discussion, which is maybe more suitable for focus group interviews (Patton, 2002).

The choice of participants in the study should be discussed from a methodological point of view. The participating HCS teachers were recruited by a convenience selection, which meant that only invited teachers had the possibility to participate and no one had the opportunity to volunteer for participation. Despite the quite low number of participants we tried to achieve a demographic spread regarding working experience and gender. However, our purpose with this study has not been to generalize our results to all HCS education or to discuss good or bad teaching. But to gain an understanding what different factors that might influence HCS teachers’ choices of teaching content in relation to food safety and how it might influence the students learning.

In the analysis the two different approaches to learning; deep level and surface level was used. They were considered suitable as the epistemology in HCS is based on knowing in practice. These approaches has however been criticized to be simplifying, that these approaches cannot be so clearly separated from each other (Beattie *et al.*, 1997). We have never had the intention
to separate them completely from each other, but more to use them as an analytic tool in the analysis.

Hopefully, the settings for all the interviews were the same as they were conducted by the same person but my own preconception and interpretation of the interviews certainly played a part in the analyses. To avoid the analysis becoming too influenced by my own thoughts and experience and to improve interrater coding reliability, Helen Göranson and Ingela Marklinder were continually involved throughout the whole analysis process but also confirming the findings (Bryman, 2012; Yin, 2011). At the end of the analysis process we reached a common agreement regarding the three themes and describing names for the themes were developed in collaboration with Päivi Palojoki.

The three themes describe what might have an impact on the teachers’ didactic choices in relation to food safety. We do not know anything about the actual teaching in the classroom, for that classroom observation would be needed. We have only discussed what implication these didactic choices might have for the students’ food safety learning.
Conclusion

- Risk areas related to all the four Cs (*Cooking, Cleaning, Chilling* and avoidance of *Cross-contamination*) are in danger of being omitted from HCS teaching, and so they need to be highlighted and become conscious didactic choices and not just routines.
- The students’ food safety knowledge and behaviour were often inadequate, especially among the boys, and the findings suggest that some students might leave school without having learned even basic food safety principles.
- HCS is particularly valuable for students who rarely or never cook at home, more commonly reported among the boys.
- Mothers were an important and trusted source of food safety knowledge, but HCS should become a trustworthy source of food safety knowledge for students in order to serve as a counterweight to unreliable sources such as the media.
- To increase students’ learning, the teaching needs to be related to their everyday practices. Food safety teaching requires more reflective practices that aim to achieve a deeper level of learning, which, in turn, might increase the food safety knowledge to be applied outside the HCS classroom.
- Food safety teaching was influenced by frames, teaching traditions and the teachers’ subjective didactic choices. Moreover, the findings indicate a need for more food safety to be incorporated into teacher training and also continuously update of accessible information from the authorities.
- The findings of this thesis indicate that food safety teaching differs and is depending on the teachers subjective didactic choices. To ensure more equivalent food safety learning for all students in compulsory school food safety needs to be highlighted in the HCS policy documents.
Future perspectives

Based on the findings of this thesis, it can be concluded that food safety actions related to all the four Cs need to be highlighted in HCS teaching and that they presently risk being neglected due to routines and teaching traditions. Food safety should, according to the Swedish National Agency for Education (2011b), be incorporated into teaching when suitable. It is thereby the individual teacher who does this, but by highlighting food safety regularly in HCS teaching, does not need to take extra time. To ensure food safety learning for the students it needs to have more of a structure, one where all four Cs are visible so that the teacher can clearly see what has been included and what is missing; when this is done, a food safety culture has been created in HCS teaching. When discussing the findings in relation to the future, it is, however, important to take into consideration that all these responses were self-reported. Food safety surveys often paint a positive picture of consumers’ food safety knowledge and behaviour, while observations indicate that consumers’ food safety actions are frequently anything but safe (Eves et al., 2006; Miles et al., 1999; Phang and Bruhn, 2011; Redmond and Griffith, 2003b). Future research on this subject should therefore preferably include observation studies.

We can surmise that the current wording in the syllabus, ‘Hygiene and cleaning when handling, preparing and storing food’, refers to the concept Cleaning, as these actions were reported to be included as routines (Paper I) (National Agency for Education, 2011a). Based on the findings of this thesis, we have sent a proposal to the Swedish National Agency for Education. We have asked that prior to its next curricular revision that the wording in the syllabus be redrafted as follows: ‘the problematization and application of food safety principles in food handling’. The current syllabus contains no food safety knowledge requirements, i.e. students do not need to perform any food safety actions in order to achieve grades. We have pointed this out and have thus suggested a minor change to the knowledge requirements.

