Family and Consumer Sciences Teacher Use of Technology to Teach Higher Order Thinking Skills

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Family consumer sciences high school teachers from the Northern Illinois region were surveyed on their use of technology to teach higher order thinking skills (HOTS). This study determined if teachers had financial support, time to plan, computers, technology training, and confidence as they apply HOTS to the use of technology. A modified version of Croxall's (2002), Technology Survey for Family and Consumer Sciences Teacher Educators, was used to gather data via Survey Monkey. The study found that 89% of teachers were using technology to teach HOTS and were sufficiently supported and trained.

This study determined how technology was being used in family consumer sciences (FCS) high school classes based on the International Society for Technology in Education's (ISTE) National Educational Technology Standards (NETS) and Performance Indicators for Teachers. Bloom's (Anderson & Krathwohl, 2001) higher order thinking skills of analysis, synthesis, and evaluation, were of specific interest and how they are being taught using technology. The ability to apply technology to teach higher order thinking skills is expected of preservice FCS teachers upon entering the field (Croxall, 2002). Specific technology skills are also expected of high school students (International Society for Technology in Education, 2008a). The curriculum in FCS courses is created to teach authentic real-life lessons, which are immediately applicable outside of the classroom. This study investigated whether FCS high school teachers felt sufficiently supported by their school in the use of technology and if they felt they had received enough technology training to instruct their students.

Literature Review

Teachers use computers to instruct students, handle administrative tasks, and correspond with parents (Rother, 2004). The International Society for Technology in Education (ISTE) has devised *National Educational Technology Standards and Performance Indicators* for teachers worldwide. Included in the standards is the use of higher order thinking skills. Teachers have been trained for many years to use Benjamin Bloom's taxonomy of higher order thinking skills to help their students become critical thinkers (Huitt, 2011). This review of literature will focus on how teachers are expected to incorporate critical thinking skills into their lessons. The field of FCS, or what used to be called home economics, has been transformed as the configuration of today's families has changed and new issues have arisen. For example, the number of divorced parents has increased along with the number of teenage pregnancies. What does the field of FCS teach and what innovations are teachers using? The latest technology used in this field will be discussed.

Background International Society for Technology in Education

The National Council for Accreditation of Teacher Education (NCATE) and the International Society for Technology in Education (ISTE) created separate technology standards

for teachers and students. The standards (NETS-T) and Performance Indicators for Teachers are as follows: "Facilitate and Inspire Student Learning and Creativity; Design and Develop Digital-Age Learning Experience and Assessments; Model Digital-Age Work and Learning; Promote and Model Digital Citizenship and Responsibility; Engage in Professional Growth and Leadership" (International Society for Technology in Education, 2008b, p. 1). There are six standards for students. The student standards are: students will (a) demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology; b) use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others; c) apply digital tools to gather, evaluate, and use information; d) use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources; e) understand human, cultural, and societal issues related to technology and practice legal and ethical behavior; and f) demonstrate a sound understanding of technology concepts, systems, and operations (International Society for Technology in Education, 2008a, p. 1). The question is: how do these standards relate to Bloom's higher order thinking skills?

Technology and Higher Order Thinking Skills

Benjamin Bloom (Huitt, 2011) created a hierarchical taxonomy to describe levels of thinking. His theory is well known and both taught and used by teachers worldwide. The top three levels, analysis, synthesis, and evaluation, require higher order thinking skills (Johnson & Lamb, 2007). Technology has been shown to improve and teach higher order thinking skills. Carr-Chellman (as cited in ChanLin, Huang, and Chan., 2003, p. 14) explained how an online course should provide students with substantial latitude and initiative to pursue their own goals. These tasks require the higher order thinking skills of analysis, synthesis, and evaluation. Teachers and parents must instill in students the desire to be an educated person. This drive makes students excited to learn new topics and reach for greater understanding of the world. Teachers are incorporating both higher order thinking skills and the ISTE standards in their lessons according to the examples below.

Technology in the Curriculum

Teachers may feel that they have to add technology into their already-set lessons as an extra lecture or special occasion rather than fully integrating it. As one teacher complained, "How can I realistically add computer activities to [an] instructional day that is already full?" (Labbo, 2006, p. 21). Rather than an addition, technology should be a "partner in teaching and learning" (Levin & Wadmany, 2008, p. 251). One's content does not necessarily need to change but the way in which it is presented can be restructured (Voogt & Pelgrum, 2005). When the teacher is familiar with using technology, he/she will be more likely to incorporate it into their daily lessons (Labbo, 2006). Technology is being used in the classroom for teleconferencing between students and researchers in the field, taking virtual field trips, and communicating with students in other countries. Interacting with students their age is a positive energy, which the teacher can use to connect students with their peers across the world. Students then start to realize how similar they are to others and they can discuss issues of common interest. However, one teacher warned, although technology skills are important, students must also learn to be "adaptable, creative, and innovative" (Young, 2008, p. 351).

