

Practice

Current Thinking From and About Home Economics/FCS and Artificial Intelligence (AI)

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This paper shares current within-field and peripheral thinking about home economics and family and consumer sciences (FCS) and artificial intelligence (AI). Home Economics 3.0 is discussed relative to Industry 4.0 and Education 4.0. The research question was “What are home economists and FCS practitioners saying about AI at this early juncture?” The profession is becoming enamoured with AI, but only 15 home economist-authored papers were found with virtually all published in the last two years. Most were commentaries or opinion pieces with nominal research papers, many early-online. There was an emergent consensus that AI can bring home economics/FCS concepts to life if the profession critically embraces world-changing technological and digitization advancements. Research is needed about (a) using AI to teach home economics/FCS, (b) using home economics/FCS to teach about AI and (c) what constitutes rebooted Home Economics 3.0 that can handle Industry 4.0 and use Education 4.0.

Introduction

Home economics and family and consumer sciences (FCS) are becoming enamoured with artificial intelligence (AI), but it is still the new kid on the block. This paper shares current within-field and peripheral thinking about this trend by reporting results from mid-December 2024 Google and Google Scholar searches (2020–2024 inclusive). Only 15 home economist-authored papers focused directly on this new aspect of practice. Virtually all were published within the last two years affirming the newness of this phenomenon in our knowledge base. Most papers were commentaries or opinion pieces rather than research reports with the latter so recent that they tended to be early-online. Most documents were found using ‘home economics’ instead of ‘family and consumer sciences.’ The research question was “What are home economists and FCS practitioners saying about AI at this early juncture?”

Home Economics 3.0 and Artificial Intelligence

To set the scene, the theme for the 2024 International Federation for Home Economics’ (IFHE) World Home Economics Day was *Home Economics 3.0: A Critical Update* (Hustvedt, 2024). IFHE (2024) assumed that home economics must be updated because “we live in an era characterized by the integration of digital technologies, artificial intelligence, internet of things and automation” (“Home Economics 3.0” section). When setting the theme, IFHE reasoned that calling the updated version of home economics 3.0 made sense (rather than 4.0) because iterations of education only went to 3.0 at the time (now at 5.0), and home economics is an education field not an industrial revolution (i.e., Industry 4.0) (Hustvedt, 2023a).

Börries et al. (2024) used a software metaphor to conceptualize IFHE’s Home Economics 3.0 as an *updated* profession, which, when rebooted, could deal with digitization, automation, and AI per the demands of the Fourth Industrial Revolution (i.e., Industry 4.0, and 4IR) (to be discussed). This updated profession would focus on (a) being AI literate and resilient to help others be the same when facing 4IR; (b) valuing and promoting the home’s care economy for a strong national economy; (c) perceiving diversity as an opportunity even if it means leaving familiarity behind; (d) advocating for behavioural changes that align with technological changes; and (e) critically and responsibly embracing digitization, including AI (Börries et al., 2024). Digitization involves converting analog information into 1s and 0s (digits) and using digital technology (e.g., Bluetooth, Google Docs, Wi-Fi networks, Blockchains, and chatbots) to both store and process data and communicate attendant information (Digital Adoption Team, 2024).

Aside from IFHE’s (2024) AI-inspired World Home Economics Day theme, its journal editors had earlier proposed a special issue on home economics and AI (Pendergast & Reynolds, 2022), which did not materialize. To commemorate IFHE’s World Home Economics Day, the American Association of Family and Consumer Sciences (2024) held a professional development (PD) workshop on “how to utilize AI (Artificial Intelligence) in FCS classrooms to enhance student learning experiences” (para. 1). These leading-edge initiatives recognized that home economics and FCS practitioners will need PD and training to effectively integrate AI into their practice (Graves, 2024; Lora, 2023).

It is vital that home economics and FCS professionals receive “various forms of support to increase their motivation to use ICT [including AI] and strengthen their agency to

face and overcome potential challenges” (Sundqvist, 2023, Abstract). In that spirit, Rosarda (2023) reiterated the significant role that professional associations play in orienting home economics toward Industry 4.0, which is predicated on automation, smart technology, and advanced technological innovations, including AI. As a professional association, IFHE set the profession down this path with its neologism *Home Economics 3.0* thus triggering a conversation about how we view this vanguard trajectory as expressed in our research initiatives.

