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Sensory reflections: towards the development of cooking literacy in Swedish Home Economics

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ABSTRACT

In Swedish Home Economics (HE), some students struggle to understand and apply instructions in their cooking. Based on Dewey's theory of experiential learning, the aim of this study was to explore the conditions for developing cooking literacy in Swedish HE, focusing on teachers' and students' use of instructions and sensory reflections. Observations were conducted in 19 student groups across four schools. Five teachers and 57 students were recorded with Dictaphones. An additional 35 students were observed. Reflexive thematic analysis yielded five themes: (1) *Shifting emphasis on different sources of instruction*, (2) *Vague instructions required ability to make sensory-reflective decisions*, (3) *Shifting emphasis on different types of sensory reflection*, (4) *Sporadic connection between sensory reflections and the cooking process*, and (5) *Need for quick problem-solving favoured instructions over reflection*. To increase opportunities for experiential learning, I suggest using systematic and continuous sensory reflections based on repetition, variation, and comparison.

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Cooking education; recipe use; cooking literacy; home and consumer studies; experiential learning; reflective inquiry

Background

Cooking is a complex activity impacted by social, cultural, temporal, and economical circumstances (Wolfson et al., 2017). In Sweden, cooking is taught in the school subject Home and Consumer Studies, which will henceforth be referred to by its international name, Home Economics (HE). Its core content includes learning how to use a recipe and master basic cooking techniques while taking health, environmental impact, and finances into account (National Agency for Education, 2022). Even though HE has a strong focus on sustainability, previous studies have found that HE cooking is strongly influenced by taste preferences and cultural traditions, sometimes to the detriment of sustainability aspects (Bohm, 2021, 2022; Gelinder et al., 2020; Gisslevik et al., 2017; Höijer et al., 2014). Cooking skills are often viewed as a foundation for making one's own way in life by being able to cook something simple and tasty from scratch, and the main way to learn this is by following a recipe. However, recipes can be problematic for inexperienced students (Granberg, 2018). Often briefly worded, they are mostly useful for people who already know how to do what they describe (Sennett, 2008). As standardized descriptions of how to assemble a dish, they have margins for improvisation and adaptation to contingencies (Sutton, 2018), such as availability of ingredients or the different characteristics of foods. Recipes also make cooking appear more coherent than it is, with discrete, concluded actions such as "chop and add vegetables" where in

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reality the cook repeatedly chops and adds, chops and adds (Torkkeli et al., 2020). Cooking is thus more fluid than recipes may indicate on the surface, but so are the recipes themselves: they are both literal and intuitive, such that some instructions are explicit and/or non-negotiable while others are implicit and/or optional (Granberg et al., 2017).

Consequently, recipes may not be ideal teaching materials for beginners. Even if students overcome the inherent difficulties of deciphering a recipe and follow it to the letter, success in the form of achieving an expected result is not guaranteed (Bohm, n.d.). For example, the recipe may not match reality because a specific utensil or ingredient is not available. Teachers sometimes address such problems by rewriting recipes to explain what students often misunderstand or adapt them to local circumstances, but this makes the recipe longer and may deter already impatient students from reading them. Teachers also attempt to prevent problems by giving additional instructions: HE lessons typically start with an introduction where teachers run through a recipe, explaining difficult words and/or demonstrating potentially unfamiliar tasks (Bohm, 2021; Hipkiss, 2014). This is followed by a section where students work in groups to cook a dish or bake something, wash the dishes, clean up, and eat (Gisslevik et al., 2017; Höijer, 2013; Petersson, 2007).

Unfortunately, students tend to forget or even ignore the run-throughs (Bohm, 2021). During student cooking, therefore, teachers answer myriad questions about tasks they have already covered during introductions, even as they also answer practical questions about the whereabouts of utensils and food items, help students adjust their cooking to fit the time available, encourage and advise them, remind them how much time is left, and assess their task performance (Bohm, 2021; Lindblom et al., 2015). Indeed, a lot of teacher attention is directed towards helping students finish on time. Lesson length in Sweden varies from 60 to 140 min, with longer lessons generally considered to be better for cooking because of the many phases that need to be gone through before the lesson ends (Bohm, 2021; Lindblom et al., 2015). As a result, teachers are caught in a dilemma where they try to use time efficiently by giving instructions at the start of the lesson, only to find that many students do not retain the information long enough to apply it in practice (Bohm, 2021).