Labbo (2006) offers a few suggestions for being successful when using technology in one's curriculum. Teachers should demonstrate computer usage throughout the day by completing basic tasks such as typing a letter, looking up the weather, or viewing a news story. This shows students the resourcefulness of computers. In an FCS classroom, this could mean looking up the latest recalled toys, infant mortality rate, or list of recent restaurant closings for safety and sanitation issues. Another suggestion of Labbo's (2006) is to incorporate graphic organizers such as a web graph, videos, pictures, and audio along with written and spoken words. This becomes a stronger lesson for students than having them simply look at plain black and white overhead slides or listen to the teacher lecture (Labbo, 2006).

The use of technology has improved communication between teachers, students, and parents. Many educators are posting their "class notes, homework, assignments, and other information to a school's Web site" (Rother, 2004, Professional Development section, para. 7.). This prevents students who are out sick, especially those with more serious illnesses, from being delayed with schoolwork. Parents can look at each class their child is taking and discover resources to help their student with homework or study for an exam. More parents are using email than telephone to communicate with teachers. Email is useful to send attachments such as a list of assignments the student is missing or the instructions for a project. In addition to the above-mentioned benefits, technology is also being used by teachers to manage students in their classrooms.

Technology and Family Consumer Sciences

Technology is used in a variety of ways in relation to the field of FCS especially as the areas of study are so varied. A number of high school FCS departments around the country have student-run businesses. They may have either a food service or catering business and/or a childcare center. Both businesses use technology in their day-to-day routines. One teacher explained that her school-based restaurant is completely computerized (Thaler-Carter, 2000). Another FCS teacher predicts that with the reality of 24-7 Internet access and other technological impacts, "teaching may become more like coaching, supervision, and guidance rather than actual instruction" (Thaler-Carter, 2000, Technology Plays a Role section, para. 3.).

Family consumer sciences professionals have a responsibility to teach young people and adults to make wise choices with the use of technology. The lack of privacy due to technology is a recent concern. With the advent of online banking and shopping has come the fear that our personal information will be stolen. Many people do not realize all the data that is being collected about them every day. Browsers track which sites consumers visit and then decide which advertisements to show. Students need to be taught to keep their identities safe when using social networks (Makela, 2008). Technology can be used to improve "individual, family, and community functions, and relationships and can be appropriate…or not" (Braun, 2008, p. 1).

Card (2008) gave a symposium titled "Incorporating technology into the FCS curriculum." She explained how she had her students create power point presentations rather than the typical poster. Her students created digital portfolios of their work in her child development, preschool, and parenting classes, which they could then show future employers. Card (2008) is an example of an experienced teacher who is constantly updating her curriculum as the technology and her students change.

A professor explained that a benefit of technology was that it makes the schoolwork students do more authentic, as they can apply it to real-life situations. To make student's class work more worthwhile, students should be sharing what they create with others, besides simply

turning it in to the teacher (Young, 2008). An example of this would be having students create pamphlets about parenting. The students could scan the pamphlets and post them online perhaps as a link from the health department or library. This would educate others about the chosen topics such as adoption, lead poisoning, or breast versus bottle-feeding, and the students would feel that their work was more valuable and therefore they might put forth more effort.

Teacher's Training Using Technology

The main obstacle that prevents teachers…using [technology] in their classrooms is lack of adequate preparation (Levin & Wadmany, 2008, p. 259). As far as training at the college level, only 29% of states had a technology course requirement for new teachers. When any new technology is introduced, schools should at the same time, provide professional development (Zucker, 2004). Klecker, Hunt, Hunt, and Lackner (2003) surveyed of 110 student teachers, found that teachers wanted more training in: "database, spreadsheet, desktop publishing…, digital video, web page development … publishing, [and] content specific software" (p. 8). Similar to students, adults have a variety of learning styles. Teachers must be taught to use technology using a range of methods (Levin & Wadmany, 2008). Some will learn better with written directions and visuals, others by multiple sessions of hands-on experiences. Teachers should not assume all their students are familiar with technology either. It is vital to discover what training one's students require before expecting them to use technology.

Methodology

The purpose of this quantitative study was to determine whether northern Illinois FCS high school teachers felt sufficiently supported by their school and if they felt they had received enough technology training to instruct their students in the use of technology. The study also compared additional factors that may play a role in the case of technology usage. In this study, the dependent variable was support and training in using technology for instruction. The independent variable was, teachers' using technology to teach higher order thinking skills.

