

Serious Fun: Viewing Hobbyist Activities through a Learning Lens

Chi-Chang Liu,* and John H. Falk**

***Center for Teacher Education, National Taiwan University**

****College of Education, Oregon State University**

Abstract:

This paper reviews a wide range of literature applicable to understanding why and how hobbyists learn. Of particular importance appear to be theories such as situated learning and communities of practice, but insights from the cognitive sciences related to expertise, motivation and interest also emerged as important. The boundaries between formal and informal education continue to breakdown, making the need to understand and address the needs of learners of all ages, across multiple settings and situations more important than ever. Learning is becoming increasingly “on-demand”, mediated by “colleagues” and initiated in order to solve learner-defined needs and interests (as opposed to the historical condition of prescribed, sequential curricula defined by nameless, faceless experts). Hobbyists afford learning researchers important opportunities to build a better understanding of interest-driven, persistent, contextually-relevant, lifelong learning.

Key words: serious leisure, hobby, scientific literacy, free-choice learning, motivation

In the twenty-first century an understanding of science enhances not only individuals' ability to satisfy their curiosity about the world but increases their chances of success in a fast-changing, science and technology-based marketplace. In order to "survive well" in the modern world, people need to continually learn, adopt, and utilize new skills and information (National Research Council, 2012). For all of these reasons scientific literacy has been a major goal of education since the 1990s (e.g., Lifelong Learning Council Qld, 2002; Miller, 1998; National Research Council, 1996; 2012; Rutherford & Ahlgren, 1993). Learning, however, is a lifelong activity (Banks et al., 2007), and learning in schools (K-12, college and graduate) only occupies three to five percent of our lifespan (Falk, Dierking, & Adams, 2006). In contrast, people spend considerable time learning outside of school. In these free-choice contexts, learning typically builds upon people's innate interests. Intrinsically motivated learners are more likely to persist in tasks over time and to expend effort to master them, particularly when they experience feelings of enjoyment and value for the activities in which they are engaged (Linnenbrink & Pintrich, 2000; Wigfield & Eccles, 1992; 2000). Learning under such circumstances has been well documented, and hobbies are among these activities (e.g., Bell, Lewenstein, Shouse & Feder, 2009; Falk & Needham, 2013).

Hobbies are classic examples of activities that combine fun and learning-intensive practices (Azevedo, 2011). Unlike in school, where topics to be learnt are imposed and participation is compulsory, hobbyists are self-motivated to engage with their hobbies and select what to learn on an as-needed basis (Azevedo, 2011). Also unlike the typical school, hobbyists engage in their chosen activities for relatively longer periods of time than are allotted to classroom activities. Thus, hobbies may fit into the classification that Papert (1980) described as "hard fun"—activities from which the practitioners gain fulfillment, and in which they work hard to learn and to achieve their goals.

In this article we review the literature related to leisure learning in an effort to provide a theoretical framework for study learning amongst hobbyist.

Leisure and Hobbies

Almost everyone (e.g., 96% of U.S. citizens aged 15 and over) engages in some kind of leisure activity (United States Bureau of Labor Statistics, 2010). Moreover, people spend a relatively large amount of time (e.g., U.S. citizens spend 5.25 hours, mainland Chinese 4.1 hours, Japanese 4.5 hours, South Koreans 5.1 hours, British males 5.3 hours and Finnish males 5.9 hours per person per day on average) participating in leisure or free time activities (Eurostat, 2004; United States Department of Labor, 2010; OECD, 2012). For many people, leisure is a source of "joy, happiness, and physical health" (Argyle, 1996, p. 6). Leisure is part of what makes life meaningful and enjoyable (Kelly, 1983), and for most people represents a significant component of everyday life (Argyle, 1996; Robinson & Godbey, 1997). One of the important characteristics of leisure is freedom; as Iso-Ahola (1999, p. 39) stated "there are no external or internal pressures or coercion to engage". Thus, leisure takes many forms: sleeping, watching TV, sitting on the sofa and relaxing, or pursuing a hobby.