Artificial Intelligence, Industry 4.0, and Education 4.0

In a symbiotic relationship, Industry 4.0 technologies (including AI) support the entire Education 4.0 learning process (Moraes et al., 2023), and Industry 4.0’s success depends on Education 4.0 (Joshi, 2022) with Home Economics 3.0 ideally playing a role (Hustvedt, 2023b).

Artificial Intelligence

AI is a branch of computer science that focuses on developing intelligent machines that can simulate human cognitive abilities (e.g., learning, decision making, problem solving, perception, and communication). That is, computerized machines are taught and then continue to self-learn how to imitate or reproduce human intelligence. AI software platforms use algorithms — a set of rules or instructions to complete calculations and other problem-solving operations. In fact, AI is a group of algorithms that creates and modifies new algorithms based on data and learned inputs (includes machine learning and its subset deep learning — nonlinear, complex correlations within datasets) (Athanas, 2023; Bliwise, 2018; Roofe et al., 2024).

Familiar AI examples include digital assistants (e.g., Siri, and Alexa); AI chatbots that simulate human conversations (e.g., ChatGPT, and Google Gemini); online personalized shopping using viewing history; virtual shopping (immersed 3D experiences); auto-navigation; smart homes and smart products, appliances, and electronics; personalized and secured banking; avatar gaming; virtual reality (simulated life experiences); and robotics (e.g., industrial, agricultural, and medical) (Bliwise, 2018; Hustvedt, 2024; Roofe et al., 2024; Schmitt, 2024; Scully, 2023).

Researchers and students encounter AI via search algorithms (e.g., Google Scholar, Semantic Scholar, and Ref-Seek), spell check, grammar check, autocorrect, plagiarism checkers, text editors, and academic writing technology (e.g., Paperpal, and Jenni AI). Educators use AI for course delivery, classroom management, administrative work, personalized instruction, and gamified learning as well as student assessment and evaluation, grading, and virtual mentoring and tutoring. Many people experience AI through virtual work, virtual (distance) education, and health monitoring (Bliwise, 2018; Lora, 2023; Oluwagbemileke, 2024; Roofe et al., 2024; Schmitt, 2024; Scully, 2023).

Industry 4.0

With its recent focus on Home Economics 3.0, IFHE (2024) reasoned that home economists must be concerned with AI because AI is the crux of Industry 4.0 (Hustvedt, 2023b, 2024; Schmitt, 2024). Industry 4.0 is the moniker for the Fourth Industrial Revolution (i.e., smart technology, automation, and AI). “Industry 1.0 was steam, 2.0 was electricity and 3.0 was computing [and 4.0 is technology]” (Hustvedt, 2024, p. 49).

Industry 1.0 (late 1700s) also launched coal and steam transportation, mechanical production, and mechanization. Industry 2.0 (early 1900s) was the age of science and mass production (assembly lines, refrigeration) fuelled by electricity and oil-based power. Industry 3.0 (late 1990s) was (a) the digital revolution (e.g., fax machines, the Internet, email, mobile communications, and personal computers) and (b) the knowledge economy where intangible information is treated as a tangible product and asset (David, 2016; McGregor, 2022, 2024, 2025).

Industry 4.0 (2010 onward) is all about technology — the application of scientific knowledge to achieve the practical goals of human life — especially *disruptive technologies* so named because they significantly disrupt (interrupt or disturb) and then alter the way business, consumers, governments, and societies operate, ideally for the better (McKinsey & Company, 2022). Examples of disruptive technologies include (a) connectivity and computational power (e.g., the Internet, cloud storage technology, and blockchains that record transactions and track assets); (b) artificial intelligence (i.e., machine learning and deep learning that mimics human learning and reasoning); (c) human-machine interactions (e.g., virtual reality, augmented reality, robotics, and cobotics); and (d) advanced engineering (e.g., 3-D printing, and nanotechnology) (McKinsey & Company, 2022; Smith, 2022).

