Title: The impact of video technology on cooking skills

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Abstract

With the decease of cooking from scratch in the domestic setting and the increasing use of broadcasting technologies to promote cooking, this study seeks to examine the role of video technology in assisting the cooking process in the home. The study explored the views of 141 female participants on their perceptions of video technology as assisting the cooking specific food and recipes. Participants took part in a cooking experiment to assess the most effective methods of learning for low-skilled cooks across four experimental conditions (recipe card only; recipe card plus video demonstration; recipe card plus video demonstration segments, conducted in stages; and recipe card plus video demonstration 'free access video demonstrations). Focus group discussion followed immediately after the cooking task wherein participants reflected on their use of video technology to assist the cooking process. Findings revealed that video technology promoted the cooking process in the following ways: (1) visualisation of the cooking process; (2) reassurance during the process; (3) replication; of the process (4) flexibility to work at your own pace; and (5) selective access to the video where required. Key learnings across all four conditions identified that individuals perceived video technology to be most effective when: (1) experiencing a new cooking skill and (2) reinforcing a more advanced technical skill. These findings display the potential for video technology to enhance cooking skills among low-skilled individuals wishing to cook a meal from scratch using fresh ingredients.

Key Words

Cooking skills, cooking confidence, technology, mobile digital technology, video, cooking demonstration.

1.0 Introduction

Research indicates that video's facility to listen repeatedly to information is likely to be a mediating factor in reinforcing learning through increased motivation and engagement (Mc Kinney et al., 2009). Video provides individuals with the opportunity to control the speed and the pace of information being presented, allowing them to process the content more effectively, before more information is presented and lost (Walls et al., 2009). Although there has been extensive research around technology and skills development, to date there are few studies on the impact of video technology on cooking skills development and engagement in the domestic environment .

1.2 Societal Changes in Domestic Cooking

Convenience has emerged as a key factor in consumer food choice, and many social and environmental factors have contributed to a decline in time spent in the kitchen (Jackson and Viehoff, 2016, Pula et al., 2014, Caraher and Lang, 1999) Industrialisation, urbanisation, commercialisation and social change have converted the social and economic landscape globally and in the UK where financial and lifestyle changes have resulted in changing eating patterns (Utter et al., 2016). There is evidence of a changes in traditional eating habits, a greater availability of high energy, ready-made convenience foods, and eating outside the home more often, with resulting over consumption (Jackson and Viehoff, 2016). Correspondingly/concomitantly there has been an escalation of consumer spending in the convenience food sector correlating with a lack of cooking skills (Mintel, 2010; Mintel, 2016; Jabs and Devine, 2006), where lower end-cost, pre-packaged convenience meals are generally energy-dense, high in fat and salt and low in micronutrients and fibre which inevitably contribute to dietary inequalities and ill-health. In recent decades the focus of

policy makers and health promotion professionals has been the conservation of domestic cooking skills through health campaigns to promote awareness and the facilitation of community cooking interventions to develop knowledge and skills albeit without an adequate or robust evidence base to support such initiatives (Reiks et al., 2014; Rees et al., 2012). Cooking skills interventions have become a popular tactic used to improve diet quality among the general population. In addition, policy debate has promoted the merits of cooking skills interventions to deliver wider public health policy solutions (Garcia et al., 2014; Condrasky and Helger, 2010). However, upon a review of the literature to date on cooking skills interventions, few studies have incorporated the use of digital technologies to support the development of individual cooking skills.

2.2 The Use of Digital Technology in Promoting Domestic Cooking Skills

Research into the effectiveness of video in enhancing learning has revealed wide ranging benefits in terms of cost as well as meeting the learning requirements of the digital native (Prensky, 2010). Prensky (2010) contends that digital natives are used to receiving information at speed, preferring to parallel and multi-task, therefore the flexibility of video using portable devices may offer more efficient learning (Lim, 2005). Indeed there has been an increased emphasis on the use of digital technology to promote skills development through use of video across social media platforms and smart phone Apps (Comiskey, 2010; Whatley and Ahmed, 2007). Videoed cooking demonstrations and those presented on television, have tended to facilitate the full process, step by step, and often with some spoken information on for example the sourcing of fresh local ingredients or nutritional facts concerning the dish being created. Current thinking however suggests that as educators, it is necessary not to simply replicate steps and stages of a process but to consider the needs and learning

requirements of the audience in order to fully engage and motivate them. Therefore it is necessary to consider what environmental changes must be introduced to best meet the needs of the intended target audience. Watson (2006) states;

> *"We spend a lot of time trying to change people. The thing to do is to change the environment and people will change themselves"*
> (Watson, 2006 p24).

