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# Food Safety Learning in Home and Consumer Studies

*Teachers' and Students' Perspectives*

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### **Abstract**

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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.

- I. Lange, M., Göranzon, H., and Marklinder, I. (2014) ‘Teaching young consumers’: Food safety in Home and Consumer Studies from a teacher’s perspective. *International Journal of Consumer Studies*, 38, 357–366. DOI: 10.1111/ijcs.12108
- II. Lange, M., Göranzon, H., and Marklinder, I. (2016) Self-reported food safety knowledge and behaviour among Home and Consumer Studies students. *Food Control*, 67, 265–272. DOI: 10.1016/j.foodcont.2016.03.014
- III. Lange, M., Göranzon, H., Fleig, L., and Marklinder, I. (2017) Adolescents’ sources for food safety knowledge and trust. *Submitted*.
- IV. Lange, M., Palojoki, P., Göranzon, H., and Marklinder, I. (2017) Food safety teaching influenced by frames, traditions and subjective selections. *Submitted*.

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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 per cent 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 life-long 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 studies<sup>1</sup> (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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<sup>1</sup> 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 conducted on food safety handling as part of HCS teaching in Swedish compulsory 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<sup>2</sup> 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).

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<sup>2</sup> Renamed home and consumer studies teachers in 2000.

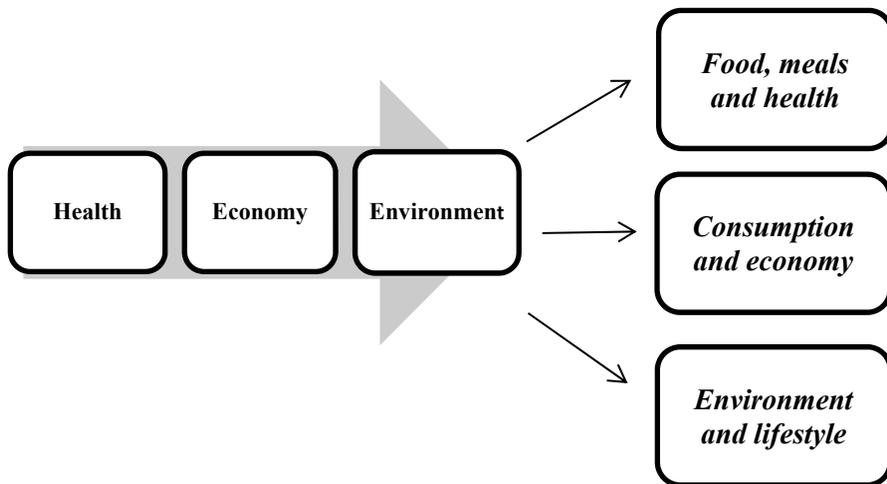


Figure 1. HCS knowledge areas and perspectives included in the HCS syllabus - 2011.

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 (Hippkiss, 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 is 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.

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

## 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 ( $\approx$  €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.

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

## 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).

Demographic characteristics	This study % (n)	Statistics from the Swedish National Agency for Education % (n)
<b>Education:</b>		
Formal HCS education	80 (269)	80 (1395)
No formal HCS education	20 (66)	20 (357)
<b>Gender:</b>		
Female:	94 (316)	93 (1622)
Male	6 (19)	7 (130)
<b>School form:</b>		
Municipal school	84 (280)	84 (1463)
Independent school	16 (54)	16 (289)
<b>Total</b>	100 (335)	100 (1752)

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.

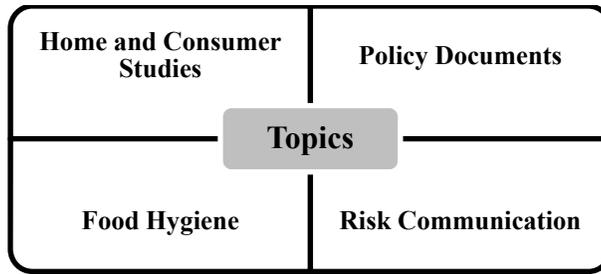


Figure 2. The four topics used in the qualitative interviews.

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 ( $\approx 7\%$  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 there thermalized and structured (Table 4)

I, performed the preliminary analysis, but to improve interrater coding reliability and confirm the findings, Helen Göranson 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.