Santos et al. (2018) further explained that Industry 4.0

encompasses a set of state-of-the-art technologies linked to the internet to make them more flexible and collaborative. In this context, technologies like Cyber-physical systems (CPS) self-organize, monitor processes and create a virtual copy of the real world [e.g., autonomous automobiles, medical monitoring, and the smart electrical grid]. Internet of Things (IoT) connects machines, objects and people in real time [e.g., fitness tracking systems, smart appliances and cars, and pacemakers] and Cloud Computing offers storage solutions as well as exchange and management of information [e.g., Dropbox, Google Drive, and email calendars]. (p. 415)

Education 4.0

It is difficult to assign exact dates to the transition from Education 1.0 to 4.0 because different people interpret how the evolution of education tracked with the evolution of the Web (1.0–4.0). Education 1.0 (starting in the 1800s) was passive, one-way, paper-based, and teacher-centered information transmission (using lesson plans). Near the end of Education 1.0 came the revolutionary Desktop Personal

Computer Era (1980s). Computers were not connected to each other until the Internet was invented in 1993 launching Web 1.0, which included desktop computers, first-generation laptops, dial-up modems, emails, listservs, and Microsoft Windows 95. Education 1.0 used read-only Web 1.0 technologies (e.g., web page content, directories, newspapers, Yellow Pages, encyclopaedias, and dictionaries) (Gerstein, 2014; Strivemindz, 2023).

Education 2.0 (more learner centered) used Web 2.0 technologies (e.g., user-generated content such as Wikipedia, Blogs, social media, key-word searches, personal websites, and YouTube). Web 2.0 gives learners more power and ways to participate and share in learning — student to student, student to teacher, and student to content. Especially active from 2000–2010, Education 2.0 has been described as internet-enabled knowledge transfer with technology cautiously adopted (Alharbi, 2023; Gerstein, 2014; Hustvedt, 2023a, 2023b; Joshi, 2022; Makrides, 2021; Strivemindz, 2023).

Education 3.0 (2010–2020) is characterized by the heavy integration of Web 3.0 digital technologies into education (e.g., portable technologies, live streams, AI-aided semantic web searches, and smart applications like smartphones and I-Pads). It is teacher-orchestrated and facilitated, ideally student-led, collaborative knowledge production via networked computer learning platforms and communication platforms (using lesson plans and learning plans). The intent is to tailor instructions to students, make learning more relevant, and prepare them for the Industry 4.0 workforce (Alharbi, 2023; Gerstein, 2014; Hustvedt, 2023a, 2023b; Joshi, 2022; Makrides, 2021; Strivemindz, 2023).

As of 2020 onward, “education 4.0 is all about changing with the changes, and . . . that means figuring out what future graduates will need” (Joshi, 2022, para. 8). It employs Web 4.0 and Industry 4.0 technology (i.e., a rich blend of physical and digital worlds): AI, machine and deep learning, blockchains, virtual and augmented reality, and the Internet of Things (IoT) (see McGregor, 2024). Web 4.0 created a world where everyday objects can be connected to the Internet and communicate with each other (Strivemindz, 2023). This hyperconnectivity includes education.

Education 4.0 is especially concerned with using the active-learning pedagogy to prepare students for ever-evolving 4.0 industries and technologies by teaching them to be successful, flexible and adaptive workers and citizens (Makrides, 2021). It strives to instill critical thinking, creative and innovative thinking, analytical thinking, questioning skills, problem-solving skills, complex decision making, technological literacy, digital literacy, and understanding big data — extremely large, complex (not easily managed or analyzed) and constantly changing data sets created using smart technology (Schmitt, 2024; Scully, 2023). The World Economic Forum (2023) added systems analysis, collaboration, negotiation, adaptability, grit, and civic responsibility for ethically and responsibly using Industry 4.0 technologies.

Current Thinking from and about Home Economics/FCS and AI

Back to AI, which is the crux of the most recent technological advances. Along with AI’s effect on (a) the future of work (e.g., automated, robotic, cobotic, and AI-heavy human displacement) and (b) trading economics (e.g., e-commerce, international trade, and algorithmic-traded financial markets), Babbar (2024) (c) identified home economics as “a third and perhaps the most overlooked effect of AI” (“Home economics” section). He asserted that because AI is changing the nature and quality of home life, AI is affecting home economics.

His main concern was AI-augmented smart homes, which generate unique challenges for home economics with its focus on home. How will AI “affect the daily routines, habits, and preferences of residents? How will it affect relationships, interactions, and communications . . .? How will it affect consumption, saving, and investment decisions? [He worried about AI hastening] the decline of human well-being” (Babbar, 2024, “Home economics” section).