Problems surrounding the application of recipe instructions in practice have been called *recipe literacy* in previous research (Granberg, 2018). In this paper, however, I use the broader term *cooking literacy* to signify the ability to transform raw ingredients into a finished dish, pastry, or dessert through a combination of instruction-following and autonomous decision-making based on sensory experiences and knowledge of causal relationships (cf. Bohm, n.d.). To harmonize with its hypernym food literacy (Benn, 2014), I divide cooking literacy into a *functional*, *interactional*, and *critical* level. The functional level involves understanding words and phrases, such that “crumbling yeast” means breaking down a cube of fresh yeast into smaller fragments. It also involves understanding the meaning of descriptive sensory words like “fluffy”. The interactional level requires applying instructions in practice i.e., manipulating the yeast in an appropriate way and knowing how much crumbling is enough, or gauging when a batter is fluffy enough to stop whisking. Finally, the critical level involves inferring implicit information and deviating from the recipe when necessary. For example, dry yeast does not require crumbling because it is already fragmented enough to easily dissolve in liquid, and a fluffy batter should be handled carefully so as not to lose its fluffiness. On the critical level, then, students understand the underlying reasons for instructions and the logical connections between actions and sensory results that are seldom explained in recipes and must therefore be learned elsewhere (Sennett, 2008).

The three levels of cooking literacy blend together. For example, a recipe may say to add flour a little at a time and knead the dough until it is smooth. The functional level involves understanding the words “knead” and “smooth”, but their meanings are embodied and therefore overlap with the interactional level where students handle the dough in practice. The functional level also requires knowing how much flour is meant by “a little at a time”, and the interactional level involves the ability to gauge when to add it and when to stop because the dough is dry enough. This connects to the critical level’s implicit understanding that flour is what makes the dough dryer and kneading distributes the flour in the dough, which is the reason for adding a little at a time. This in turn

requires proficiency on the interactional level, since only kneading that is sufficiently vigorous and technically correct will distribute the flour properly and prevent the mistake of adding too much. Therefore, all levels of cooking literacy are developed simultaneously through a combination of learning words while connecting them to sensory experiences and causal relationships.

Cooking thus involves several elements that are not included in recipes, notably sensory phenomena that are not and/or cannot be explained, which means inexperienced students may not even know that vital information is missing. When recipes are used as teaching materials, students must switch between instruction-following and reacting to events whose timing the recipe cannot predict, such as when and how much to regulate temperatures – what Sutton (2018) calls the contingencies of cooking. Since no recipe can tell them when a dish is done, they need to use their own judgment to decide e.g., when to flip over a pancake (Berg et al., 2019). Jaffe and Gertler (2006, p. 147) state that “a good cook knows how things ought to taste, smell, look, feel, and sometimes even sound through different stages of the cooking process”, but the novice has not internalized this knowledge yet and needs to learn it somehow.

One way of doing this is to engage in the type of reflective inquiry promoted by Dewey (1958). His theory of experiential learning emphasizes two fundamental principles whose nature determines the quality of learning experiences: *continuity* and *interaction*. Continuity signifies that experiences are not discrete entities but inextricably linked such that past experiences influence current experiences, which in turn impact future ones. In the case of cooking, cumulative student experiences of how food develops during various manipulations build on each other to form an understanding of what cooking is, how it happens, and its results. The second principle, interaction, denotes the context where the learner interacts with objects and people, i.e., foods, utensils, equipment, recipes, peers, and teachers. The interplay between continuity and interaction determines the quality of the experience, i.e., to what extent the learner takes from the pedagogical situation what the educator intended.

Berg et al. (2019) use the term *aesthetic judgment* to designate students' continual evaluation of and decisions around food based on pleasure and enjoyment, but this paper needs a slightly broader term that signals more general judgments, such as how to gauge temperature. This involves sensory experiences that arise in the meeting between a person and a food, where senses often overlap (Korsmeyer & Sutton, 2011), and which require reflection to make appropriate decisions. To harmonize with Dewey's terminology, I will therefore use the term *sensory-reflective decision-making* to signify the continuous string of experiences, reflections on those experiences, and actions based on those reflections that occur during cooking. Based on the above understanding of experiential learning, the aim of this study was to explore the conditions for developing cooking literacy in Swedish HE, focusing on the following research question: *How do instructions and sensory reflections manifest and interrelate throughout the lesson?*

Method

The study was processed by the Swedish ethical board, but ethical vetting was deemed unnecessary (dnr 2022-05939-01). Four schools were recruited at a HE teachers' conference where I held a presentation that ended with a call for participants. Eight teachers expressed interest in participating and were contacted again at the start of 2023. Four of the teachers, from four different schools, still wished to participate, and an additional teacher joined because her colleague did. All teachers were female. Four were formally qualified for HE and one was finishing her degree during the study. The schools were located in a small village and a big city in the south of Sweden. After an introductory Zoom meeting, the participating teachers chose student groups to approach with information about the study. The students were between 12 and 16 years old (grade 6–9), which means the older the students, the more cooking experience from HE lessons they had, since Swedish HE is generally taught in grades 5 or 6, 7 and/or 8, and 9. However, I did not ask students about their cooking experience outside of school, so knowledge and skills probably varied.