Among these many forms of leisure activities, hobbies emerge as particularly interesting from a learning perspective as they involve active pursuit of knowledge and skills, sometimes

deep knowledge and skill, all while delivering the requisite feelings of joy and fulfillment expected from a satisfying leisure experience. Hobbies are classic examples of free-choice learning; activities that combine fun and learning-intensive practices (Azevedo, 2005; Falk & Dierking, 2002). Although there has been considerable research conducted on free-choice learning, most has focused on experiences of relatively short duration such as visiting a museum or aquarium or watching a television special on the universe (cf., Bell, et al., 2009). Studying the learning process of hobbyists offers opportunities to understand a very different type of lifelong, free-choice learning. The time and effort expended by hobbyists usually includes searching for various types of information about one subject, applying multiple learning skills, and learning complex content, all over long periods of time.

Stebbins (2007) defined a hobby as “the systematic and enduring pursuit of a reasonably evolved and specialized free-time activity that leads to the acquisition of knowledge, skill, or experience” (p.7). Although hobbyists usually have specific learning goals and expect some outcomes, feeling pleasant, satisfied and fulfilled during the engagement is usually considered as one of the most important intrinsic motivations which drives a hobbyist to pursue the activities, and what motivates them to stay with the hobby before they reach their learning goals (Stebbins, 2012). Tsaur and Liang (2008) described an extreme form of hobbyist, the recreation specialist, as possessing the following attributes: learning competency; a strong will to learn; a general commitment to assisting others with learning; and a drive towards mastering all aspects of their selected area. Not all hobbyist activities are intrinsically motivated (Stebbins, 2007). However in order for hobbyists to receive extrinsic rewards they must work hard to develop certain skills and knowledge, and participate in some, if not all, of the activities that are required for the hobby (Stebbins, 1993).

There has been increasing interest in knowing how people pursue and participate in their hobby and how they learn about the information and knowledge they need in order to keep this kind of leisure activity enjoyable, including research on koi keeping (Liu, 2012), beer brewing (Murray, 2011), , backpacking (Chang, 2009), photography (Cox, Clough & Marlow, 2008), amateur astronomy (Berendsen, 2005; Berendsen & Storksdieck, 2007; Yocco, Jones & Storksdieck, 2012), ecotourism (Falk, Ballantyne, Packer & Benckendorff, 2012), bird watching (Hvenegaard, 2002), public health (Heo, Lee, Pedersen & McCormick, 2010; Dilley & Scraton, 2010), and science education generally (Bergin, 1992;; Falk & Dierking, 2010; Jones & Symon, 2001; Okamoto, 2001) . A consistent theme throughout all of these investigations is that pursuit of hobbies represents one of the most important ways individuals learn.

Hobbyists as Learners

All kinds of leisure activities, including hobbies, involve searching for and using information to different degrees (Hartel, 2011), and searching for related information while not “physically” engaging with the hobby should also be considered as a part of leisure activities (Liu, 2012). In fact, hobbyists spend a substantial amount of time “thinking” about their hobby while they are not “doing” it (Gelber, 1999). Hobbyists develop projects on their own, and create a plan to achieve the goals of those projects. Hobbyists also are noteworthy for largely relying on themselves, rather than someone else, to organize how and why they seek out the necessary information and resources needed to pursue their hobby (Liu, 2012). There are four notable

characteristics of hobbyist learning: 1) the situated, real-world nature of what is learned; 2) the social, community-aspect of the enterprise; 3) the development of expertise or mastery; and 4) the important role played by interest and intrinsic motivation.