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

## 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

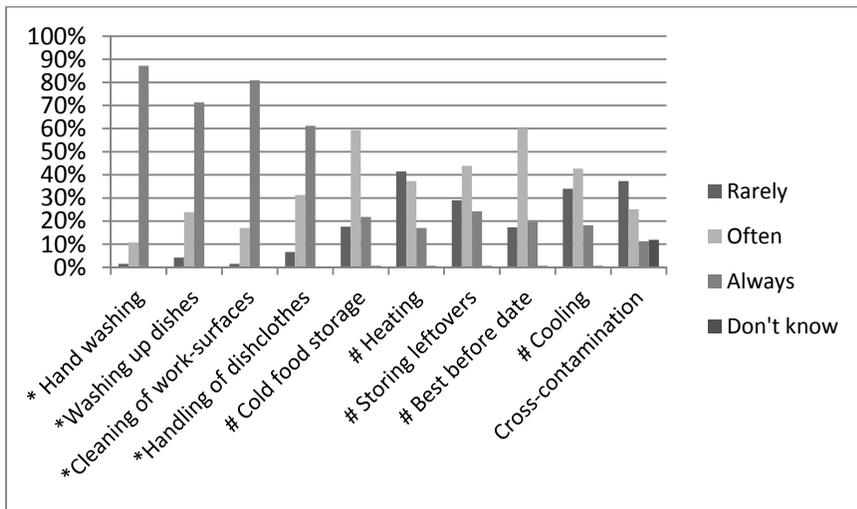
## Paper I

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).



\* = Always included (high frequency for the response option 'Always'), # = Often included (high frequency for the response options 'Often' or 'Rarely').

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).

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

\* 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.

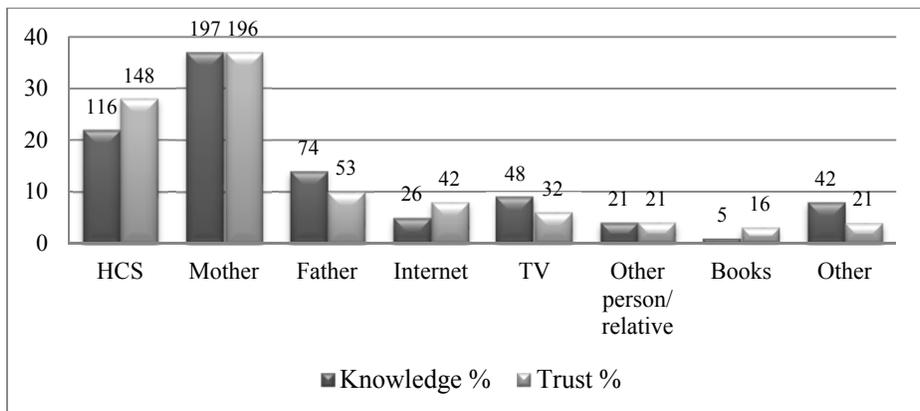


Figure 4. Students' responses to the questions: "My **knowledge** regarding food safety comes mainly from:" and "Which source of information do you **trust the most** when it comes to food safety?" ( $n=529$ )

## 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 campylobakter 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 ( $\geq 60\%$  O<sub>2</sub>) 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 ( $\approx$  €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 indicate the impact that the teachers' didactic choices will have on the students learning by including/excluding things 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 Hjalmskog (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 ( $>48^{\circ}\text{C}$ ) (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; Palojoiki, 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; Taché 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 Hultåker (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

Hem och Konsumentkunskap (HK) är ett ämne i den svenska grundskolan med koppling till hemmet och dess vardagliga praktiker. Undervisningen i HK ska syfta till att eleverna utvecklar kunskaper om och intresse för arbete, ekonomi och konsumtion i hemmet. Eleverna ska ges möjlighet att utveckla ett kunnande som rör mat och måltider men även en medvetenhet om vilka konsekvenser olika val i hushållet kan få. Då HK är obligatoriskt för alla elever ger det en utmärkt möjlighet att utbilda alla framtida konsumenter i Sverige. Undervisningen i HK innehåller en stor mängd praktisk matlagning där livsmedlen fungerar som ämnets läromedel. Det är den enskilda läraren som köper in livsmedlen och därmed avgör vilka livsmedel som kommer att användas i undervisningen. Att utbilda eleverna inom livsmedelshygien; om hur de hanterar, tillagar och förvarar mat på ett sätt så att de undviker att drabbas av matförgiftning skulle kunna innebära hälsofördelar för eleverna som framtida matkonsumenter. I HK kursplanen från 2011 är detta område framskrivet inom kunskapsområdet *Mat, måltider och hälsa* som: ”*Hygien och rengöring vid hantering och tillagning av livsmedel*”.