Divergent, Evolving Perceptions

As home and human well-being are the crux of home economics, and AI can change the home and compromise well-being, the effect of AI on home economics cannot be ignored (Babbar, 2024). Obunaduke (2023) agreed that AI is affecting home economics but contradicted Babbar’s opinion on its negative impact on home and well-being saying instead that, along with the Internet, big data, and cloud computing, AI can “accelerate human well-being thus achieving family security and development” (p. 10).

Indeed, mid-December 2024 Google Scholar search results intimated that home economics and FCS practitioners’ perceptions of the impact of AI on the profession and its mandate were divergent and evolving. To illustrate, Schmitt (2024) was convinced that AI matters to home economics and FCS because “AI is already used in many practical, everyday activities” (p. 31). Obunaduke (2023) agreed: “the application of digital technologies in Home Economics is no more a futuristic matter. It has started affecting every component of Home Economics” (p. 16).

In contrast, Deagon (2024) posited that “the opportunities and challenges of AI in Home Economics are yet to be discovered” (Abstract) — intimating potential. Jung et al. (2024) clearly recognized “the potential to integrate AI into . . . home economics” (p. 517) as did Oluwagbemileke (2024). Alali (2023) encouraged the profession to share technology-focused research (in his case using meta-verse avatar technology to teach home economics) to inform educational institutions as they explore and strategize the potential of integrating AI into home economics curricula.

Both Schmitt et al. (2024) and Scully (2023) moved beyond exploring *potential* and outright recommended integrating AI into home economics curricula because AI has an increasing and ubiquitous presence in daily life. Scully believed that FCS “educators should embrace AI and its integration into the classroom so students can learn about

and work with this important technology” (2023, para. 12). However, this may be easier said than done. Consider that Korean home economics teachers held moderate ($M = 3.85$) expectations of AI and other new technologies in home economics classes. They expressed overall concern ($M = 4.40$) about using AI with attendant skepticism ($M = 3.05$) about the results of AI-supported home economics education (Kim et al., 2023).

Benefits of AI in Home Economics Education

This skepticism is intriguing because mid-December 2024 Google search results revealed a consensus that AI “can notably augment comprehension of home economics concepts” (Alali, 2023, p. 91; see also Lora, 2023). It can facilitate learning about food preparation and nutrition; budgeting and financial planning; clothing and textiles; home management and organization; family life and technology (e.g., identity theft, and cyberbullying); health management and wellness; and housing and interior design (Abd Elazim, 2024; Lora, 2023; Roofe et al., 2024; Scully, 2023).

Noteworthy is that home economics educators were urged to help learners recognize *when* they are interacting with ubiquitous AI and judge whether this interaction benefited or harmed their well-being (Athanas, 2023). Shim and Choi (2023) reported that employing AI-based learning activities in home economics classes increased students’ AI literacy, which entails both (a) recognizing, understanding, using, and critically evaluating AI applications; and (b) effectively communicating and collaborating with AI (Laupichler et al., 2022).

Torggler et al. (2023) commented on home economics vocational education and training (VET) instructors’ low self-assessment of their AI knowledge and AI literacy and recommended targeted AI training. Al-Desouki Al-Shami (2024) similarly recommended updating home economics teacher education programs so that preservice teachers are oriented to integrate AI into home economics curricula. Done responsibly and ethically, home economics students can (a) gain 21st-century skills and prepare for an AI-influenced future and career paths, (b) remove barriers between school-based learning and real life thus making learning more relevant, (c) experience enhanced learner engagement and motivation and (d) benefit from teachers’ use of learner-specific data and tailored instruction (Lora, 2023; Scully, 2023). In fact, AI’s

potential for transforming home economics education is boundless . . . The future of AI in home economics education holds immense potential for personalized learning, immersive experiences, and data-driven insights. Predictive analytics, educational games, and VR/AR technologies powered by AI will revolutionize how students learn, practice, and apply home economics skills [that] prepare them for [future] challenges and opportunities. (Lora, 2023, para. 41, 51)