Situated Learning

According to Falk and Dierking (2000; 2013), all learning is situated and contextual. That said, a lot of people are asked to learn within contexts, such as classrooms, where the content is divorced from both the direct realities of the subject and the specific needs of the learner. Hobbyist learning stands in stark contrast, typically the content to be learned is directly and specifically focused on the particular needs and realities of the hobby; hobbyists are self-directed in choosing and developing their “learning programs” (Azevedo, 2005). The typical ornamental fish hobbyist, for example, will over time need to know about a wide range of subjects, including fish biology and ecology, water chemistry, fish taxonomy, physics, and veterinary medicine, as well as skills such as plumbing and electrical wiring, and possibly the standards of judging different varieties of fish if the hobbyists are intending to enter contests (Liu, 2012). However, each topic will emerge as important to learn only when it is needed, and each will be anchored to the concrete realities of keeping fish alive within a tank. Even when hobbyist learning involves traditional classroom lessons, which it occasionally does, the content is contextualized for the learner. For example, Fine and Holyfield (1996) documented that mushroom hunting hobbyists usually learned crucial knowledge from classes which were offered by their mushroom society or an environmental agency. When attending those classes, they learned taxonomy, identification skills, cultivation ecology, and the role of the mushroom in history and culture. Although the hobbyists’ society and the environmental agency design the courses, the hobbyists always had the freedom to choose which courses to take.

Although baseline knowledge might be acquired distally through classroom courses, books, magazines or perusing the internet, ultimately all hobbyist learning becomes situated within real-world contexts. It is only when the individuals applies their knowledge to the actual situations and challenges of the hobby that they gain the confidence, skills, values and competence necessary to move them along a trajectory towards mastery. In a study on woodturning hobbyists in Australia, Ehrich and Delahaye (2006) found that newcomers considered that the structured courses/sessions in which basic skills and safety issues of the woodturning hobby were covered and emphasized were very crucial and helpful in their learning experience, but ultimately they needed to go home and learn through actual trial, and importantly, error. It is exactly these kinds of goal-directed, knowledge and skill-dependent circumstances occurring within situationally relevant settings that Tennant (1997) has argued characterize meaningful learning experiences. In Fine and Holyfield’s mushroom hobbyist study (1996), the newcomers usually did their first mushroom hunting with experienced hunters. The mushroom hunters agreed that although learning from workshops or classes was important, such learning was not enough; learning in the field was critical because the identifying cues also include the microhabitats of the mushroom and the seasons in which the mushroom appears. In case after case, both the real world physical context and the sociocultural context created by mentors, situated within a community of practice, appeared to be crucial to supporting hobbyist learning.

Community of Practice

According to Lave and Wenger (1991), newcomers learn by participating in community events and “understand through increasing involvements” (p. 36). In Baldwin’s (1999) research studying the hobby of dog sports, he documented that the learning of dog sport hobbyists usually begins with joining a local dog sport club. In the club, new members learn and practice dog handling skills, study the history and standards for various breeds, and learn to understand the rules of the American Kennel Club. They interact closely with other members, learn from members who know more than they do about the subjects they are interested in, and share their knowledge with other members. These newcomers learned a great deal by attending dog shows and other related events; and explicitly saw and defined them as “educational activities” (Baldwin, 1999). In the wood turners’ case (Ehrich & Delahaye, 2006), the hobbyists began their learning and got a feel for how to perform various skills by watching demonstrations by instructors and experienced hobbyists, and modeling them. They also practiced while being guided and monitored by conveners, and received instant feedback when things did not go well. They received advice and help from peers as well. Some koi hobbyists joined koi clubs and followed experienced koi owners in pond building, koi purchasing and even koi showing. As individuals became more knowledgeable in koi keeping, many learned that sharing knowledge and mentoring other newcomers was an important value of this community (Liu, 2012). Similar findings emerged from studies of mushroom hunting (Fine & Holyfield, 1996) and amateur astronomers (Berendsen & Storksdieck, 2007; Yocco, Jones & Storksdieck, 2012).

Hobbyists typically join hobbyist organizations such as clubs, and participate in the club events with other hobbyists. The organizations can provide benefits such as equipment, information, and activities from which hobbyists can learn more about the hobby (Fine & Holyfield, 1996). Yocco, Jones and Storksdieck (2012) found that not only did participation in amateur astronomy clubs contribute to members’ knowledge, but it also contributed to their interest and willingness to share that knowledge with others. The longer an individual was a member of an amateur astronomy club, the more likely they were to be motivated to engage in outreach and education activities; serving as mentors to support the learning of the next generation of amateur astronomers.