To inform students about the study, I recorded a ten-minute presentation that was shown during a HE lesson. Principals, teachers, students, and students' legal guardians also received detailed written information and returned signed consent forms. In the 19 groups, 92 students agreed to be observed, and of these 57 agreed to be recorded with sound. During five weeks in 2023, I observed one to two lessons per student group. Observations focused on teacher actions, how students performed cooking methods, and participant interactions. All lessons were recorded with Dictaphones worn by participants, resulting in 33 hours of recorded sound. Sections of the sound files that involved cooking were transcribed, but I excluded sections about laying the table, cleaning, and washing the dishes. The data thus consisted of (1) field notes about teachers and all participating students and (2) transcripts of the sound files from teachers and the students who consented to being recorded. This resulted in 390 pages of 1.5 spaced text.

The data were analysed using reflexive thematic analysis (Braun & Clarke, 2021). In a first step, they were coded, using open coding that focused on how teachers and students used instructions and sensory reflections to navigate cooking activities. Codes that illustrated how students and teachers used instructions and reflections were grouped around central organizing concepts such as "efficiency" and "different sources of information" to create themes. The first thematization resulted in ten themes that highlighted the different ways instructions and sensory reflection were used. However, these were deemed too many and too detailed. Through many reworkings, they were whittled down to five overarching themes: (1) *Shifting emphasis on different sources of instruction*, (2) *Vague instructions required ability to make sensory-reflective decisions*, (3) *Shifting emphasis on different types of sensory reflection*, (4) *Sporadic connection between sensory reflections and the cooking process*, and (5) *Need for quick problem-solving favoured instructions over reflection*. Importantly, during the observation period, I also conducted interviews with teachers that resulted in another article (Bohm, n.d.). These interviews indicated that the cooking characteristics I observed were typical and that instructions and reflections did not differ much from lesson to lesson.

In the results, all names for participants have been pseudonymized. To further strengthen confidentiality, student groups are not connected to specific schools. Instead, I identify student groups by referring to grade and the chronological number of observations, such that 6.1 is the first observed grade 6 group and 8.4 is the fourth observed grade 8 group.

Results

During the studied lessons, students made bread, chocolate date balls, cookies, battered and fried fish with boiled or roasted potatoes and a cold sauce, battered and fried chicken fillets, chicken wok with rice, and chicken stew with rice. In the following, I show how each of the five themes played out during introductions, cooking, and meals.

Shifting emphasis on different sources of instruction

Three different kinds of instructions were used: recipes, teacher run-throughs, and teachers' real-time guidance during cooking. Run-throughs were largely student-passive, but occasionally, teachers asked for sensory reflections, as in the following excerpt from 8.6.

Teacher Phebe: Then we're going to put [the cookie dough] on an ordinary baking tray that's down there, on a baking sheet, so that there's a lot of space in between. Because when you pour out this cookie dough it's quite a small blob, but it'll melt in the oven and spread, so they become quite big, and if they lie too close together, what happens then? Malte? What happens if you put them too close together and they grow in the oven?

Malte: Maybe they grow into each other.

Teacher Phebe: And we get Siamese twins, and that's not what we're after today.

Malte: And maybe the heat doesn't spread properly if they're too close together.

Teacher Phebe: That could also happen, that they don't have the time to become properly cooked. Good.

Teachers sometimes demonstrated a specific technique or visual aspect of a food during run-throughs, but also gave ready-made explanations of terms, techniques, and sensory reasons for doing tasks, such as rinsing hands in cold water before rolling a cookie dough to prevent the butter from melting.

During cooking, students referred to recipes, run-throughs, and real-time guidance to evaluate what they or their peers did, suggest solutions to challenges, argue about specific steps, and adjust their actions. When cooking a dish with several components, students sometimes used additional recipes for rice or potatoes on packaging or in the recipe section of the HE textbook. This required knowing how recipes for staples were grouped separately and found under “rice, boiling” in the index. New information sometimes surfaced in real-time guidance. For example, teacher Ester told students in 8.1 and 8.2 to start boiling the potatoes before frying the fish because boiling the potatoes took longer and the fish would otherwise cool before they were done.