The purpose of this study was twofold. First, to determine if northern Illinois FCS high school teachers felt sufficiently supported and trained to use technology and determine if they were actually using technology to teach higher order thinking skills in their classrooms.

Subjects

Research was conducted in the six counties of the Northern Illinois region. Potential participants were 491 FCS teachers from every high school in that region that offered a FCS curriculum. The location was chosen because of the wide range of classes taught throughout the schools in the Northern Illinois region and the variety of student populations in each school. There were 172 total participants, a 37% return rate, who provided complete survey results. The teachers were all certified as secondary level FCS teachers. The majority of teachers attended at least one training session in technology and taught in a suburban school with at least one other FCS teacher.

Survey Instrument

The survey instrument, "Technology Survey for Family Consumer Sciences Teacher Educators," was adapted from Croxall's dissertation work (2002). Croxall (2002) tested the reliability using Cronbach's alpha but did not report the actual number. The original study was designed to help family consumer sciences teachers share lesson plans that teach both technology

and higher order thinking skills. A web site, http://sites.google.com/site/familyconsumersciencesslessons/, was created, that lists the 77 lesson plans used in this study. Participants of the study were emailed the website for use in their lesson planning.

Results

Family consumer sciences teachers were surveyed about their level of support in terms of money, time to plan, and computers, and their training and teacher confidence level in relation to technology. In all cases, over half of participants *strongly agreed* or *agreed* that they did receive enough support or training. In regard to financial support, 87% were satisfied with training, 90%, with time, 65%, and in regards to enough computers and other technology, 72% were content. When asked about their confidence in their ability to teach or demonstrate computer skills in the classroom, 87% of teachers either *strongly-agreed* or *agreed*. In general, teachers do appear to receive adequate support and training, although they could use more planning time for the use of technology. The majority, 96%, reported their computer skills to be from average to very advanced. There was a significant correlation between teacher's confidence with their ability to use technology in the classroom and their self-reported skill level (see Table 1). How these skills relate to use in the classroom was studied next.

The frequency of use of technology in various FCS course was noted in terms of which classes it was modeled by the teachers and/or required of the students. Child Development, Consumerism and Finance, Foods and Nutrition, and Interior Design classes were reported by over 50% of participants as both having technology modeled by the teacher and being required of students. As far as specific hardware technology used in FCS classes, digital cameras and simulator babies were modeled by over 50% of teachers. Simulator babies were the only technology reported being required by over 50% of students. In terms of software, teachers modeled word-processing, desktop publishing, spreadsheet, presentation software, and hypermedia software in over 50% of responses while students were required to use word processing, presentation, and hypermedia software (Word Wide Web searching) at least in 50% of teacher's classes. Teachers' rating of their own ability to use Desktop Publishing and Power Point was significantly related to their requiring students to use these programs. In other words if teachers do not feel comfortable using a particular software, they do not expect their students to use that software either.

The next set of questions related to FCS teachers' observance of the International Society for Technology in Education's National Educational Technology Standards and Performance Indicators for Teachers. Only 15% reported being familiar with the standards, although 52% said they were somewhat familiar with them. In total 90%, of teachers *strongly-agreed* or *agreed* that they did in fact use technology to teach higher order thinking skills and they had enough support and training (see Table 2).

Table 1

Means and t-test Between Financial Support, Training, Time, Computers, Teacher Confidence, and Use Of Technology (Tech) To Teach Higher Order Thinking Skills (HOTS)

	N	Mean	Std. Deviation
Financial Support	168	3.29	.70
Training	168	3.3	.65
Time	160	2.8	.70
Computers	167	2.96	.81
Confidence in Ability	166	3.22	.70
Use of Tech to Teach HOTS	165	3.23	.63

Student t-test for Equality of Means	Test Value = 0 *t*	df	Sig. (2-tailed)
Financial Support	60.625	167	.000
Training	65.187	167	.000
Time	50.987	159	.000
Computers	47.238	166	.000
Confidence in Ability	59.451	165	.000
Use of Tech to teach HOTS	65.784	164	.000

Table 2

Mean and t-test: Use Of Technology (Tech) To Teach Higher Order Thinking Skills (HOTS) and Levels of Support and Training Between "Agree" (3) and "Strongly-Agree" (4)

	Use Tech to Teach HOTS	N	M	SD
Financial	3.00	94	3.24	.68
	4.00	55	3.53	.63
Training	3.00	94	3.26	.62
	4.00	55	3.38	.65
Time	3.00	91	2.79	.66
	4.00	51	3.04	.77
Computers	3.00	93	2.91	.86
	4.00	55	3.13	.79
Teacher Confidence	3.00	92	3.13	.70
	4.00	55	3.42	.66