For most individuals, the digital device itself, for example, a smart phone or tablet, is close at hand with rapid internet access; and as more people choose portable devices to access this, the way in which they acquire their information has and continues to change (Ericsson, 2010). Several studies have utilised small screens, such as iPods (Kellems & Morningstar, 2012; Rayner, 2011; Murray and Olcese, 2011) and handheld computers (Cihak, Kessler, and Alberto, 2008) as electronic prompting devices. Regardless of the differences in tasks and materials, video in these studies has been found to be effective in developing a range of skills. Few studies to date have specifically addressed the use of video technology to improve cooking skills.

2.3 How Digital Technology Impacts on Learning

Wishart (2016) contends that visualisation is especially relevant in understanding key concepts, and the visual nature and audible content of video serves as a substantial learning tool. Indeed according to Mayer's (2001) cognitive theory of digital learning, an individual's information processing system is separated by cognitive channels to differentiate visual and auditory stimuli. Learning is accessed by integrating the information from these separate channels suggesting that learners can process only a limited amount of information at any given time. This is highlighted

through empirical research, which found that if a large amount of visual and verbal stimuli are offered simultaneously, the learner experiences cognitive overload and cannot reach maximum understanding of the content (Mayer, 2001). However, because video offers the functions of repeated access and control of the speed and pace of the verbal and visual stimuli offered, cognitive overload is decreased. Therefore, using video technology to teach cooking skills has the potential to improve learning, engage individuals in the cooking process and have a positive influence on diet quality. The aim of this study is to gain greater understanding of individuals' perceptions of using digital technology, specifically video technology, to assist the cooking process.

3.0 Research Context: Cooking Skills

The data presented in this paper is part of a larger study addressing the impact of cooking and skills and the role of technology in the promotion of cooking and their influence on the healthiness of diets in adults aged 20-60 years. Quantitative data was collected via a nationally representative consumer survey to measure cooking and food skills on the IOI and investigate their relationship with socio-demographic and psychological factors. Qualitative techniques (interviews, experiment and focus groups) explored individual behaviours and use of cooking skills. The data reportrd here is part of larger study involved a mixed methods approach using qualitative and quantitative techniques on the island of Ireland. This paper presents the qualitative findings of the focus groups which followed the cooking experiment.

3.1 Sample

One hundred and sixty participants were recruited to take part in the cooking experiment [40 participants x four experimental conditions]. All were selected using specific recruitment

160 criteria: (a) female; (b) cook for a family; and (c) consider themselves as low-ability cooks.
161 The final sample consisted of 141 participants across 16 focus groups. A total of 21
162 participants withdrew from the study for various reasons (e.g. unexpected commitments, non-
163 attendance and illness). The sample size of each experimental condition is described as
164 follows: condition one (n=34); condition two (n=33); condition 3 (n=35) and; condition 4
165 (n=39).

166

167 **3.2 Methodology**

168 To explore individual perceptions of video technology on cooking skills, a cooking
169 experiment followed by a focus group discussion was used. Within the experiment
170 participants were asked to prepare a lasagne using fresh ingredients, and were categorised
171 into four experimental conditions. Condition 1 (control group) involved use of a recipe card
172 only. Condition 2 permitted participants to watch a video demonstration of the cooking
173 process in advance (plus use of a recipe card). Condition 3 included video segments of the
174 cooking demonstration, where the full demonstration was divided into steps (plus use of a
175 recipe card). Participants were asked to watch each video segment then enact it, before
176 moving onto the next step. Lastly, Condition 4 involved unrestricted access to the video (plus
177 use of a recipe card) where participants could access the video as and when required. This
178 paper will focus specifically on the results of the focus group discussion wherein participants
179 reflected on their use and perceptions of the video technology used in the experiment. Each
180 focus group discussion was based on the appropriate experimental condition therefore only
181 one experimental condition was discussed in any given focus group.