The origin of the EHEC outbreak described in the Introduction was found quite quickly: there were hygiene failings at the farms that supplied the meat. Finding the source fast is an essential step in order to stop further contamination. To accelerate this tracking, strategies to reduce the number of outbreaks have been developed by the responsible authorities in Sweden: the county council–run infectious disease units (Landstingens smittskyddsenheter), the Swedish Board of Agriculture (Jordbruksverket), the Swedish National Vet-
erinary Institute (Statens Veterinärmedicinska Anstalt), the Swedish National Food Agency (Livsmedelsverket) and the Public Health Agency of Sweden (Folkhälsomyndigheten). Collaboration is important when trying to reduce the number of foodborne illnesses, and the authorities need to realize that HCS teachers are a valuable conduit of food safety information. But this also applies the other way around: HCS teachers need to use the authorities as reliable sources of knowledge but also of updated information. In future work, it would be desirable for more food safety–related teaching material that is applicable to HCS teaching but also to put a Swedish twist on the four Cs so they are easily comprehensible for HCS and usable for all consumers.
Svensk sammanfattning


I kommentarmaterialet från Skolverket som tillhör kursplanen går även att läsa att antalet fall av livsmedelsburna sjukdomar ökar i samhället varför dessa kunskaper är viktiga för eleverna ur ett hälsoperspektiv. Internationell forskning visar på brister bland barn och ungdomars kunskaper och beteende kopplat till livsmedelshygien. Det finns ingen tidigare forskning gjord om undervisningen i livsmedelshygien inom HK. Därför är av intresse att studera detta område ibland elever i grundskolan men även hos verksamma HK lärare. Syftet med denna avhandling har varit att undersöka livsmedelshygien som en del av undervisningen i Hem och Konsumentkunskap i den svenska grundskolan.

I Sverige uppskattas man att ungefär fem hundra tusen fall av matförgiftningar inträffar varje år, vilket innebär att cirka fem procent av Sveriges befolkning drabbas. En matförgiftning kan leda till allvarliga konsekvenser för den enskilde men även orsaka stora samhällskostnader. Den årliga kostnaden för de fem vanligaste livsmedelsburna sjukdomarna i Sverige beräknas uppgå till ca en miljard svenska kronor. Nya råvaror ofta från hela världen, nya processer, en allt större andel äldrande befolkning och föränderliga mikroorganismer är exempel på riskfaktorer som förklarar varför matförgiftningar lyfts fram som ett folkhälsoproblem av Världshälsorganisationen (WHO).
De flesta personer klarar en matförgiftning bra, men för de som tillhör en riskgrupp såsom äldre, småbarn, gravida eller de med nedsatt immunförsvar finns risk för allvarliga konsekvenser. Små barn (0-5 år) som drabbats av en livsmedelsburen sjukdom som EHEC kan utveckla den mycket allvarliga följdsjukdomen Hemolytiskt Uremiskt Syndrom (HUS), vilken innebär akut njursvikt vilket ofta kräver intensivvård och dialys och som kan ge livslånga komplikationer. EHEC kan spridas via köttfärs som inte upphettats tillräckligt och i Sverige rapporteras om flera utbrott där hamburgare eller kebabs med koppling till otillräckligt upphettad köttfärs varit orsaken till utbrottet.

Många av dessa fall av matförgiftning skulle kunna undvikas via förbättrade hygienkunskaper och rutiner. Tyvärr visar internationell konsumentforskning på såväl bristande kunskaper som ett riskbeteende bland konsumenter. Man misstänker att mörkertalet kring antalet matförgiftningar kopplat till hemmet är stort då de sällan inrapporteras till myndigheterna, men man uppsskattar att minst vart tredje fall av matförgiftning har sitt ursprung i det privata hushållet. HK har sin utgångspunkt i hemmet, så det är av forskningsintresse att studera livsmedelshygien som en del av undervisningen i HK.

I denna avhandling har de Fyra C:na (Cooking, Cleaning, Chilling and to avoid Cross-contamination) varit viktiga utgångspunkter. Alla dessa representerar fyra viktiga områden när det gäller att undvika matförgiftning: upphettning, rengöring, kylförvaring och att undvika korskontaminering. De Fyra C:na har tagits fram av den brittiska motsvarigheten till Livsmedelsverket för att underlätta och tydliggöra dessa områden för den enskilde konsumenten men även för att användas inom utbildning i skolan.

