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The food and foodservice industry are one of the largest growing areas for employing Registered Dietitians (RD). High growth rates are anticipated in a number of non-traditional areas for RD. There is justification for requiring culinary skills in dietetic training as knowledge of food and food preparation play a role in all areas of dietetics. The purpose of this pilot study was to determine if the inclusion of basic culinary technique videos in a college Advanced Foods class would improve student culinary skills and food knowledge. The results of this study indicate significant improvement in test scores for the class viewing culinary videos. The results of this study are beneficial for Dietetic Educators and Family and Consumer Sciences teachers.

There has been an ongoing national trend where speed and convenience in food preparation is essential (Jarratt & Mahaffie, 2007). Wide generational differences display varying behaviors around food, and differing attitudes about food, nutrition, and wellness (Jarratt & Mahaffie, 2007). In addition to these needs, consumers want pure, natural, healthful, and safe foods (O'Sullivan Maillet, 2002; Rhea, 2012).

The industry is being pressured to develop these foods (Jarratt & Mahaffie, 2007; Rhea, 2012) as consumers drive the demand. Increasingly Registered Dietitians (RD) are assisting the food and foodservice industry to meet this growing demand. RDs with backgrounds in food science and culinary arts are involved with formulating food products and in developing innovations in foodservice (Nyland, 2012; O'Sullivan Maillet, 2002; Rhea, 2012). RDs should prepare themselves to be leaders in food industry and food service operations (Rhea, 2012).

There is strong scientific justification for requiring culinary skills in dietetic training (Begley & Gallegos, 2010; Accreditation Council for Education in Nutrition and Dietetics (ASEND), 2007; Schaeffer & Miller, 2012) as knowledge of food and food preparation play an important role in all areas of dietetics (Long & Barrett, 1999). For example, RDs in public health programs often instruct school teachers, perform culinary demonstrations, and assist in menu planning for families (O'Sullivan Maillet, 2002). Educators have identified a decrease in students' proficiency of culinary skills (Canter, Moorachian, & Boyce, 2007; Schaeffer & Miller, 2012). The purpose of this pilot study was to determine if the inclusion of basic culinary technique videos in a college Advanced Foods class would improve student culinary skills and food knowledge.

Literature Review

Dietetic Educators (DE) are continually challenged to incorporate more information about food, nutrition, and management into their classes in order to enhance the competence of entry-level dietitians (Marsico, Borja, Harrison, & Loftus, 1998; Scheule, 2000). Julia Child, a well-known chef who made "cooking from scratch" accessible to the average person, confirms all dietitians should be able to cook. Mrs. Child stated, "It is essential that every dietitian and

nutritionist also be a reasonably good cook, and that the culinary arts be a fundamental part of their curriculum” (Canter et al., 2007, p. 315). “ADA’s vision is for members to be the most valued source of food and nutrition services” (Short & Chittooran, 2004, p. 1602). Rhea (2012) indicates revisions in dietetics curriculum will be necessary to prepare students for industry changes, including the need for increased food science and food knowledge.

One of the goals of DE is to be creative with methods to develop culinary skills in their students while teaching knife skills, healthy cooking methods, and increasing food familiarity (Canter et al., 2007). Many university programs do not have adequate facilities for teaching food classes (Canter et al., 2007) and purchasing and maintaining industrial cooking equipment and the expense of food and supplies can be cost prohibitive. Researching alternative solutions to teach these skills to students, while controlling costs, is imperative. Utilizing a video series aimed at food preparation and culinary skills in addition to culinary classes may be one solution to this challenge (Schaeffer & Miller, 2012).

However, according to Levy and Auld (2004) the impact of demonstrations on student learning will likely be weaker than cooking classes. They also indicated the use of videos rather than hands on culinary classes will have less of an impact. In contrast to Levy’s position, Jackson, Helms, Jackson, and Gum (2011) indicate technology-enhanced pedagogies are becoming more evident in the classroom. The National Education Technology Plan stated technology should assist students in understanding difficult concepts, help students to engage in learning, provide students with information and resources, and meet students’ individual needs (Redmann & Kotrlik, 2004). DE should consider utilizing various teaching methods in the classroom (Fox & Roberts, 1993; Mitchell & Nyland, 2005; Palermo, Walker, Brown, & Zogi, 2009).