182

183 **3.2 Procedure**

Data were collected in 16 focus groups facilitated at Ulster University, Coleraine and St. Angela's College, Sligo and facilitated by an experienced moderator (DS). Each focus group began with an ice-breaker activity requesting participants to introduce themselves and state how often they cooked from scratch. The moderator then provided instruction on ground rules of the focus group discussion (e.g. not talking over each other, the importance of confidentiality) before proceeding to a series of guided open-ended topics. Results from the literature review and data from an earlier round of interviews from the larger study informed the development of the focus group topic guide (Table 1). Each focus group was conducted immediately after the cooking experiment, lasted between 50 and 65 minutes and was audio recorded. An assistant moderator (FL) was also present to take notes to help focus the discussion. At the end of each focus group, participants were thanked and an honorarium of £60 (60 Euros) was paid and a free copy of a *safe*food cookbook given to each participant for their time and to remunerate the travel costs of study participation.

Table 1 Outline of the focus group topic guide

Topic	Description	Aids/Activities	Duration
Introduction	• Facilitator introduction • Boundaries of the focus group and contracting including recording consent		5 minutes
Confidence Levels	• What was your perceived confidence ability in cooking lasagne from scratch prior to the task? • Has this confidence changed as a result of the experiment?	Participants may use pre survey and post self-evaluation sheets	5 minutes
Evaluation of dish	• Individual perception of taste and appearance of the finished dish - How does it taste? • Comparisons with group participants' dishes? • Is this what was expected in terms of ability and taste of the finished dish?	Check dishes in oven and serve Taste testing Participant taste testing evaluation sheet.	20 minutes
Barriers/Facilita	• How challenging did you find the	Demonstration	10 minutes

tors to cooking from scratch	task? What were the most/least challenging aspects of the task? • What would encourage/discourage you to cook using fresh ingredients at home? • What additional barriers do you consider prevent you from cooking this or a similar dish in the home environment?	of portion costing card	
Identification of skills used	• What skills can you identify in cooking lasagne? • Do you consider these skills achievable in your home? • Which skills did you consider most challenging? • Would you practise these to enable you to cook this or a similar dish at home?		5 minutes
Use of technology	• Do you have home access to the internet? • Do you use the internet to assist with learning practical skills? • Can you think of an example? • Group 1 – Do you consider the task as more/less challenging because of lack of visual demonstration? • Groups 2-4 – How do you consider technology to have assisted/hindered learning? • Groups 2-4 – Are there aspects of this form of learning which you consider particularly useful? • Would you consider using technology to assist with home cooking? • What part do you consider technology can play in promoting cooking from scratch in your own homes?		10 minutes
Transferability of skills/learning to the home setting Summary and ending	• Considering the skills you identified earlier - Can you think of other meals where you might incorporate skills developed today, or different ingredients for example you may like to change or incorporate ingredients to make the dish healthier or more preferable for the family's taste? • What would you do differently next time?		5 minutes

3.3 Analysis

All discussions were digitally recorded, professionally transcribed and uploaded to the qualitative analysis software Nvivo 10 (QSR International Pty Ltd, Victoria, Australia). An inductive coding approach was used to identify a comprehensive set of evolving codes to: (1) summarise the raw data and (2) establish links between the research aim and the raw data. Using a sample of two transcripts initial codes were generated independently by two researchers (DS and LH) and discussed in a process of triangulation for the purposes of developing a codebook to be applied to the remainder of the data. To ensure inter-coder reliability, a further three transcripts were coded and agreed. Codes were then grouped together to form potential themes in relation to the aim of the study. Verbatim quotes are displayed with the day, focus group number, experimental condition and the location in which the focus group was held, respectively, following in parentheses.

4.0 Results and Discussion

Results are presented using two broad perspectives between and across experimental conditions.

4.1 Condition 1 - control group (recipe card only)

Within this experimental condition participants did not have access to a video demonstration or images of each stage of the cooking process, only written information on a recipe card with a small thumbnail picture of the lasagne. The reported outcomes of Condition 1 indicated that the text-only recipe did enable the participants to produce an end product; however those who had not experienced this process before lacked confidence and expressed concerns with certain technical (cooking skills) aspects of the recipe.