Run-throughs and real-time guidance also deviated from the recipe. In a short excerpt from 6.7, teacher Elisabeth suggested three deviations: using oil instead of margarine, using a frying pan instead of a casserole, and halving the chicken wok recipe. She even proposed a deviation from the third deviation: using more than half of the ingredients in order not to end up with too little.

Teacher Elisabeth: ((Reads from recipe)) “Heat the cooking fat in a casserole until it browns”. It won’t brown because it’s oil, so you will only feel that it’s warm. A casserole ... I can show you what it looks like. But you’re making such a small amount ... ((Shows casserole)) Here. This is a casserole. It has slightly higher edges, but using the frying pan is okay. (...) No, you must halve [the recipe], but you might have to take a little more than half to make it cover the bottom [of the pan].

Although deviations were communicated during run-throughs and real-time guidance, they were not always explicit. For example, teacher Beata demonstrated how to fry breaded chicken in 6.3 without referring to the recipe at all. Instead, she based her actions and explanations solely on sensory reflections, such that the chicken was done when it was a specific temperature. However, the recipe specified a seven-minute frying time per side. Student Noa planned to follow this instruction, but one minute after he had put his chicken in the pan, teacher Beata urgently told him to flip it over because seven minutes would ruin the meat. She told him to listen closely to her run-throughs to avoid such mistakes but did not acknowledge that this alternative instruction deviated from the recipe.

Vague instructions required ability to make sensory-reflective decisions

Recipes and other instructions could not cover all contingencies, such as how long it took to heat the oil in a pan. Vague instructions like “you can probably turn up the heat a little, maybe to five or six” (teacher Ester, 8.2) indicated the frequent need for autonomous sensory reflections based on previous experience. Teachers and recipes sometimes suggested a range between, for example, “two to three decilitres of flour” (recipe, 8.3) or “ten to fifteen minutes [in the oven] depending on size” (teacher Ritva, 8.4). In the context of roast potatoes or cookies, a phrase like “taking on colour” (teacher Ester, 8.1) could mean anything from light gold to dark brown. Kinaesthetic cues like the softness of a potato when pierced with a skewer were also relative. Teachers sometimes used the phrase “it depends” to signal that students must make ambiguous decisions based on preference or on type, size, and amount of ingredients, as in the following excerpt from teacher Ritva’s run-through in 8.3.

When [the cookies are] in the oven you must be observant, both of the baking time but also how they look, because it depends how big you’ve made them, how long it’ll take. They may be done after only six minutes. And speed is of the essence at the end, so 30 seconds too long and they’ll burn. So, when five minutes have passed, check how they look, and then maybe you must leave them for one minute or 30 seconds more, it depends how dark you want them. If the edges are dark brown, they’re burning.

Teacher Ritva’s vague instructions indicated that neither the clock nor fixed visual cues determined the precise moment to remove the cookies from the oven. Instead, sensory-reflective decisions

required comparison between different states on a spectrum. In rare cases, students were offered opportunities to make such comparisons, as when teacher Beata showed 6.3 the difference between a raw chicken fillet and one she had fried during 6.2's lesson. However, students were mostly expected to make the call without such help.

Vagueness also occurred when it came to the interplay of taste, smell, and consistency. For example, when 8.1 and 8.2 made fish and a sauce, teacher Ester told them to experiment with seasoning but did not clarify how to determine a good fit.

You can choose between a few different ingredients. There's Turkish yoghurt, there's sour cream, and there's mayonnaise. (...) There's cucumber relish, there's sweet chili sauce if you want to add that to the sauce. (...) I've brought out all the spices we have, so you can think for yourselves what spices you want. Smell them and reflect: where could this fit in? (Teacher Ester, 8.1)

Here, students were left to guess which ingredients went well together and in what amounts, which required previous experience of some kind.

Shifting emphasis on different types of sensory reflection

Teachers frequently used sensory reflections to explain why recipes were written as they were, to reveal the unsaid in recipes, and to explain deviations. Sometimes these sensory reflections were brought up several times throughout the lesson, creating continuity. For example, techniques for assessing the doneness of chicken meat were introduced during run-throughs and brought up again during cooking and mealtimes. Another common instruction concerned the appropriate temperature of cooking oil, exemplified by the following excerpt from a demonstration in 6.4.

Teacher Beata: Now I can see it's starting to get hot. How can you see that by looking at the oil? Yes, Vendela?

Student Vendela: It starts bubbling?

Teacher Beata: Well, it shouldn't do that because then you've got water in the frying pan.

Vendela: Oh, okay.