Den första delstudien bygger på en web-baserad enkät där HK lärare fick svara på frågor kopplat till deras kunskaper, beteende och attityd gällande livsmedelshygien. Resultaten av denna studie visar att lärarna ansåg livsmedelshygien som en viktig del av deras undervisning och även med koppling till elevernas hälsa. Trots detta indikerar resultatet att viktiga områden kopplat till livsmedelshygien såsom nedkylning, upphettning, kylförvaring och att undvika korskontaminering riskerar att saknas i undervisningen. Saker kopplat till Cleaning; handtvätt, handdiskning, rengöring av arbetsbänkar och hantering av disktrasor inkluderades däremot ofta varför de summerades som HK rutiner.

Lärarna rapporterade även att känsliga livsmedel hanterades på helt olika sätt i undervisningen. När undervisningen hanterade kyckling så innehöll dessa lektioner i mycket större utsträckning moment av hygien, tillagning och problematisering jämfört med motsvarande undervisningen om köttfärs vilket kan kopplas till lärarnas riskuppfattning. Deltagande HK lärare med lång erfarenhet av att arbeta som HK lärare (>10 år) och lärare utan formell HK utbildning rapporterade gemensamt mer adekvata kunskaper men även att inkludera områden som bäst före datum och kylskåpstemperatur i större utsträckning i sin undervisning. Många av de deltagande lärarna utan formell HK utbildning rapporterade en bakgrund inom livsmedelsbranschen, som ofta är kopplad till andra lager och regler än skolan.

Mamma och därmed hemmet rapporterades vara en viktig källa till kunskap gällande livsmedelhygien men även en trovärdig källa, speciellt bland de deltagande flickorna. Pojkarna ansåg även HK vara en viktig och trovärdig källa till kunskap. Pojkarna rapporterade även pappa och övriga källor såsom media eller annan person som viktiga källor. HK rapporterades som en viktig källa till kunskap för elever som sällan eller aldrig lagar mat hemma, vilket var vanligast bland pojkarna. Även om HK rapporterades som en viktig källa till kunskap så behöver ämnet öka på sin trovärdighet bland eleverna för att fungera som en motvikt till andra mer opålitliga källor. Att det inte finns några garantier för att de fyra C:na tas med i undervisningen kan förklara att det finns en risk att elever lämnar grundskolan utan att ha fått grundläggande livsmedelshygien kunskaper.

I den tredje och sista delstudien intervjuades HK lärare om vad som kan påverka deras didaktiska val med koppling till livsmedelshygien. I analysen av intervju material kunde tre olika teman uppmärksammas som alla kan få konsekvenser för elevernas lärende kopplat till livsmedelshygien. Det första som kan påverka är olika ramfaktorer såsom lektionslängd, budget eller kursplan. Tidsbrist i slutet av lektionen till exempel kan leda till att hygienmoment med koppling till Cleaning blir lidande men även klassrumsdesign och en begränsad budget kan påverka hygien undervisningen.

Nästa tema som uppmärksammas i analysen var den traditionella undervisningsmiljön i HK som kännetecknades av rutiner och likheter. Undervisningen följer ofta samma struktur och måltiden är lektionens fokus. Lärarna kunde ofta uppe 

Vad de undervisade om och även Hur de undervisade men de hade inte lika lätt att diskutera Varför de gjorde olika saker. Rutiner kunde ses kopplade till Cleaning på samma sätt som i den första delstudien. Dessa rutiner kunde utföras utan reflektion och riskerades därmed att bara läras ut som en form av ytinlärning med läraren fungerande som
en modell att efterlikna. För att öka chansen att eleverna tar med sig dessa kunskaper och använder dem utanför HK klassrummet så behöver undervisningen sträva efter en djupinlärning där reflektion kring Varför blir en viktig del.


Resultaten i denna avhandling indikerar att undervisningen av livsmedelshygien i HK behöver förstärkas med koppling till alla områden sammanfattande under de fyra C:na. Undervisningen behöver få en tydligare struktur där det är lätt för läraren att avgöra om de fyra C:na har inkluderats i undervisningen eller ej. För att undvika att livsmedelshygien hamnar utanför undervisningen eller bara blir som rutin så behöver det vara ett medvetet didaktiskt val när lärarna planerar sin undervisning. Eftersom livsmedlen är läromedlet i HK så kan de i större utsträckning få vara utgångspunkt för de didaktiska valen istället för att man utgår ifrån recepten, som visat sig i annan svensk HK forskning. För att eftersträva ett djupare lärande för eleverna behöver undervisningen vara kopplad till deras egen vardag men även ännu mer reflektierande kring Varför dessa olika moment bör genomföras. Via en mer reflektierande undervisning kan man öka chanserna att eleverna kommer att använda sig av dessa kunskaper utanför HK klassrummet.