I kommentarsmaterialet 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 uppskattar 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 äldre befolkning och föränderliga mikroorganismer är exempel på riskfaktorer som förklarar varför matförgiftningar lyfts fram som ett folkhälsoproblem av Världshälsoorganisationen (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 såsom EHEC kan utveckla den mycket allvarliga följsjukdomen 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 kebabspett med koppling till otillräckligt upphettad köttfärs varit orsaken till utbrotten.

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 uppskattar 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 lagar och regler än skolan.

Den andra delstudien genomfördes bland elever i årskurs 9. Elever fick svara på en enkät via s.k. mentormeterknappar på sina respektive skolor. Enkätfrågorna visades på *Power Point* bilder där eleverna sedan valde ett svarsalternativ med hjälp av mentometern. Denna metod uppfattades som populär, eftersom nästan alla elever valde att delta och det var säkert även en fördel för deltagarantalet att frågor och svar lästes upp högt. Frågorna i enkäten hade koppling till elevernas kunskaper och beteende men även till deras matlagningssvanor, källor till kunskap och förtroende för dessa. När det gällde frågor kopplat till elevernas kunskaper och beteende så indikerade resultaten att pojkar hade ett större riskbeteende men även att de lagade mat hemma i mindre utsträckning än flickorna. Eleverna rapporterade även att de ofta värmer mat hemma i mikrovågsugnen, men att de sällan uppfattade några risker kopplat till detta. Både otillräcklig upphettning och för långsam nedkyllning av mat är moment som kan leda till matförgiftning. Båda momenten riskerar dock att hamna utanför HK undervisningen eftersom maten ofta tillagas och äts under lektionen.

Mamma och därmed hemmet rapporterades vara en viktig källa till kunskap gällande livsmedelshygien 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 intervjumaterialet kunde tre olika teman uppmärksammas som alla kan få konsekvenser för elevernas lärande 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 uppmärksammades 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 uppge *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 djupinläring där reflektion kring *Varför* blir en viktig del.

Val av undervisningsinnehåll påverkas också av den enskilde lärarens subjektiva val. Deras kunskaper, riskmedvetenhet och erfarenhet påverkar de didaktiska valen. Det kan få konsekvenser för elevernas lärande. Om en lärare till exempel inte uppfattar att ett visst livsmedel kan vara kopplat till någon form av risk så förmedlar de ingen risk till eleverna. Men att prata risker med eleverna kan vara komplicerat, då det kan medföra en rädsla för vissa livsmedel hos eleverna.

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 utgångspunkten 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 reflekterande kring *Varför* dessa olika moment bör genomföras. Via en mer reflekterande undervisning kan man öka chanserna att eleverna kommer att använda sig av dessa kunskaper utanför HK klassrummet.

Läroplanens val av undervisningsmaterial innebär att andra saker väljs bort vilket kan få konsekvenser för elevernas lärande. Det är lärarnas egna kunskaper och riskmedvetenhet som påverkar de didaktiska valen. Eftersom resultaten indikerar brister gällande dessa, så kan valen därmed innebära att viktiga moment kopplat till livsmedelshygien minskas eller helt försvinner ur undervisningen. Därmed indikeras ett behov av mer utbildning inom området för HK lärare men även ett behov av mer uppdaterad information från olika myndigheter. Eftersom undervisningen sett utifrån dessa resultat verkar variera mycket så behöver området livsmedelshygien lyftas fram i HK:s styrdokument för att eftersträva en mer jämlik undervisning.

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 hälsofördelar 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.