Technology: What’s best for Dietetic Students?

Jackson et al. (2011) suggested students exposed to extensive visual input during childhood may have differing expectations with regards to learning. These students consider technology an enhancement or necessity as part of learning, and prefer visual images to traditional learning styles (Jackson et al., 2011). In 2006, 639 college students participated in a study to determine their expectations in the classroom: 81% anticipated classroom presentations that were technology-enhanced, 45% expected occasional computer simulations, and 52% expected the utilization of videos and DVDs (Jackson et al., 2011). When comparing technology enhanced pedagogies to those pedagogies with no technology, more students from the technology enhanced pedagogy wanted to see DVDs and simulations (Jackson et al., 2011).

Rudi (2012) identified children from the current generation as “Digital Natives” and referred to blending online tools and traditional teaching methods in the classroom as hybrid curriculum. This type of instruction is also termed blended learning, mediated learning, or web-enhanced instruction and seems to combine students’ love of technology and the need to belong (Glass, 2003). To accommodate the needs of this generation, many educators are reflecting on their current pedagogies and are trying new approaches (Ertmer, Ottenbriet-Leftwich, Sadik, Sendurur, & Sendurur, 2012). By utilizing hybrid curriculum, the teacher is still vital in the classroom while using the computer as a tool of instruction (Rudi, 2012). Hybrid curriculum is research-based and is validated by student pass rate increases (Rudi, 2012).

Anderson and Perry (1994) found the most appropriate technology must be incorporated in a natural manner into the classroom to give students equitable access to the benefits of technology. Technology should not be integrated into the classroom for the sake of using

technology; it should enhance the instructional content objectives (Hora & Holden, 2012; Kotrlík & Redman, 2009). The pedagogy must also be true to the instructor's teaching philosophy (Ertmer et al., 2012; Hora & Holden, 2012; King, 2012; Wood, 2011) and increase student learning (Ertmer, 2005).

Short and Chittooran (2004) surveyed DE asking about changes they had implemented in the classroom in the past 5 years. They indicated an increased use in technology, changes in teaching methods, and an increased need for hands-on teaching experiences. The DE expected to increase their use of technology, change teaching methods, and change student projects. The DE identified increased use of technology, changes in nutrition education mediums, and interactive lessons as major trends (Short & Chittooran, 2004). The instructional mediums currently utilized by the DE were lecture (88%) and demonstration (71%). By using creative approaches to incorporate new resources, the DE can enhance students' learning (Dexter, Doering, & Reidel 2006).

Some educators are hesitant to implement technology into the classroom (Glass, 2003). Reasons for this hesitation are attributed to lack of understanding technology, concern over possible job elimination, fear of the unknown, and fear of change (Bitner & Bitner, 2002; Glass, 2003). Concerns surrounding skill level of technology use can be a barrier for educators, as well as lack of technical support, and time constraints for implementation (Kotrlík & Redmann, 2009). Brinkerhoff (2006) noted additional barriers such as training, personality factors, and anxiety. Wood (2011) found higher education faculty felt technology could be a useful tool in the classroom, however, they felt they did not have adequate computer support from their institutions.

Glass (2005) stated educators need to embrace the change and update their pedagogies, because, "the teaching of culinary arts has gone hi-tech" (Glass, 2005, p. 6). One reason DE do not implement technology is the length of time required to develop online courses or video-tape instructional materials (Hora & Holden, 2012; Jarvis, 2004). However, teaching courses online or utilizing videos can make physical resources, in this case instructional kitchens, more accessible or available and would be economical and increase facility usage (Glass, 2005; Jarvis, 2004). Canter et al. (2007) suggested a faculty member could develop a video of a virtual institutional or commercial foodservice operation.