Att eleverna får med sig kunskaper gällande livsmedelshygien är viktigt för dem som framtida matkonsumenter, för sin egen skull men även för att de förmodligen kommer att laga mat till andra som tillhör någon av riskgrupperna. Förbättrade kunskaper för eleverna skulle kunna innebära hälsoskörd för dem som enskilda personer och om antalet matförgiftningar minskar så minskar även samhällskostnaderna. I framtida arbeten skulle det vara värdefullt med mer arbetsmaterial och läromedel kopplat till hygien anpassat för HK men även en svensk variant av de fyra C:na som lätt kunde användas i HK undervisningen och därmed säkerställa detta lärande.
I would like to express my gratitude to all those people who in various ways made this thesis possible. Being a PhD student is the hardest and the most challenging thing I have ever done but at the same time the most fun and developing. To feel that you progress and learn new things every day is a joy, although there have been many pits and ditch runs down the road. Many people have been involved in the actual process of this thesis, but also many surrounding and supporting me and I’m so very grateful to all of you despite which. I’m especially grateful for your concerns during my sickness and without you all; you would not hold this thesis in your hand.

First of all I would like to thank all participating teachers and students, without your contribution this thesis would not exist. You have all been an important part of the development of home and consumer studies education. A disadvantage that I have experienced as a researcher is that we tend to focus on lacks and flaws and rarely bring out the good part. But I have seen and experienced so many good examples of HCS teaching and I know what an amazing job you are doing that might not have been visible here.

I would like to dedicate an extra gratitude to Stiftelsen Kronsprinsessan Margaretras Minnesfond for funding this project. Without your generous support this project would not have been possible and I would not have had the opportunity to become a researcher. During these years I have been reading about the Crown Princess Margareta and she is described as an enterprising, forwarded and modern woman with many different interests and it have been an honor to make research in her spirit.

I would like to send a special Thank you to the following people:

Ingela Marklinder, my Supervisor, you are the most enthusiastic and at the same time the most persistent person I have ever met, even more than me. But these two characteristics have been so valuable during these years. My co-supervisor Helen Göranzon, your ability to keep calm, find new solutions as well as undetected literature is also things that I have appreciated so much. This thesis has implied a lot of hard work but the working climate among us three has always been characterized by high ceilings, joy, encouragement but also time. You have always taken time to discuss and explain
each step of the way; this has been so valuable for my development to become a researcher. This work has brought some tears but most joy to my life, thanks to your commitment but also to your concern when I needed adjust the work in relation to my sickness. Thank you!!

Christina Fjellström, you deserve a special thank, as you initially contributed as co-supervisor and helped me to put the thesis into its context. But above that for requested funding and initiated the Graduate school, which I got the privilege to be a part of. Also a special thank you to Ylva Mattsson-Sydner, for assisting Christina in this work and for your leadership of the department.

To all persons who in various ways have worked at the department during these years. You have all been so supportive, especially during my period of sickness. I, however, wish to direct a little extra thanks to Agneta Andersson, for keeping me in touch with my accent and my roots, Helena Elmståhl, for giving me the opportunity to be a part of developing new courses but above that for a close collaboration around teaching. Magaretha Nydahl, for supporting us doctoral students in an excellent way and Karin Hellstådius for your genuine laughter through the wall, which have helped out many times.

To the PhD students at the department, the amount has grown during my years which is fun but have also meant more opportunities for discussions and supports which is very valuable for a PhD student. First I like to thank my former and present PhD student colleagues, Elin Lövestam & Pernilla Sandvik for introducing me at the beginning. Also thanks to former and present PhD students Malin Skinnars Josefsson, Nicklas Neuman, Evelina Liljeberg, Anette Pettersson, Christine Persson Osowski, Maria Somaraki & Aravinda Berggren Clausen for good support but also for valuable criticism during our seminars. Thanks to Karolin Bergman for being such a fun room-mate and to Gita Berg for joining our room with all lot of energy and “fresh air”. A special thanks to former PhD student Karin Höijer for encouraging me to apply for this job although there were some obstacles in the way.