Teacher Beata: That's the thing. But it starts moving a little, like this. ((Angles the pan to let students see)) (...) Look at the oil now, it's flightier in the pan, so it's like ((gestures back and forth)) *tsch-tsch-tsch*, a bit mobile like that. And hold a hand ... don't get it in your heads to touch the oil, please. You can hold a hand above it to feel if it's hot or not, and look here, when you put [the chicken] in, you can see it sizzle.

Here, teacher Beata described how to visually and kinaesthetically assess whether the oil was hot enough. In 6.3, she also referred to the hot oil as "expanding" and "becoming lighter". During cooking, she moved between kitchen units, repeating her instructions:

Teacher Beata: It starts moving a little back and forth. You can feel that it's hot too. Can you feel that? Yes. Then it's ready. And you can try, look here, if you ((puts the edge of the chicken into the pan)) you can see it start to bubble a little.

However, this type of continuity was not very common. In most cases, teachers did not systematically introduce all the sensory tools at students' disposal or refer to them again later. Sometimes sensory reflections were only brought up with certain students, such that the teacher told some students to assess temperature visually and others kinaesthetically. Instructions also differed between groups. In 6.1, teacher Beata did not mention surface colour as a way of assessing doneness during her run-through, but only mentioned temperature. However, student Baltasar mentioned the surface colour of his chicken to a fellow student, and whether or not teacher Beata heard this, she did bring it up as a way of gauging doneness in her 6.2 and 6.4 run-throughs. While cooking, student Palle in 6.2 referred back to this by saying, "That one's good, they were supposed to be golden brown", thereby creating his own continuity, but none of the other students in the groups or teacher Beata did. Thus, sensory reflections were only intermittently coherent throughout the lesson, making for different experiences for different students.

Sporadic connection between sensory reflections and the cooking process

While students seldom tasted their food during cooking, they did use visual, kinaesthetic, and olfactory reflections to assess their own or others' work, suggest solutions to problems, evaluate solutions, predict results, or explain things to peers. Student reflections required previous experience unless they referred to instructions or a photo of the finished dish. For example, John in 8.3 mentioned a possible reason (too much baking soda) why his and Pelle's cookies turned out soft instead of crispy, a reflection that indicated previous experience. When Pelle asked teacher Phebe why their cookies were soft, she said "reality doesn't always conform to your mental image [of what they should be like]". However, she did explain to another student group that the use of cupcake liners could make cookies softer.

Sometimes, students' lack of knowledge about sensory impact of various ingredients led to unfavourable results. For example, Niklas in 8.4 added more sugar and baking soda to his oat cookies than the recipe called for because he liked the taste, which resulted in a see-through sheet of melted dough rather than cookies. Niklas told his friends this was because of the sugar, while teacher Ritva suggested he had used too much baking soda, which he denied. There was no discussion about the specific ways sugar or baking soda might impact the finished result. "Mistakes" could also be made on purpose. In one case, two students from 6.5 added more and more salt to their dish as a joke, but did not admit to this when teacher Elisabeth asked.

Elisabeth: What was it that made your food very salty?

(...)

Elisabeth: Everyone salted it? So it wasn't just one person who—

Amund: It fell in.

(...)

Elisabeth: Into the pan, alright. Did you try to remove the salt, or did you just stir it in?

Amund: We tried to remove as much as we could, but it was hard, it was so (...)

Elisabeth: That explains it. What should you think about next time, with the salt?

Amund: Have more control over it.

Here, the teacher-led reflection was arguably superfluous since the students had consciously sabotaged their own dish.

In other cases, students noted problems they did not bring up with the teacher. For example, Ellen in 8.1 found her fried, breaded fish "ugly" and "weird" because it broke apart and the breadcrumbs clumped together. She did not suggest a possible solution or ask teacher Ester for help, but simply manoeuvred the fish with a spatula. Thus, connections between actions and results were left unexplored. This was also common at mealtimes when students made sensory reflections about their finished products, exemplified by the following excerpt where teacher Ritva and three students in 8.4 discuss their chocolate date balls.

Teacher Ritva: So, assessment of taste, consistency?

Minna: Mm, good consistency.

Oskar: Yeah, because they're ...

Minna: Chewy.

Beatrice: Soft.

Oskar: They aren't very hard.

Teacher Ritva: Not very hard, no.

Here, neither the teacher nor the students discussed what made the chocolate date balls chewy or soft. Teachers did sometimes connect sensory results in the finished dish to the recipe, other instructions, or student actions, but not always in a systematic way that connected and summarized instructions and reflections from different parts of the lesson.