Expertise

Expertise is frequently considered a goal of education. For example, the differences between the schemas of novices and experts are frequently used as the foundation of cognitive models of learning (e.g., Bransford, Brown & Cocking, 2000) and the relationship between experts and novices represents a key construct within sociocultural models of learning (e.g., Lave & Wenger, 1991). Chi (2006) defined expertise as “the manifestation of skills and understanding resulting from the accumulation of a large body of knowledge” (p. 167). Marathe, Hmelo-Silver and Liu (2007) then supplemented this definition with the idea of not only accumulating a large body of knowledge and skills, but also knowing the ways to use them, and suggested that the ways of using such knowledge and skills may vary according to the situation. There are various ways to develop expertise; one of the common ways is through formal education (Chi, Feltovich & Glaser, 1981). However, sociocultural theories emphasize that

expertise is primarily learned through forms of apprenticeship within communities of practice (Lave and Wenger, 1991). Within a community of practice, newcomers learn and become experts through interacting with other members, engaging in community events, and taking on increasing responsibilities in their involvement with their communities. These two perspectives suggest that expertise can be developed in multiple ways, for example both professionals and amateurs can develop expertise in a particular field, but the former may occur primarily through formal instructional mechanisms while the latter might be primarily obtained through informal instructional sources (Hmelo-Silver, Marathe & Liu, 2007).

Since hobbyists' learning is primarily driven by their own intrinsic motivations, and they usually develop their own packages of learning based on their needs and are free to choose any topics and subjects to learn, the ways hobbyists learn and the ways they make sense of information may well be different from those of other types of experts trained by formal education systems, such as scientists. Hmelo-Silver, Marathe and Liu (2007) conducted a qualitative study to document the differences between ornamental fish hobbyists and scientists in understanding aquariums. They found that during the interviews, the hobbyists focused more on the functional components of the system, whereas the scientists focused more on the abstract system, which might reflect the ways they learned the information and the goals of their learning about this subject. The ornamental fish hobbyists' learning goal is to keep their fish healthy, while the scientist's goal is to achieve a conceptual understanding of how this one system articulates with other, similar systems. Accordingly, hobbyists' learning strategies differed from those of students in a formal classroom studying the same topic. For example, hobbyists learned the nitrogen cycle because they needed to know how to get rid of harmful waste in order to keep their fish healthy. So their learning focused on the portion of the cycle taking place within the aquarium components and the ways in which they could manipulate aquarium water quality. Despite the differences between professionals and amateurs, Hmelo-Silver, Marathe and Liu (2007) also noted that both groups of individuals developed a high degree of mastery of their topics as evidenced by their flexibility in the ways they viewed aquariums; they could demonstrate both component and abstract knowledge of systems when necessary.

As previously noted, one thing that distinguishes hobbyist learning trajectories from those in the formal education system is the self-directed and self-motivated nature of their learning (Azevedo, 2005). In order to learn and to achieve their goals, hobbyists develop "learning programs" (Azevedo, 2011), choosing what, how, when, where, from whom, and with whom to learn, and they rely on themselves to find all the information and resources based on what they have already learned and what they need to know (Liu, 2012). The hobbyists might not be able to learn all the subjects related to the hobby as a package all at once so they select what to learn next according to what they already know, and construct the knowledge in a framework that makes sense to them.