My five PhD colleagues in the NFHK, thank you for good support and critical revision during our meetings but also for good encouragement and support outside our meetings. Albina Granberg, we are two really different people, yet we complement each other so well and you have been an import person throughout this work, Lolita Eriksson for always being so supportive and calm, that is contagious, Emma Oljans for fruitful discussions while warming hands on the radiator in the beginning, Emmalee Gisslevik & Ingela Bohm, despite the time between our meetings we have always easily
picked up where we last meet. Thanks to all supervisors in NFHK, but an extra thanks to Karin Hjälmeskog for sharing your didactic knowledge with us, but also for nice travel company during our trips even if it is sometimes hard to keep up with “the fastest walking grandmother in Uppsala”.

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**Thomas Lange**, my dear brother, who always helps out in every situation whether it is data trouble, walking company or entertaining the kids, you are an important part of our life.

**Eric, Isac & Milly**, you are the best thing I have, you all make me happy and make me laughs every day, I am so proud to be your mother. You have gone through things that children should not have to do, but still you all have kept up the spirits, often with a good sense of humor. You have not even complained when I have basically lived in front of the computer and barely answered to questions, you are the best kids, with the best patience and I promise to try to be a little less distracted now that this thesis is finished.

**Ulrik**, I cannot imagine a life without you, we were so different when we meet and we still are, but I think that is often our strength. You have always stood by me despite difficulties and you know that I always rely on you to fix everything. This project, however I tried to fix on my own, but it would never have been done without your encouragement, support and interesting discussions no matter time of day. You and the kids make everyday a better day.

**Marianne Lange**, I dedicate this thesis to my mother Marianne, you are most caring, supportive and kind person. I do not think I have would have made it all the way here without you. You always see that everyone is feeling well and are well fed; “the grandma incubator”, as my children calls it. You are a true inspiration to have the courage to try new things and that you can combine hard work with family life. No matter how old I get I never get tired of you asking me every evening how my day was, (Hur har det gått idag då?).
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**SOU 2008:109** En hållbar lärarutbildning. *In: Utbildningsdepartementet (ed.).*


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Yiannas, F 2015. Food Safety = Behavior: 30 Proven Techniques to Enhance Employee Compliance.
Yin, R 2011. *Qualitative research from start to finish*, New York, Guilford Press.
Till dig som undervisar i Hem- och konsumentkunskap

Som lärare i Hem och konsumentkunskap så inbjuds du härmed att delta i enkäten ”Mat, hygien och lärande i Hem- och konsumentkunskap”. Denna studie ingår som en del i den Nationella forskarskolan i Hem- och konsumentkunskap (NFHK) med mål att öka kunskapsbasen inom ämnet genom vetenskapliga studier.

Enkäten tar ca 15 minuter att fylla i och du svarar helt anonymt. Vi har ingen möjlighet att se vilket svar som är ditt och inget enskilt svar kommer att urskiljas. Din skola har blivit utvald eftersom den ingår i Statistiska Central Byråns (SCB) register över Grundskolor i Sverige.

Din medverkan är mycket betydelsefull för resultats tillförlitlighet. Det är dock helt frivilligt att delta och du kan när som helst avbryta din medverkan.

Tack för din medverkan!

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Ingela Marklinder Helen Göranzon Christina Fjellström
Fil.Dr Fil.Dr Professor

<table>
<thead>
<tr>
<th>Aldrig</th>
<th>Sällan</th>
<th>Ofta</th>
<th>Alltid</th>
<th>Vet ej</th>
</tr>
</thead>
</table>
1.1 | Tvätta händerna |
1.2 | Förvaring av kylvaror |
1.3 | Korskontaminering |
1.4 | Datummärkning |
1.5 | Nedkylning av mat |
1.6 | Uppvärmning av mat |
1.7 | Handdiskning |
1.8 | Rengöring av arbetsytor |
1.9 | Hantering av disktrasor |
1.10 | Förvaring av matrester |
1.11 | Bakterietillväxt i mat |
1.12 | Mögel i mat |

2. Vilket av nedanstående påståenden stämmer bäst överens med din uppfattning?

<table>
<thead>
<tr>
<th>Stämmer inte alls</th>
<th>Stämmer lite</th>
<th>Stämmer ganska bra</th>
<th>Stämmer helt</th>
</tr>
</thead>
</table>
2.1 | Brist på kunskaper om livsmedelshygien kan innebära en hälsorisk för individen |
2.2 | Matförgiftningar är en hälsorisk ur ett samhällsperspektiv |
2.3 | Livsmedelshygien är en viktig del av Hk-undervisningen |
2.4 | Jag anser att det är viktigt att vara uppdaterad och ta till mig nya råd och rön inom området livsmedelshygien |
2.5 | Jag saknar bra arbetsmaterial som jag kan använda i min undervisning i livsmedelshygien |
2.6 | Jag anser att handdiska är en viktig kunskap för mina elever |
2.7 | Jag anser att livsmedelshygien är en del av skolans uppdrag när det handlar om att uppnå god hälsa bland våra skolungdomar |
3. Har du blivit matförgiftad någon gång under det senaste året?