An alternative approach to hybrid education was developed by Warmin, Sharp, and Condrasky (2012) where college age students participated in a culinary nutrition program with a chef and a Registered Dietitian. Classroom materials included basic cooking methods, knife skills, flavor combinations, and variety when creating menus. Participants reported they could perform cooking skills at a higher level at the conclusion of the program. The nutrition component of the study was online. Due to the significant increase in participant posttest scores, the researchers suggested considering an online cooking component in addition to the nutrition component in the future as well (Warmin et al., 2012).

Further possibilities include the use of haptics where students, using a Food Simulator, put a device in their mouth and capture the force of real food and experience the auditory and chemical sensation experiences when eating food (Glass, 2005). Although this technology sounds like science fiction, it is presently being developed. Other possible technologies include: streaming video, classroom-response systems also referred to as clickers, and web-based simulations (Hora & Holden, 2012).

Forms of Technology: Streaming Video and Online Tutorials

Streaming video is a popular and cost effective way of using technology in the classroom. Strom (2002) examined the utilization of streaming video, or Click and Go Video, which provides the DE the opportunity to enhance the classroom experience for students. He emphasized current methods of creating streaming video as no longer cost prohibitive, time consuming, or necessitating a professional videographer. One example given was the utilization of streaming video for teaching catering in a hospitality program. Video clips integrated recipes and instructional information with cooking sessions. The goal of the videos was to prevent the educator from repeating demonstrations, allowing the educator to engage in more supportive work with the students (Glass, 2005; Shah, George, & Himburg, 1999; Strom, 2005). Educators from the department performed the demonstrations in the video. Adequate lighting was a challenge during the taping sessions to ensure cooked food looked appetizing and were appropriate colors. Sound needed to be monitored carefully as the running compressors in the kitchen often overshadow the appropriate sounds in the recording (Aase, 2008). One disadvantage of this technology includes the lack of a live educator. If a student has questions, the video will not answer them and viewing a video repeated times may not give students a better understanding of the material (Glass, 2005).

The challenge for academia is how to use streaming video in ways that are pedagogically appropriate and meet their students' learning needs (Strom, 2002). Utilization of technology allowed lectures to be viewed online and class time was spent conducting learning activities. This allowed students' time to practice skills and develop a deeper understanding of course concepts. Classroom activities would allow the students to apply what they had learned. Students anticipate being active participants in their learning (Dornan, Hadfield, Brown, Boshuizen, & Scherpier, 2005).

Maintaining professional credibility in dietetics includes staying current with new trends, including the use of technology as it is an expected curricular change (Short & Chittooran, 2004) and aligning technology with dietetics practice is essential (Hora & Holden, 2012). "The ultimate goal of education and research in 2017 is to position the dietetics practitioner to best provide what the customer wants – good food and good health" (O'Sullivan Maillet, 2002, p. 1405). It is becoming more apparent that increased utilization of e-learning and technology in the classroom could be a sensible solution to the current demise of cooking skills of dietetic students.

The purpose of this study was to determine if the inclusion of basic culinary technique videos in a college Advanced Foods Class would improve student culinary skills and food knowledge.

Methods

At a Midwestern university, in an Advanced Foods Class with two sections, the students were asked to participate in a study about food knowledge and culinary skills. One section watched a set of culinary videos in addition to the normal classroom curriculum and will be referred to as Classroom Plus. The second section had normal classroom curriculum and will be referred to as Classroom Only. All students in the two sections of the same course agreed to participate in this study and signed consent. They were told that all data collection would be reported in aggregate with no student identifiers.

The Classroom Only section consisted of 14 students taking the Advanced Foods Course. The Classroom Plus consisted of 20 students who were assigned to view four culinary videos

produced by a national culinary school. The videos were available both in the classroom and at the university library. Students were expected to view these on their own time which took approximately six hours. The list of videos is found in Table 1. The students were assigned to view the videos by the end of the semester.

Table 1.
Required videos and length of viewing time.

Video	Viewing Time
Knife Knowledge	120 minutes
Dry Heat Volume One	90 minutes
Dry Heat Volume Two	90 minutes
Moist Heat	90 minutes

During the first week of the semester all students were given a pretest of food and culinary knowledge and a posttest identical to the pretest was administered the last week of the semester. The pre/posttest questions can be found in the Appendix. While scores were given to the students, correct answers were not shared.