> *"I suppose, with the white sauce, you think you're doing it wrong with the recipe card. I've not made it before so I lobbed the milk in too quickly. If you'd seen it being done first you'd know you were doing it wrong before you went ahead. Yeah, if you want to learn something new, even, it's good to see how other people do it."* (2, 2, 1, R.O.I.)

In addition participants discussed their ability to visualise the end product (lasagne) but struggled to visualise certain steps and stages within the recipe (béchamel sauce). Subsequently, participants suggested that a sequence of images reflecting each stage of the process would have been more helpful than written text instruction.

> *"I have made it from scratch but I've never made the cheese sauce from scratch, so that was an experience! I kind of found, as I was going through, I hadn't a clue if I was doing it the right way. I think you'd need to see what the end product is supposed to look like after the meat, then the cheese sauce. Especially through the cheese sauce even if you had pictures."* (2, 1, 1, N.I.)

Wishart (2016) contends that visualisation is important in understanding key concepts, and as a result, emphasised the visual nature of video as a beneficial learning tool. This condition lacked the visual aspect of outlining the steps involved in the cooking process and participants highlighted this where they reported a lack of visual expectation in terms of what was required from them in completing each stage of the task. Results underlined the importance

of visualisation in developing confidence and reassuring the participants that they were following the cooking process correctly.

4.2 Condition 2 - Video demonstration - (watch full video before task + recipe card)

Within this experimental condition participants watched the video demonstration in advance and had access to the recipe card. The outcome of Condition 2 revealed that the majority of participants positively perceived the video technology, specifically discussing how it improved their technical skills required in béchamel sauce making. While results indicated that viewing the video in its entirety prior to the experiment led to an increased inability to recall all of its content, participants did discuss how they retained specific images in key stages of the experiment. This result was particularly evident during the sauce making process, offering reassurance of following the correct process.

> *"I forgot exactly what to do when I came to make it, but I remembered that the sauce was supposed to look really thick to start with, so I knew I did it right."* (3, 2, 2, R.O.I.)

> *"I probably wouldn't have been able to do it unless I'd watched the video first because I would have thought I'd have made a mess of it and given up. … When you remembered back to the video you realised you were ok."* (3, 1, 2, N.I.)

The majority of participants within this condition expressed a preference to follow recipe text rather than instruction via video however this may have been due to their prior experience of making a bolognaise sauce consequently not finding this part of the video beneficial.

However, results did highlight the significance of visualisation in the development of cooking skills. In this instance, individuals did consider seeing the demonstration prior to beginning the experiment beneficial for anticipating that certain stages within the cooking process were being completed correctly.

4.3 Condition 3 - Video demonstration (watch each segment then cook + recipe card)

Within this experimental condition, participants watched a total of five segments of the video demonstration in pre-determined stages while cooking the recipe and had use of the recipe card. The outcome of this condition demonstrated that the majority of participants positively perceived the video in terms of the staged sequencing of the cooking process. Participants were aware of how the consistency of the béchamel sauce should appear once prepared, however were uncertain of what the viscosity should be throughout the stages of the sauce-making process. Watching the video offered them a visual expectation of the cooking process and provided them reassurance that they were following each stage of the cooking process correctly.

> *"I can't remember what it was but I got a video on how to prepare fish because I didn't know where to start, and you could do it in stages like we did today by stopping and starting it … You could see exactly what to do, and follow it."* (3, 3, 3, N.I.)

In addition, results indicated that the step-by-step sequencing reduced the need to recall aspects of the recipe as they simply followed the video in real time.

"You can pause it where they're at and catch up, so you're not having to remember things." (1, 2, 2, N.1.)

Results indicated that this real time step-by-step process also allowed participants to work at their own pace by stopping and starting the video as and when needed.

"I'd watch it first when I'm trying to figure out what I'm doing.... I'll, you know, look and research and, you know, watch it to see if I think I can do it, and then when I'm doing it I'd, you know, watch it and pause it as I go along then." (3,1,2, R.O.I.)