   Ja
   Nej
   Vet ej

4. Är du rädd för att bli matförgiftad?

   Ja
   Nej
   Vet ej

5. Hur många människor matförgiftas uppskattningsvis i Sverige varje år?

   ca 100 000 människor
   ca 250 000 människor
   ca 500 000 människor
   Välldigt få, nästan alla matförgiftningar sker utomlands
   Vet ej

6. Vilken anser du vara den främsta källan till dina teoretiska kunskaper inom livsmedelshygien?

   Tv
   Kvällstidningar
   Min lärarutbildning
   Internet
   Gymnasieutbildning
   Dagsidningar
   Hemifrån föräldrar
   Facklitteratur
   Livsmedelsverket
   Sjukvården
   Annat

7. Om du vill uppdatera dig inför en lektion inom ämnet livsmedelshygien, vilken källa vänder du dig till i första hand?

   Google/Wikipedia
   Livsmedelsverket
   Tv
   Facklitteratur
   Vetenskapliga texter
   Dagsidningar
   Kollegor
   Annat
8. Vad är det som styr dig mest när du bestämmer vad en lektion ska innehålla utifrån skolans ramfaktorer? (Rangordna från 1-3 där 1 är det som påverkar mest) Rullista 1-3

8.1 Lektionslängd
8.2 Ekonomin
8.3 Elevgrupp

9. När jag planerar min undervisning utgår jag ifrån:

<table>
<thead>
<tr>
<th>9.1 Kursplan</th>
<th>Aldrig</th>
<th>Ibland</th>
<th>Ofta</th>
<th>Alltid</th>
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<tbody>
<tr>
<td>9.2 Läroböcker</td>
<td></td>
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<td>9.3 Egna tankar och idéer</td>
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<td>9.4 Tips från kollegor</td>
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<td>9.5 Önskemål från föräldrar</td>
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<td>9.6 Önskemål från elever</td>
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<tr>
<td>9.7 Önskemål från skolledningen</td>
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<td></td>
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<tr>
<td>9.8 Gemensam planering i arbetslaget</td>
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</tr>
<tr>
<td>9.9 Idéer från internet, TV, tidningar</td>
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<tr>
<td>9.10 Aktuella problem i samhället</td>
<td></td>
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</tbody>
</table>

10. Kontrollerar du att eleverna har gjort rent i Hk-köket innan lektionen är slut?

Ja, varje lektion
När jag hinner
Aldrig

11. Vem anser du ska ansvara för att Hk-köket är rent?

Jag överlåter ansvaret till eleverna
Jag ansvårar för det slutgiltiga resultatet men eleverna måste ta sitt ansvar i det enskilda köket
Det är mitt ansvar som lärare

12. Hur ofta byter ni disktrasa i din Hk-sal?

Efter varje lektion
Varje dag
Några gånger i veckan
En gång i veckan
Mer sällan än en gång i veckan
Vet ej
13. Vad gör ni med den utbytta disktrasan?

Kastar dem
Tvättar den i dismaskinen
Tvättar i tvättmaskinen på 60 grader
Tvättar i tvättmaskinen på 90 grader
Vet ej

14. Lektion 1: Du ska undervisa om "Bäst före datum" och "Sista förbrukningsdag".

Jag går igenom det teoretiskt men även praktiskt, vi tittar och luktar på olika livsmedel och tittar på olika märkningar och problematiserar genom att eleverna får bedöma vilka livsmedel som ska kastas
Jag går igenom det teoretiskt och sedan får eleverna läsa själva i böckerna
Jag går igenom det teoretiskt men även praktiskt där vi tittar och luktar på livsmedel och tittar på märkningar
Jag undervisar inte om detta

15. Lektion 2: Du ska undervisa om rätt kylskåpstemperatur.

Jag går igenom det teoretiskt men eleverna får även prova praktiskt hur man kan kontrollera kylskåpstemperaturen
Jag går igenom det teoretiskt men eleverna får även prova praktiskt hur man kan kontrollera kylskåpstemperaturen och vi diskuterar vilken mikroflora som tillväxer vid olika temperatur
Jag går igenom det teoretiskt och sedan får eleverna läsa själva i böckerna
Jag undervisar inte om detta