Challenges Using AI in Home Economics

Despite this potential, concerns arose in the nascent literature about the responsible use of AI within home eco-

nomics and FCS practice. Roofe et al. (2024) cautioned practitioners against relying so much on AI that they “replaced the human element of the FCS professional with AI tools” (p. 2) (see also Lora, 2023). Other challenges include (a) the ethical use of AI to protect students’ privacy and when generating evidence-based research for teaching home economics; (b) equitable access to AI tools and resources to ensure home economics learners’ inclusivity; (c) responsible preemptive testing of AI platforms before using them to teach home economics; and (d) concerted efforts to acquire ongoing PD and AI training for interpreting AI-generated data, gaining familiarity with various AI platforms, and adapting instructional strategies (Lora, 2023; Miller, 2023; Roofe et al., 2024; Schmitt, 2024).

Educate AI About Home Economics

On a final note, some authors commented on how important it is that any data that AI retrieves *about* home economics and FCS are correct and positive. For example, Deagon (2024) recounted intentionally chatting with two online AI tools about home economics to see what popped up. Upon learning that AI chat tools will ask if the information was relevant, she recommended that home economists must increase their “online presence to ‘teach’ AI about . . . our profession’s impact and actions” (Abstract). The adage “garbage in, garbage out” comes into play here (Athanas, 2023), meaning we must proactively (re)present home economics and FCS in a comprehensive, positive light on the Internet and in data sets, so that anyone asking AI questions about us receives truthful and affirming answers from AI overviews (Deagon, 2024).

Schmitt (2024) added that “clear and precise questioning is vital for accurate AI responses, but critical evaluation is [also] necessary as AI may produce biased and inaccurate outputs” (p. 32). Lora (2023) concurred, recommending that home economists should intentionally “ensure that AI algorithms are trained on diverse datasets and regularly monitored to mitigate bias [against home economics]” (para. 56). As we progress down the AI path identified by IFHE (2024), we must stay ahead of the game and make the rules about how home economics and FCS are interpreted and presented in ubiquitous algorithmic searches and AI chats and overviews.

Conclusion

Lee (2019) strongly urged home economists to take a lead role in influencing systems that shape human lives, including AI systems. AI is “changing human identity [and creating] a super-intelligent and hyper-connected society” (p. 149). It is profoundly affecting home life and quality of life (Babbar, 2024; Obunaduke, 2023). It is imperative that Home Economics 3.0 become Industry 4.0 literate and AI literate and make the profession’s presence known to AI in a positive light — we must hone this imperative and become as ubiquitous as AI (Deagon, 2024; Schmitt, 2024).

To expedite this imperative, this paper discerned current thinking within and about home economics and FCS and AI as of December 2024. There was an emergent consensus

that AI can “bring home economics concepts to life” (Lora, 2023, para. 4), if we are prepared to critically embrace this world-changing technological advancement in the Digitization Era. My eyes were opened writing this paper. I empathize with both the skepticism *and* the potential found in the nascent literature from our field. IFHE (2024) was right to challenge us. In fact, maybe it should have proposed *Home Economics 4.0* or even *Home Economics 5.0* (see McGregor, 2024).

Going forward, home economics and FCS must be updated and retooled and our AI literacy bolstered because Industry 4.0 partially depends on Home Economics 3.0 employing Education 4.0 (Babbar, 2024; Hustvedt, 2023b). Home economics associations’ endorsements of AI are very recent (Rosarda, 2023). As well, there is little literature about using AI to teach home economics and FCS or using home economics and FCS to teach about AI. Of special interest is what should Home Economics 3.0 look like when it is updated to handle Industry 4.0 and use Education 4.0 let

alone what is coming down the pike with Web 5.0, Industry 5.0, Education 5.0, and Society 5.0 (see McGregor, 2024)?

We need this research to strengthen our knowledge base; inform future research, policies, and industries; and transform education and practice in both the Digitization Era and the Post-Digital Era, where people will optimize the use of technology instead of just adopt it (Danave, 2024). Another issue is that once we have entrenched digital and smart technology into home economics and FCS (e.g., Home Economics 4.0 and 5.0), how do we continue to evolve as a profession in a Post-Digital Era? The pace of AI-based technological change is profoundly exponential. Home economics and FCS practitioners must keep up by becoming vanguard, thinking professionals (McGregor, 2025) who are fully cognizant of their accountability to the public and the future vis-à-vis artificial intelligence.

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