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UPPSALA  
UNIVERSITET

## **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 Byrån (SCB) register över Grundskolor i Sverige.

Din medverkan är mycket betydelsefull för resultatets 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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**1. I Lgr-11 återkommer begreppet Hygien som ej fanns med i Lpo-94 eller Kursplan 2000. I vilken utsträckning tar du upp nedanstående med koppling till hygien?**

	<b>Aldrig</b>	<b>Sällan</b>	<b>Ofta</b>	<b>Alltid</b>	<b>Vet ej</b>
1.1 Tvätta händerna	<input type="checkbox"/>				
1.2 Förvaring av kylvaror	<input type="checkbox"/>				
1.3 Korskontaminering	<input type="checkbox"/>				
1.4 Datummärkning	<input type="checkbox"/>				
1.5 Nedkylning av mat	<input type="checkbox"/>				
1.6 Uppvärmning av mat	<input type="checkbox"/>				
1.7 Handdiskning	<input type="checkbox"/>				
1.8 Rengöring av arbetsytor	<input type="checkbox"/>				
1.9 Hantering av disktrasor	<input type="checkbox"/>				
1.10 Förvaring av matrester	<input type="checkbox"/>				
1.11 Bakterietillväxt i mat	<input type="checkbox"/>				
1.12 Mögel i mat	<input type="checkbox"/>				

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

	<b>Stämmer inte alls</b>	<b>Stämmer lite</b>	<b>Stämmer ganska bra</b>	<b>Stämmer helt</b>
2.1 Brist på kunskaper om livsmedelshygien kan innebära en hälsorisk för individen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 Matförgiftningar är en hälsorisk ur ett samhällsperspektiv	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3 Livsmedelshygien är en viktig del av Hk-undervisningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4 Jag anser att det är viktigt att vara uppdaterad och ta till mig nya råd och rön inom området livsmedelshygien	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5 Jag saknar bra arbetsmaterial som jag kan använda i min undervisning i livsmedelshygien	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6 Jag anser att handdiska är en viktig kunskap för mina elever	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7 Jag anser att livsmedelshygien är en del av skolans uppdrag när det handlar om att uppnå god hälsa bland våra skolungdomar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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
- Väldigt 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
- Dagstidningar
- Hemi från 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
- Dagstidningar
- 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:**

	<b>Aldrig</b>	<b>Ibland</b>	<b>Ofta</b>	<b>Alltid</b>
9.1 Kursplan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.2 Läroböcker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.3 Egna tankar och idéer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.4 Tips från kollegor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.5 Önskemål från föräldrar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.6 Önskemål från elever	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.7 Önskemål från skolledningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.8 Gemensam planering i arbetslaget	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.9 Idéer från internet, TV, tidningar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.10 Aktuella problem i samhället	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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 ansvarar 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 diskmaskinen
- 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
- 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
- Jag delar ut råvaror och dessa tillagas enligt recept, vi talar om handtvätt, hur det ska tillagas
- 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 lär 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)



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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 förälder 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

Doktorand

Docent

018 – 471 XX XX

018- 471 XX XX

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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

7. Känner du till kursmålen i Hk?

- A. Ja
- B. Några, men inte alla
- C. Nej

8. Får du själv ta fram livsmedel från kylskåpet i din Hk-sal?

- A. Ja
- B. Ibland
- C. Nej
- D. Vet ej

9. När torkar du av arbetsytan?

- A. Alltid när lektionen är slut
- 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

11. Brukar du diska hemma?

- A. Nej, aldrig
- B. Ja, med diskmaskinen
- C. Ja, jag handdiskar
- D. Ja, med handdisk och diskmaskin

12. Vad är en bra kylskåpstemperatur?

- A.  $-18^{\circ}$
- B.  $+8^{\circ}$
- C.  $+4^{\circ}$
- 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 disktrasa?

- A. Varje dag
- B. Ungefär en gång i veckan
- C. Varannan vecka
- D. Ungefär en gång i månaden
- E. Mer sällan än en gång i månaden
- F. Vet ej

15. Disktrasan 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 äta mellanmål hemma och "Bäst före datumet" på mjölken har 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 använts 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. Ojämn värmning 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. Undervisningen i Hk
- B. Mamma
- C. Pappa
- D. Internet
- E. TV
- F. Annan person/släkting
- G. Böcker
- H. Annat

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. Annat

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