16. Lektion 3: Eleverna ska tillaga en kycklingrätt

Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt
Jag delar ut råvaror och dessa tillagas enligt recept
Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt, hur det ska tillagas, skilda skärbrädor, fakta om farliga bakterier
Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt, hur det ska tillagas, skilda skärbrädor
Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt, hur det ska tillagas, skilda skärbrädor
Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt, hur det ska tillagas, skilda skärbrädor
Vi hanterar aldrig kyckling

17. Lektion 4: Eleverna ska tillaga en köttfärsrätt.

Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt
Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt, hur det ska tillagas, skilda skärbrädor
Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt, hur det ska tillagas, skilda skärbrädor
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Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt, hur det ska tillagas, skilda skärbrädor, fakta om farliga bakterier
Vi hanterar aldrig köttfärs
18. Innan lektion 4 portionerar du upp köttfärsen till eleverna. Vilken är den viktigaste anledningen till detta?

- Alla elever får rätt mängd
- Det är mer hygieniskt
- Det går fortare
- Jag portionerar aldrig upp

19. Vilka livsmedel ställer du fram innan lektionen börjar?(Här kan du välja flera alternativ)

- Jag tar inte fram något det gör eleverna själva
- Mjölkprodukter
- Fisk
- Kött
- Kryddor
- Torrvaror
- Frukt
- Grönsaker
- Potatis och rotfrukter
- Pasta och ris
- Matfett
- Annat

20. Hur undervisar du eleverna om livsmedelsförvaring?

- Jag tar fram alla livsmedel i förväg och berättar för eleverna var de förvaras
- Jag låter eleverna hämta allting själva så de lära sig var det förvaras
- Jag tar fram vissa saker som jag berättar om och resten får eleverna själva ta fram
- Jag tar fram allt själv och har ingen genomgång
- Eleverna vet var saker förvaras så jag tar inte upp det i min undervisning
- Annat

21. Vad är skillnaden mellan "Bäst före datum" och "Sista förbrukningsdag"?

- Det är ingen skillnad mellan dessa två
- Varor med "Sista förbrukningsdag" är känsligare och kan innebära en hälsorisk efter utsatt datum
- Varor med "Bäst före datum" är känsligare och kan innebära en hälsorisk efter utsatt datum
- Vet ej

22. Är du rädd för att äta ett livsmedel där "Bäst före datumet" har passerat?

- Ja
- Nej
- Vet ej
23. Går det alltid att med sina sinnen avgöra när ett livsmedel innebär en hälsorisk?

Ja
Nej
Vet ej

24. Hur mäter du temperaturen i Hk-salens kylskåp?

Vi har en display på utsidan som visar temperaturen
Jag har en termometer i kylskåpet
Jag läser av på flera ställen i kylskåpet
Jag märker på livsmedlen när det är lagom
Jag mäter aldrig temperaturen

25. Hur placerar du olika livsmedel i kylskåpet?

Strukturerat så att det som hör ihop står tillsammans
Det beror på vilken temperatur det är på olika platser i kylskåpet
Alltid det som är mest känsligt högst upp
Där det finns plats
Har aldrig reflekterat över detta

26. Kön

Kvinna
Man

27. Jag är född år:

(Rullista från år 1946 – 1992 + alternativet Senare)

28. Är du utbildad Hk-lärare?

Ja
Nej

29. Om du svarade Ja på frågan ovan, vilken kursplan var aktuell när du läste din Hk utbildning?

Lgr - 62
Lgr - 69
Lgr – 80
Lpo – 94
Kursplan – 2000
Lgr – 11
Vet ej

30. Hur många år har du arbetat som Hk-lärare?

(Rullista med alternativ från 1 – 45 år)
31. Jag arbetar på en:

Kommunal skola
Friskola
Annan skolform

32. Jag arbetar i:

(Rullista med Sveriges samtliga län)
Mitt namn är Marie Lange och jag är doktorand inom ämnet Hem- och konsumentkunskap vid Uppsala Universitet. Vi planerar att inom mitt forskningsprojekt genomföra en enkätstudie bland elever i årskurs 9. Studien genomförs på plats på er skolan med ett nytt system via s.k. mentometerknappar och enkäten kommer att ta ca 15-20 minuter att genomföra. Även om undersökningsområdet är Hem- och konsumentkunskap så behöver genomförandet inte ske i samband med denna undervisning utan jag kan komma på en tid som passar er undervisning.