In Liu's (2012) study on koi hobbyists, he documented that hobbyists progressed through a series of stages of expertise, each with its own set of learning goals and strategies. Although the highest levels of expertise often required considerable time and effort, even the lowest levels of expertise involved considerable investment from the learner. An over-riding characteristic of this kind of learning was that it is fundamentally learner-centered and need-based, and strongly focused on process rather than content. Perhaps most importantly, the kind of complicated and

continuous effort required to achieve expertise was driven by the hobbyist's sustained motivation and interest in the subject. In fact, recent investigations have revealed the very strong links between expertise and interest and motivation (Hidi & Renninger, 2006). According to Meece (1991), knowledge and interest act as positive feedback loops; when learners are motivated by interest, they will be looking to gain knowledge which particularly applies to that subject, and will learn with a goal of mastering that subject, which in turn results in not only gains in knowledge but increases in interest.

Interest & Motivation

When queried about why they engage in their hobby, "interest" was the most frequent answer (Stebbins, 2007). An "interest" shows when a subject or topic has identifications (Dewey, 1913) or meanings (Blumenfeld, 1992) for an individual. "Interest" is one of the intrinsic motivators present when someone is satisfied by engaging in an activity without any additional reward, and it creates a tendency to respond to certain stimuli, to become involved in certain activities and to acquire certain specific skills and/or knowledge (Joseph & Edelson, 2004). According Hidi and Renninger (2006), interest is a multi-dimensional construct involving both cognition and affect. According to Joseph and Edelson (2004), learning motivated by interests has: 1) natural appeal (Renninger, 2000); 2) persistence and effort (Hannover, 1998); 3) mastery goal orientation (Shiefele, 1991); and 4) rich and strong connections to knowledge (Renninger, 2000). As learners become more interested in a topic, they become increasingly willing to find ways of acquiring knowledge and information surrounding the topic, and increasingly willing to invest the necessary time and effort required to learn about the topic. In other words, individuals who have an interest in a topic are more likely to be motivated learners; they are more likely to seek out challenge and difficulty, use effective learning strategies, and make use of feedback (Barron, 2006; Csikzentmihayli, Rathunde, & Whalen, 1993; Lipstein & Renninger, 2007; Renninger & Hidi, 2002). For example, koi hobbyists are motivated by their own interest to engage with their hobby and spend large amounts of time and effort over long periods of time learning about the topics of koi and koi keeping; all in pursuit of the goal of mastering the knowledge of koi keeping (or at least a level of mastery sufficient to maintain a healthy population of koi). Importantly, the knowledge they acquire during the learning process is neither linear nor prescribed, but rather divergent and emergent, yet all is connected to the short and long-term goal of koi keeping (Liu, 2012).

According to Joseph and Edelson, (2004) there are two kinds of satisfaction connected with learning a topic or subject with interest: 1) the immediate fulfillment upon engaging with the subject or topic of interest; and 2) the long-term benefit of developing a new skill or knowledge base and the ability to experience the interest more deeply in the future. When individuals gained satisfaction from engaging with a topic or subject, they naturally wanted to learn more about that topic or subject and, in the process, become a motivated learner (Renninger, 2000). As a result of their high personal interest in their subject, hobbyists display a strong motivation to learn. To achieve the goal of having fun with their hobbies, hobbyists have to devote quite a large amount of effort to learning.

Rewards, both personal and social, are part of the motivations that drive hobbyists to learn (Stebbins, 2007). Stebbins further noted that personal enrichment, self-gratification, and self-

actualization were ranked as the three most important rewards hobbyists sought. For example, a well-designed and well-constructed koi pond with a group of healthy, beautiful koi actualizes and expresses the owner's self-image and also brings the owner the feeling of pleasure, enrichment and re-creation, as well as monetary benefit if the owner sells the koi (Liu, 2012). In order to receive the rewards listed above, a hobbyist must work hard to develop certain skills and knowledge, and participate in some, if not all, of the activities that are required for the hobby. Taking monetary rewards as an example, in general the time required to raise an average koi for market far exceeds the typical monetary value of the koi. This suggests that the process of engaging in koi raising activities were more highly valued amongst hobbyists than were the products of the activities; these findings further suggest that koi hobbyists might be engaged in a "flow" activity (Csikszentmihalyi, 1990). Flow is the sensation which comes from engaging with an intrinsically rewarding activity. It is usually self-evident, and people usually recognize the feeling but have difficulty objectively comparing it to other feeling states. Key characteristics are that the activity be moderately challenging for the individual and that it have clearly understood boundaries. If the activity is too easy, the individual would not feel any challenge and might lose interest. If it is too difficult, the individual will feel frustrated or lost during the process and might lose interest as well. In addition, the individuals must be able understand what success or failure "looks" like. All of these conditions well describe typical hobby situations and typical hobbyist learning; it is an understandable task, challenging but doable. If and when these conditions are met, the hobby is likely to be fun and yield intrinsic rewards.