T-test for Equality of Means	*t*	Df	Sig. (2-tailed)
Financial	-2.502	147	.013
Training	-1.178	147	.241
Time	-2.020	140	.045
Computers	-1.504	146	.135
Teacher Confidence	-2.469	145	.015

Demographic Data

Teachers were asked a few demographic-type questions about their programs, training, schools, and themselves. There was a wide range of courses taught by the FCS teachers who participated in this study. Seventy-one percent of participants teach Foods and Nutrition courses, 46% teach Child Development courses, 29% teach Consumerism and Finance, 27% teach Apparel and Textiles, 19% teach Family Living, and 18% teach Interior Design. These figures overlap as many teachers teach more than one subject. Another 45 respondents wrote the names of one to three courses under the "other(s) please specify" section. Some of these courses included Fashions I and II and Child Development. Participants, for some reason, did not feel comfortable categorizing their course into one of the general categories. Further research might be done next time to determine more precise category names or the wording could have been changed to accommodate a wider range of classes.

A few questions focused on the teachers' technology training. When asked if participants were required to take a technology course prior to graduating from college, less than 50% said yes (47%). The next question followed by asking teachers if they had taken technology related

classes, workshops, seminars, or online sessions since becoming a teacher. Overwhelmingly, this response was yes with 88%. Thirty-five percent of participants reported taking one to two classes or workshops, 42%, the majority, have taken three to five classes, and 23% have taken six or more.

As expected, most of the participants reported teaching in a suburban school (94%). Most of the teachers in this survey have other FCS teachers in their departments; 28% have two to three teachers, 48% have four to five teachers, and 20% have six or more teachers. Regarding the number of students in participants' schools, the majority of respondents, 45%, have 1,000 to 3,000 students. Teachers were asked about the amount of budget money their department receives. Fifty percent of respondents chose "do not know or do not wish to share." One could assume that teachers did not wish to share and that they do know how much budget money their department has but as the question was not separated, it is unclear. According to those who answered with a monetary figure, 38% had over $3,000. A few teachers commented through email that they felt lucky because their department was given much more than $3,000. This was a delicate question and in the future, more research would need to be done if the question were to be pursued.

Conclusions and Implications

The findings from this study are beneficial to teachers. It is encouraging to see that the majority of FCS teachers are already using technology and are teaching higher order thinking skills. Often teachers feel pressured to try new teaching methods or to make sure they are teaching students critical thinking skills. By reading through the questions related to the International Society for Technology in Education standards, teachers might realize that they may already be teaching these skills to their students. The standards portion of the survey can be used as a self-test of one's teaching methods. If there are certain items that a teacher does not *strongly-agree* with that she/he does, then those are items they may wish to learn more about or may wish to try to include in future lessons. Teachers should also make sure they are teaching the ISTE student standards. This study demonstrates that FCS teachers are forward thinking and generally confident in using technology, yet we must continue to learn the latest uses of software, and hardware so that our field stays competitive with other electives and up to date with current knowledge.

Application

The following are lesson plans collected through the author's dissertation. Many more examples can be found online at http://sites.google.com/site/familyconsumersciencesslessons/. An analysis lesson plan may require students to gather data and decipher the meaning of the information. For example, in Life Studies, students analyze their diets using a web program. It shows them their caloric intake, nutritive values and everything they need to know about foods they consume. They then take what they learn and write a paper using the web as their resource" (Hirose, 2009, p. 103). Students using information to create a presentation and a related class activity would require the skill of synthesis. A service learning project requires students in Foods classes to research nutritional needs and problems of seniors. The students are then responsible to plan a nutritious snack that can be served at a nursing home facility that will meet nutritional needs as well as identify any special nutritional needs of some inhabitants (Hirose, 2009, p. 104). When students must explain why they are taking a certain action or the reasoning behind their answer, they are using evaluation. In a parenting class, students take Baby-Think-It-Over home

and care for it for 3 days and 2 nights. They must type [a] summary of events that took place, reflect on their experience, and decide if they are ready to parent (Hirose, 2009, p. 104). This lesson plan included analysis, synthesis, and evaluation. In advanced fashion, students use a computerized pattern-maker. Students must design a garment, take their measurements, and use the information to take standard slopers and transform them into a pattern for their original design. They use Cochenille Design Studio's Garment Designer software, along with the reference and design manual. Students then construct the garment and finally, evaluate how well the final product matches the original design. (Hirose, 2009, p. 105). These are some examples of technology incorporated into the classroom and specifically a family consumer science curriculum using Bloom's taxonomy.

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