Det finns väldigt lite forskning gjord kring just ämnet Hem- och konsumentkunskap och detta projekt är tänkt att bidra till att stärka ämnets vetenskapliga bas och är en del av den Nationella Forskarskolan i Hem- och Konsumentkunskap som just nu pågår i Sverige, för mer info:

http://www.ikv.uu.se/Forskarskola/

Utifrån Vetenskapsrådets etiska riktlinjer så kan frågorna i denna studie inte anses vara av etiskt känslig karaktär och de kommer att besvaras helt anonymt. Därmed krävs inte samtycke från föräldrar utan det räcker att samtycke har inhämtats via företrädare för undersökningsdeltagarna (Skolledning, Lärare). Undersökningen ska ske inom ramen för ordinarie skoltid och varje deltagare har när som helst rätt att avbryta sitt deltagande.

Vår förhoppning är att er skola vill delta i detta projekt och därmed bidra till att utveckla Hkk ämnets vetenskapliga grund men även att ge era elever en möjlighet att vara med och samla in forskningsdata på ett helt nytt sätt!

Vänliga hälsningar

Marie Lange Ingela Marklinder
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1. Vilken dag är det idag?
  A. Måndag
  B. Tisdag
  C. Onsdag
  D. Torsdag
  E. Fredag

2. Jag är:
  A. Flicka
  B. Pojke

3. Jag går på en:
  A. Kommunal skola
  B. Friskola

4. Jag går i årskurs:
  A. 8
  B. 9

5. Jag har Hk denna termin:
  A. Ja
  B. Nej

6. Har din skola ett speciellt Hk-klassrum?
  A. Ja
  B. Nej, vi besöker en annan skola
  C. Nej, vi använder andra lokaler på vår skola
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
</table>
| 7. Känner du till kursmålen i Hk? | A. Ja  
   B. Några, men inte alla  
   C. Nej |
| 8. Får du självta fram livsmedel från kylskåpet i din Hk-sal? | A. Ja  
   B. Ibland  
   C. Nej  
   D. Vet ej |
   B. När den ser smutsig ut  
   C. Jag torkar aldrig av den |
| 10. Har du fått undervisning i Hk om hur du bör handdiska? | A. Ja  
   B. Nej  
   C. Vet ej |
   B. Ja, med diskmaskinen  
   C. Ja, jag handdiskar  
   D. Ja, med handdisk och diskmaskin |
| 12. Vad är en bra kylskåpstemperatur? | A. +18 °C  
   B. +8 °C  
   C. +4 °C  
   D. Vet ej |
13. Påverkar kylskåpets temperatur hur lång hållbarhet ett livsmedel har?
   A. Ja
   B. Nej
   C. Vet ej

14. Hur ofta bör man byta diskrasa?
   A. Varje dag
   B. En gång i veckan
   C. Varannan vecka
   D. En gång i månaden
   E. Mer sällan än en gång i månaden
   F. Vet ej

15. Diskrasan kan sprida bakterier som kan orsaka matförgiftning
   A. Ja
   B. Nej
   C. Vet ej

16. Det är farligt att smaka på rå köttfärs
   A. Ja
   B. Nej
   C. Vet ej

17. Kycklingkött ska alltid vara genomstekt
   A. Ja
   B. Nej
   C. Vet ej

18. Du ska åta mellanmål hemma och "Bäst före datumen" på mjölkens has passerat. Vad gör du?
   A. Om lukt och smak är okej, använder den
   B. Använder den inte
   C. Vet ej
19. "Bäst före datum" och "Sista förbrukningsdag" är samma sak
a. Ja
b. Nej
c. Vet ej

20. Man kan använda en och samma skärbräda under matlagningen oavsett vilka livsmedel som används tidigare på den
a. Ja
b. Nej
c. Vet ej

21. Handtvätt är bara viktigt innan man börjar matlagningen
a. Ja
b. Nej
c. Vet ej

22. Brukar du värma mat i mikrovågsugnen?
   a. Ja, varje dag
   b. Några gånger i veckan
   c. Mer sällan än varje vecka
   d. Aldrig

23. Ojämna värming av mat i mikrovågsugn kan ge matförgiftning
a. Ja
b. Nej
c. Vet ej

24. Hur ofta lagar du mat hemma?
   a. Varje dag
   b. Ofta
   c. Sällan
   d. Aldrig
25. Mina kunskaper gällande livsmedelshygien kommer främst från:
   a. Undervisning i Hk
   b. Mamma
   c. Pappa
   d. Internet
   e. TV
   f. Annan person/släkting
   g. Böcker
   h. Annet

26. Vilken informationskälla litar du mest på när det gäller livsmedelshygien?
   a. Undervisningen i Hk
   b. Mamma
   c. Pappa
   d. Internet
   e. TV
   f. Annan person/släkting
   g. Böcker
   h. Annet
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