While this condition did show an overall positive effect of technology on cooking skills and practices, results revealed some negative reactions to its use. Participants who had previous experience in making a bolognaise sauce found viewing some of the steps within the process time-consuming and off-putting.

"It was a pain having to watch the rest of it though...it made me run out of time." (1, 1, 3, N.I.)

Participants also discussed how the step-by-step video instruction illustrated the amount and speed at which ingredients should be incorporated throughout each step of the cooking process.

"It gave me more guidance, as you're saying, with each step; now have I done this right or am I adding the milk at the right times, you know, or am I adding too much milk too quickly?" (1, 1, 3, R.O.I.)

This condition offered visualisation and reassurance of the cooking process in real-time through watching the steps of the video in sequence. Watching the video in stages helped to prevent cognitive overload (Mayer, 2001). In addition, participants considered that the skills demonstrated in the video made it easier for them to replicate during the experiment. However, the ability to replicate key skills was only viewed as valuable when undertaking a new skill for the first time (e.g. sauce-making) or a more complex skill which typically they did not practise on a routine basis.

4.4 Condition 4 - Video demonstration (watch video segments as required + recipe card)

Within this experimental condition, participants watched the segmented video cooking demonstration and had use of the recipe card as and when required. Results displayed similar findings to those of Conditions 2 and 3 in relation to the use of technology for the purposes of visualisation. However, by allowing participants the flexibility of selecting which steps to view as and when required, as many times as they required (selectivity), this resulted in participants utilising the video to meet their individual needs.

"You can rewind it, you can just put it on pause; I like dipping in and out when I need it." (1, 2, 4, N.I.)

"I'd probably have it running in the background as an audio while I do something else, and just listen to what I need." (2, 3, 4, N.I.)

Results showed that the majority of participants were familiar with making the bolognaise sauce so chose not to watch the steps relating to this stage in the recipe. However, this did not apply when undertaking the steps relating to the sauce-making. Walls et al. (2009) contend that an important learning aspect of video technology is the facility to pause, rewind and repeat. This ensures that participants may process video content more effectively, before more information is presented and lost. Indeed according to Mc Kinney et al. (2009) the ability to repeatedly watch and listen to video reinforces learning, promoting further motivation and engagement. Some participants discussed how they viewed only the steps relating to the sauce-making and that they viewed these steps more than once to ensure a successful outcome. Individuals highlighted that, in terms of learning a new skill, the visual nature of the video together with the facility to reinforce key aspects of sauce-making served to reassure and engage them in the process.

> *"I was able … I just wanted to see what my cheese sauce looked like compared to the girl's in the video. I just used one bit of that video, the sauce really, because I make spaghetti all the time and didn't need the video then."* (1, 2, 4, N.I.)

Again, findings or accounts from respondents were similar to Conditions 2 and 3 whereby technology was beneficial to those carrying out a new skill for the first time (sauce-making). Similarly, results revealed that participants who had no experience of preparing a béchamel sauce suggested that the visual impact of the video was important in terms of anticipating what the sauce should look like at each step of the process, as well as reassuring them that they had replicated an acceptable consistency.

Condition 4 demonstrated the importance of visualisation, flexibility and selectivity in using technology while cooking. It is now recognised that simply replicating the steps and stages of a process is not sufficient to engage the target audience. Consideration should be given to the learning needs and requirements of a range of individuals within that target audience. Therefore in order to meet these needs, as educators, it is necessary to make changes to the learning environment (Watson, 2006). Results suggested participants experienced the benefit of having the freedom to view the segments of the demonstration they needed as often as they needed throughout the experiment. Therefore in order to engage and motivate the audience to develop and learn new cooking skills, perhaps it is more beneficial to offer individuals the option to select relevant parts of the process of which they are unfamiliar, as a result promoting self-determination, empowerment and a person-centred approach to learning.

4.5 Summary of experimental conditions

Findings highlighted that the majority of individuals perceived the video technology positively in aiding the cooking process, in particular where new or more technical cooking skills was required.