Need for quick problem-solving favoured instructions over reflection

There was a strong focus on producing a successful dish, bread, or sweetmeat on time, which meant students needed to make their sensory-reflective decisions quickly, while their food was cooking. When they were unable to do so and asked for help, teachers gave instructions more often than they encouraged student reflection. They repeated information from the run-through, urged students to read the recipe, told them what the recipe said, or offered explanations. For example, they clarified how to read the recipe, showed what utensils to use, explained cooking terms, or identified unfamiliar food items. Even without being asked, teachers also supported students by telling them in what order and for how long to do specific steps, how to perform techniques, use utensils, handle food items hygienically, and avoid getting hurt, and how and when to assess doneness. To prevent mistakes, they alerted students to opportune moments for action, for example when to add ingredients.

Sometimes, such instructions included sensory reflections. For example, teacher Ritva explained to a group of students in 8.3 when and why to stop mixing their cookie dough:

That's enough, you don't need to mix it anymore. You can add ... oh, you already added the egg. Yeah, now you can mix it some more. Just go on, mix it. There. Yes. You can stop. (...) It's better that it's a little bit hard than that it's much too soft. So, mix it a little more. There, that's enough. You don't need to ... You see, [the dough] is like a ball now, so stop.

Other times, teachers simply said something looked done or good without explaining why. In general, quick problem-solving was prioritized, even when students were encouraged to reflect on parts of the process. For example, teacher Phebe discussed baking time with Malte and a non-participant in 8.6.

Teacher Phebe: Why do you choose to bake them for twelve [minutes]?

(...)

Teacher Phebe: Because?

Malte: To make sure they're all done.

(...)

Teacher Phebe: And that's what I hoped you would say, NN, that you'd set [the timer] for the shortest time [in the recipe]. Your cookies say, "ten to fifteen", and you're saying you'll set it to fourteen.

(...)

Teacher Phebe: What if that's too long?

Malte: Then we'll take it out and ...

Teacher Phebe: What's usually recommended, Malte, is to always set it on the shortest time and check. After ten minutes the cookies will be done, and then it's just a matter of how you want the surface to look, and you can decide that for yourself.

Here, teacher Phebe did not manage to elicit the answer she wanted. Thus, even when teachers strove for student reflection, they often ended up solving dilemmas for the students, sometimes even performing tasks for them, such as lowering stove temperatures.

Discussion

During cooking lessons in HE, emphasis shifted between three different kinds of instruction – run-throughs, recipes, and real-time guidance – that did not always harmonize. There was occasional but not systematic continuity in instructions and reflections throughout the lesson, making for a fragmented approach. Caught between these different sources of fragmented instructions that were also sometimes vague, students were expected to make sensory-reflective decisions in real time regardless of previous experience. When this became difficult, teachers helped them finish their dish on time rather than encouraging student reflection. In the following, I will argue that the development of cooking literacy might be facilitated if teachers modify these problematic characteristics of HE cooking. I will discuss how an increased focus on process over product is crucial; how systematic, autonomous comparison may help students develop sensory-reflective abilities; and how sensory-reflective planning, decision-making, and evaluation can be arranged during run-throughs, cooking, and meals. Finally, I will discuss how my findings contribute to the field of HE research.

Increasing focus on process and experience over recipes and dishes

The main goal of a Swedish HE cooking lesson is generally to create a complete dish, dessert, or pastry (Bohm, 2022). On paper, reasons for this include the hope that students learn the steps included in the recipe. However, students work in groups and seldom perform all or even their share of tasks (Lindblom et al., 2016), which means they do not necessarily gain the experiences so important for experiential learning (Dewey, 1986). This study also indicates that completing the product on time was so central that teachers did not always involve students in the sensory reflections so essential to cooking (Sutton, 2018) or even let them perform tasks on their own. Indeed, the focus was frequently on *cooking a dish* rather than on *learning to cook*, rendering students passive recipients of ready-made explanations and solutions rather than active explorers. This phenomenon may be partly due to time poverty, since HE teachers tend to give direct orders when time is scarce (Lindblom et al., 2015).

Sennett (2008) describes how practical skills are often demonstrated by a master and expected to be mimicked by the apprentice, even though the master already knows the technique and cannot put themselves back in the shoes of the novice, and the apprentice might not be able to figure out “what turned the key in the lock” (p 181). Therefore, students need to experience how central phenomena such as time, utensils, methods, and temperatures together with amounts, shapes, texture, size, proportions, and interplay of ingredients impact results (Bohm, n.d.). Learning to negotiate ingredients, actions, and preferences based on previous experiences (cf Berg et al., 2019) reduces reliance on standardized and sometimes faulty recipes. HE teachers wish students would taste and evaluate their dishes during cooking (Bohm, n.d.; Höijer et al., 2011), but unless students know what to “look for”, this may be difficult. In an ideal world, teachers would ask continuous questions about what is happening to the food, whether that is good or bad, and how to impact it going forward. Since they cannot clone themselves, however, students may have to conduct their own sensory-reflective discussions.