Test questions accompanying the video series were selected for the pre/posttest. The desired knowledge and skill level of dietetic students, curriculum guidelines and Knowledge Statements for Dietetic Students from the Academy of Nutrition and Dietetics were utilized when selecting questions (ACEND, 2012). To validate the test, six DE from the university took the test and questions were adjusted in regards to content and wording before being administered to the students.

Statistical data were analyzed descriptively. T-tests were used to estimate differences on pre and post-test scores to identify food knowledge and culinary skills.

Results and Discussion

The results of this study showed improved test scores between pre and post tests for the Classroom Plus and Classroom Only students as shown in Table 2. There were no significant differences on the pretest scores for students in the Classroom Plus or Classroom Only.

Table 2.
Difference in Pre and Post Test Scoring for Students in the Classroom Plus and Classroom Only Sections.

	Pretest Mean	Posttest Mean	T(df)	Significance
Classroom Plus	17.70	21.70	-3.87(19)	$\leq .001$
Classroom Only	19.21	20.93	-2.4(13)	.03

The Classroom Only section demonstrated significant learning from pre to posttest which was attributable to the course curriculum. There was a significant difference in posttest scores for the Classroom Plus section compared to the Classroom Only section. It appears that the inclusion of culinary videos in an Advanced Foods Class significantly enhances student learning.

Conclusions, Limitations and Applications

Conclusions

A set of videos designed by a culinary institute for teaching food enthusiasts was used to augment classroom curriculum for an Advanced Foods Class. Culinary skills and food knowledge varies among dietetic students (Schaeffer & Miller, 2012). When comparing two sections of the same course with a consistent curriculum, and adding culinary videos to one section, food and culinary knowledge for those students was significantly enhanced.

Results of this pilot study will assist professors in making pedagogy decisions when developing or adjusting dietetics curriculum. One of the advantages of equalizing the cooking skills and food knowledge of the students using videos outside the classroom is the additional face to face class time that can be utilized in educating the students on other topics or more intense learning of advanced skills. In addition, the introduction of technology in the classroom such as videos would be both cost effective for the university and convenient for the student.

Limitations

Several limitations of this study were noted. The appropriateness of the current videos may have been too advanced for this course. Feedback from the students suggested development of a specialized set of videos which could be more applicable to the practice of dietetics than the culinary school videos which were more advanced and specialized. Another limitation of the study was student motivation and time to view the videos. This was a result of copyright laws since posting the videos on any viewing sites was prohibited.

Applications

Online posting of DE produced videos would decrease the inconvenience for students having to watch the videos in the library or classroom. The DE could develop a video illustrating demonstrations and return demonstrations performed by dietetic students teaching each other culinary skills. This is an area for further development and future research studies.

Another possibility would be developing a study abroad program or a summer on campus cooking class. In a study conducted by Sasson, Black, and Dalton (2007) students participated in an Italian study abroad program for three weeks. They were instructed on cooking, shopping, tasting food, and eating. More than 50% of the participants reported increases in the number of meals and variety of foods they were preparing at home, and an interest in improving their cooking skills. Eighty percent of the participants reported an increase in the amount of time spent on cooking, eating, and enjoying food (Sasson et al., 2007). This research concept could possibly be developed and used for an on campus program emphasizing the same focus areas (Canter et al., 2007) and the course could be taken before the Advanced Foods class. This research is also applicable to Family and Consumer Sciences teachers with strategies to be more effective educators in their classrooms.

The Academy of Nutrition and Dietetics, along with the late Julia Child concurred that all dietetic students should develop culinary skills and be knowledgeable about food and food preparation. It is the responsibility of the DE to prepare each dietetic student for the challenges they will face as an RD regardless of their specialty. The introduction of new technology in the classroom will help achieve this goal and further prepare dietetic students for changes in the food industry.