Focus group results suggested that technology assisted the cooking process in the following ways: (1) visualisation of the process and final product; (2) real-time reassurance of individual progress; (3) replications of cooking skills; (4) flexibility to work at your own pace; and (5) selective access to the video as and when required. While visualisation and reassurance were deemed important to the control group these were not discussed specifically in relation to the video technology used within the experimental task but rather imagery (or photographs) of the stages within the recipe. In contrast however, Condition 4 demonstrated

that all the benefits considered helpful in the cooking process were present in Condition 4. All five benefits are summarised across each experimental condition in Table 2.

Table 2 Benefits of technical assisted cooking across experimental conditions

Identified Benefit	**Condition 1**	**Condition 2**	**Condition 3**	**Condition 4**
Visualisation				
Real-time reassurance				
Replication				
Flexibility				
Selectivity				

Key learnings across all four conditions identified that individuals perceived the video technology to be most effective when: (1) learning or applying a new cooking skill; and (2) reinforcing a more advanced technical skill. More specifically, this occurred when participants were asked to make a béchamel sauce with which they were unfamiliar meaning the majority of participants relied on the use of the video technology to assist them. Table 3

displays the stages of the sauce-making process shown in both the text and video demonstration and describes how the visual nature of the video supports skills development.

Table 3 Stages of sauce-making

Stage of Process	Text instruction on recipe	Additional visual actions as seen in the video – not available on recipe card
1	Melt the fat	• No stirring, fat not bubbling and fat becomes transparent
2	Add the flour and cook for 1 minute	• Visualisation of the expected texture of flour and fat mixture • Visualize the speed at which flour was added
3	Take off the heat, place on a pot stand and stir in the milk slowly	• Visualisation of the gradual addition of milk • Reassurance of the dense, gloopy almost "doughy" consistency • After all the milk is added the appearance is like thin custard
4	Return to the heat and bring to the boil	• Visualisation of vigorous stirring to a smooth consistency
5	Reduce to simmer until the sauce coats the back of the wooden spoon	• Visualisation of a smooth consistency; no lumps • The demonstrator lifts spoon out of sauce to leave a trail, coating the back of the wooden spoon

For the majority of participants, sauce-making was deemed a new skill. A number of participants suggested that, without the video, they would have disposed of the sauce at the stage when the flour was added to the fat and cooked.

> *"That's my first time making the sauce, so if I hadn't seen the video, mine would have been thrown in the bin at the point before you add the milk because it just looked wrong. I paused it too and did a bit, then it was easier."* (1, 1, 3, N.I.)

> *"No, if it was home I'd have thrown it in the bin, just no: I'd have no patience. The only thing was the girl on the video made it and I saw hers was like the way mine was, so I went on ahead with it and it turned out ok."* (1, 2, 4, N.I.)

The "gloopy" consistency (at stage 2) was unfamiliar with the smooth viscosity typical of a finished béchamel sauce. Therefore through watching the video, participants conceptualised the thick and "doughy" appearance of the batter and felt reassured to continue cooking. In contrast, participants from Condition 1 (recipe card only) did not have access to the visual aspect of the stages in sauce-making and expressed lesser reassurance at this stage of the process.

> *"I thought I had made the cheese sauce wrong: when I added the flour and the butter it just went to mush. I thought no…and then I started looking over at somebody else's… you have to add milk yet, because I thought that was it."* (2, 1, 1, N.I.)

These results highlight how video technology assisted participants in visualising the consistency of the sauce at each stage of the process, which in turn reassured them to continue the cooking process.

Where more technical skills were introduced into the cooking process, or where the end product would be adversely affected by mistakes and trial and error would be unacceptable, video technology was described as helpful. Therefore adapting the learning environment (Watson, 2006) empowered individuals by promoting self-determination in selecting the

sections of the video most important to them, and this subsequently encouraged confidence, motivation and engagement. For example, the majority of participants throughout Conditions 2, 3 and 4 discussed how they used the video technology to assist them in the sauce-making process.

5.0 Conclusion

It is clear that video technology has a place in supporting some people to cook from scratch. Video technology, due to its flexibility and the ability to utilise at one's own discretion (selectivity), further served to reassure and reinforce the key cooking skills required to achieve a successful meal outcome. The results from this study provide evidence of the potential to rely on the scalability of video technology to redress the current cooking skills imbalance among the general population.

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