Such discussions only intermittently happened in this study. Even when students noted mistakes, they did not always pursue a sensory-reflective solution, perhaps partly to avoid drawing teacher attention to their problems out of worry for their grades (Lindblom et al., n.d.). But when potential solutions are not explored, learning suffers. For autonomous sensory reflection to work without constant teacher presence, students need strategies for constructive collaboration and communication (cf Taar & Palojoki, 2022). One such strategy is to systematically reflect on past actions, the present state of the dish, and future actions. Through sensory-reflective explanations, students identify how their past decisions have impacted current sensory results, e.g., why their food has burned; through sensory-reflective decision-making, they discuss what to do based on current

sensory aspects of the food, e.g., they choose a course of action to prevent burning; and through sensory-reflective predictions, they guess how a given action will impact the food, e.g., that the food will not burn if they lower the heat. By continually looking at, smelling, feeling, listening to, and tasting the food instead of just following the recipe, students can gauge the development of their dish and practice how to identify required actions. This keeps them up to date about what is happening, increases the likelihood that each student gains a holistic understanding of the whole cooking process, and helps them use each other's competencies to reason their way to solutions when faced with challenges (Taar & Palojoki, 2022).

However, one logistical problem remains. Even if students learn to communicate constructively through sensory reflection, cooking is a time-sensitive activity. Therefore, a dish may burn on a too-hot stove before a conversation about it reaches a relevant conclusion. I have argued elsewhere for a departure from the classic meal-centred lesson (Bohm, 2021, 2022), and I reiterate my argument here, since – perhaps counterintuitively – meal-centred lessons are not ideal for experiential learning. Since time poverty impacts teachers' teaching style (Lindblom et al., 2015), less stressful lesson formats might encourage exploratory discussions with students rather than direct orders. With a more experimental approach to cooking, focused on exploring food through the senses, students might have the time for what Sutton (2018) argues is essential for learning to cook: trying, failing, and making changes, i.e., conscious risk-taking. Lassen and Hjalmeskog (2021) also argue for designing HE cooking lessons where students take risks, use their senses, conceptualize, plan, and make decisions – the question is how such a lesson can be organized.

Developing sensory reflection through systematicity, repetition, and variation

At the turn of the twentieth century, Dewey's laboratory school of the University of Chicago used cooking to teach principles of physical processes (Mayhew & Edwards, 1936). Different characteristics of different foods were studied through experimenting with amounts of water, time, and heat when cooking rice, granular cereals, and so on. I propose a similar set-up in HE, where instead of being offered ready-made solutions, students come up with their own strategies for sensory reflection through guided exploration (Dewey, 1933). For example, a lesson devoted to frying can focus on different types of cooking fat, how different fats react to heat, their sensory impact on the food, what happens when you fry with and without fat, and how and when to regulate temperatures. A simple experiment where students fry pieces of bread or potato can be enough to compare the impact of time, temperature, type of fat, texture and size of the bread/potato, and proportions between fat and bread/potato on visual appearance, smell, consistency, taste, and maybe even sound.

To apply this approach, however, teachers need to encourage systematicity and autonomy among students. The teachers in this study frequently used sensory reflection when introducing elements of cooking and advising students on courses of action, but the practice was not always systematic or student active. Although students were sometimes instructed to observe “wandering” hot oil during a run-through and then encouraged to notice this aspect during cooking, they were just as often told to hold a hand over the frying pan to kinaesthetically feel the heat instead. Thus, although teachers were experienced cooks who knew several ways of assessing the sensory development of food, students did not experience them all. This created fragmentation since instructions focused on different techniques for experiencing and reflecting on different sensory aspects at different times and with different students. Rather than a holistic exploration of oil in its various states, based on all available senses, students were offered disconnected snapshots. To make matters worse, recipes based on butter or margarine unhelpfully referred to browning and sizzling, further fragmenting and confusing the experience.

Since experience is continual, systematicity is crucial: similar experiences should reoccur and build on each other (Dewey, 1986). For maximum effect, both the visual experience of “wandering oil” and the kinaesthetic one of feeling the heat above the pan can be introduced during run-throughs, then reoccur for all students during cooking, and ideally be brought up again at the

end of the lesson. Indeed, Nuthall (2005) posits that students must encounter a phenomenon a minimum of three times to remember it. While a few students in this study may have encountered an experience several times by listening to the run-through, reading the recipe, applying it in practice, and discussing it with peers or teachers, others may have done none of this.