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Appendix Pre/Posttest

True/False Questions

1. When grilling and broiling white meats, they should be cooked through, but not overcooked.
2. Grilling is best used for less tender cuts of meat which require high heat.
3. Carryover cooking refers to the fact that foods continue to cook even after they have been removed from the heat source.
4. Broiling is a technique used to cook foods where the heat source is located below the food.
5. Pan gravy is a sauce used in roasting that is made with a roux that incorporates fat rendered from the roast.
6. Broiling is a technique used to cook foods where the heat source is located above the item to be cooked.
7. When steaming, the steaming vessel should remain open.
8. The final internal temperature for poultry is 165°F internal.
9. When braising, the main item should be completely covered by the cooking liquid.
10. Foods that have gone through the standard breading procedure should not be stacked.
11. Pan-fried items may be finished in the oven to complete cooking.
12. Recovery time is the amount of time it takes the oil to return to the proper temperature after an item is cooked.
13. Should a piece of meat be removed from the oven when the internal temperature is lower than the desired doneness?

14. One of the differences in braising and stewing is the size of the main item. Braising uses portion size or larger cuts while stewing uses bite size pieces.
15. To release the drippings from the bottom of a pan by adding liquid and stirring is called fond.

Multiple Choice Questions

16. Allowing an item to rest after it has roasted
 - a) Will give the cook time to prepare the rest of the meal
 - b) Is an optional techniques
 - c) Stops the carryover cooking of the roast
 - d) Redistributes the juices that have accumulated in the center of the roast
 - e) None of the above
17. A technique used to cook foods on the top of the stove in a cast iron or other heat-resistant metal pan over intense heat.
 - a) Broiling
 - b) Spit-roasting
 - c) Barbecuing
 - d) Pan-roasting
 - e) Grilling
18. A technique that cooks foods by surrounding them with dry air in a closed environment
 - a) Roasting
 - b) Broiling
 - c) Barbecuing
 - d) Poêléing
 - e) Grilling
19. Examples of steaming liquids include:
 - a) Water, beer, or oil
 - b) Wine, stock, or butter
 - c) Stock, court bouillon, or oil
 - d) Water, stock, or wine
20. Moist-heat techniques include:
 - a) Sautéing, steaming, or poaching
 - b) Sautéing, braising, or roasting
 - c) Steaming, shallow poaching, or deep poaching
 - d) Frying, steaming, or smoking
21. Cooking liquids associated with poaching include:
 - a) Water, wine, or oil
 - b) Beer, oil, or water
 - c) Vinegar, citrus juice, or butter
 - d) Stock, wine, or vinegar
22. When preparing a stew, it is best to thicken the sauce
 - a) Just before serving
 - b) After the vegetables have been cooked and before the liquid is added
 - c) After the main item is fully cooked and all the solid ingredients have been removed
 - d) Once the stew has been taken off the direct heat and cooled slightly
 - e) a or b

23. Food items to be stir-fried are
- a) Cut into portion-size pieces
 - b) Usually breaded, using the standard breading procedure
 - c) Always blanched to shorten their cooking time
 - d) Cut into bite-size pieces, which acts to tenderize the food
 - e) None of the above
24. The most important consideration in choosing oil for deep frying are
- a) Neutral flavor and color and low smoke point
 - b) Fatty acids, flavor, and glycerin
 - c) Well-developed flavor and color and a high smoke point
 - d) Neutral flavor and color and high smoke point
 - e) None of the above
25. The standard breading procedure usually does not include
- a) Breadcrumbs
 - b) Eggs
 - c) Flour
 - d) Seasonings
 - e) Arrowroot or cornstarch
26. Which cooking medium is best suited for deep frying
- a) Olive oil
 - b) Seasoned oils
 - c) Vegetable oils
 - d) Butter
 - e) Lard
27. The most reliable method for determining doneness in roasted items is to use a(n)
- a) Instant read thermometer
 - b) Oven thermometer
 - c) Color chart indicating doneness
 - d) Timing cooking time in relation to weight of meat
28. Which of the following are used to thicken stews or braises
- a) Flour and starch
 - b) Slurry and a reduction
 - c) Pureed Vegetable
 - d) All the above
 - e) None of the above
29. The three things used to evaluate the quality in sautéed items are
- a) Flavor, texture, color
 - b) Crispness, color, cut
 - c) Texture, color, freshness
 - d) None of the above

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