However, not only repetition is needed for learning, but also variation and comparison. In this study, sensory reflections lacked context in that there was not always a contrasting phenomenon for students to compare their experiences to. Someone who has never gauged the heat of cooking oil by holding their hand over a pan may not be able to discern “lukewarm” from “smoke point”. Developing this ability requires experiencing variation, since it is in contrast to other phenomena that a phenomenon gains its meaning (Marton & Trigwell, 2000). To discern relative heat, students must also experience relative cold. By exploring and verbalizing sensory experiences when a food is in a state of “too little”, “too much”, and “just right”, they may develop a feeling for gradual changes. Likewise, to understand the unique behaviour of hot oil, they must experience how butter reacts differently. Through comparison, they may conclude that sight, smell, and hearing are useful when assessing the heat level of butter, while sight and kinaesthetic feeling are better for assessing oil.

Importantly, the exploration of sensory experiences is not only crucial for learning to cook but has also been shown to increase openness to novel foods such as fruit and vegetables (Coulthard & Sealy, 2017; Mustonen & Tuorila, 2010; Reverdy et al., 2008). It may also help develop the abilities, required by the HE syllabus, to reason around the cooking process and on sensory aspects (National Agency for Education, 2022). Ideally, the experiences created by the type of reflective inquiry sketched here would create a holistic toolbox of sensory reflections students can apply to unfamiliar foods and dishes in the future – or in the terminology of this paper, cooking literacy. To prepare future HE teachers for such a pedagogy, important aspects of teacher education programmes are food chemistry, sensory vocabulary, and the sensory interplay between ingredients.

In summary, my findings confirm the problems surrounding recipe literacy in HE (Granberg, 2018), but by introducing the broader concept of cooking literacy, I also reveal the interplay between instructions, autonomous decision-making, sensory experiences, and knowledge of causal relationships. Therefore, I propose that both recipe literacy and cooking literacy offer complementary perspectives for future research. My findings also support the integration of John Dewey’s experiential learning theory into HE research since his framework of experience and reflection aligns with the pedagogical goals of the Swedish HE syllabus (Dewey, 1933; National Agency for Education, 2022). Given the emphasis on sensory experiences in the latest syllabus for HE (National Agency for Education, 2022), there is significant potential to expand research into how these dimensions of cooking can enhance learning. While earlier HE research has explored aesthetic judgments and taste preferences (Berg et al., 2019; Bohm, 2016; Gelinder et al., 2020; Gisslevik et al., 2017; Höijer, 2013), my findings suggest the need for further studies that incorporate sensory and experiential dimensions to better understand and teach the complexities of cooking as a reflective, hands-on activity. Based on my findings, I recommend future HE studies that apply an experimental approach to cooking, emphasizing sensory engagement in cooking decisions.

Strengths and limitations

All schools were located in a limited area in the south of Sweden. Catchment areas varied socio-economically, but none were deprived or multicultural. However, the analysis was done on a high level of abstraction which may make the study transferable to other contexts. More concerning is the over-recruitment of students who seemed fairly experienced with cooking. However, even these students encountered problems, and consequences for inexperienced students could be inferred through teacher interactions with non-participants.

Lessons were not videotaped, so student activities were only captured through field notes. Sound files sometimes revealed actions through sounds e.g., whisking or frying, or by students verbalizing

what they did. Unfortunately, however, several sound files were corrupted, making speech muddled. This made for fragmented data in some groups and hampered my ability to trace the development of entire conversations or chains of events. Therefore, it is possible that I missed some sensory reflections made by students. However, the data set was large, and all teacher sound files were good, so partial data loss did not impact my analytical conclusions.

Of course, students may have made sensory reflections silently, so I cannot draw conclusions about their understanding, thoughts, learning, or rationale for actions unless they expressed it. It is also possible that students had practiced sensory reflection during previous lessons, but if so, teachers did not refer to this during the study.

Conclusion

This study examined how instructions and sensory reflections in HE lessons manifested and inter-related during cooking. From the perspective of Dewey's experiential learning, fragmentation, vagueness, and the need for quick problem-solving risked undermining the iterative learning process needed to build cooking literacy. To address these challenges, I propose a more systematic approach to integrating sensory-reflective decision-making throughout lessons. Simple experiments that allow students to compare, reflect on, and build on their sensory experiences can create continuous and meaningful learning opportunities. In group work, students can develop their cooking literacy by articulating past actions, reflecting on current results, and planning future steps based on sensory feedback. These practices, supported by a departure from the traditional meal-centred lesson format, might enable students to build a holistic toolbox of sensory-reflective skills.

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