Conclusion:

Through this review we brought together learning theories such as situated learning and communities of practice, as well as insights from the cognitive sciences related to expertise, motivation and interest to collectively inform an understanding of hobbyists' learning processes. One obvious conclusion appears to be that hobbyists are driven by a need to know, and will thus avail themselves of any and all available learning resources that will support that need – be it formal, informal or some combination of the two. That said, the research also seems to suggest that since the learning activities of hobbyists are driven primarily by specific, practical needs, learning opportunities that are situated within appropriate contexts and can deliver useful information on an "as needed" basis are likely to be most valued and most frequently sought after. Hence, the importance to hobbyist learning of communities of practice; groups of individuals who are capable of both understanding the specific needs and interests of the hobbyists and able to deliver information in a timely and relevant fashion. The sense of belonging and affiliation that result from these groups probably also significantly contributes to the value of these hobbyist communities. Since hobbyists primarily are seeking to satisfy identity-related needs and desires (cf., Falk, 2009), being surrounded and accepted by like-minded individuals creates a particularly reinforcing environment for hobbyists.

In the current knowledge age, there will be increasing associations and interactions occurring between leisure activities and learning (Falk, et al., 2012). Concomitant with the growth of leisure and learning is the relentless erosion of the boundaries between formal and informal education as learners of all ages seek to satisfy their needs to understand and address a wide range of issues, at all times of day and through whatever means that are available. Studying hobbyists affords an important opportunity to build a better understanding of how

individuals engage in learning across their lifetime; particularly since it represents a prime example of persistent, long-term learning driven primarily by the learners' interest in, and motivation for a subject. Individuals engaged long-term in hobbies develop high levels of knowledge and expertise; knowledge and expertise rivaled only by the most dedicated, seasoned and formally trained professionals. Because hobbyists' learning processes share many characteristics with what is typically considered as optimum learning, both in formal and informal settings, knowing how hobbyists learn could contribute to our understanding of learning theory and how those theories operate in real-world contexts. The in-depth knowledge gained from studying hobbyists' learning has the potential to be directly applicable to a wide range of both informal and formal learning situations, including the learning that occurs during participation in science fairs, project-based learning, science festivals, the Maker movement and in-depth experiences in informal settings like science centers, zoos and aquariums; in the process further blurring the increasingly artificial formal-informal dichotomy.

What this review also makes clear is that the optimized form of learning represented by hobbyists is not a rare and unusual phenomenon but rather surprisingly common. Intensive pursuit of a subject through hobbies is something that a significant percentage of the population regularly engages in; including individuals with minimal formal education! This intensive type of learning, often underemphasized within schools, is actually quite well supported in the free-choice learning world by a wide array of public and private organizations. Thus an increased understanding of the learning needs and interests of hobbyists would directly benefit this large and diverse community of learners and the education providers who support them. With an enhanced understanding of the learning patterns and factors that contribute to overall learning success by this group of leisure learners, educators of all types, including government extension and outreach agencies, businesses catering to hobbyists, continuing education facilities, science centers and potentially K-12 schools could make more informed decisions about the design and implementation of hobbyist-focused educational interventions, including particularly when and how to best facilitate learner scaffolding. Investigations of this important group of learners have only scratched the surface. Studying the learning of leisure hobbyists has great potential for contributing to our understanding of education across diverse settings.

References:

- Argyle, M. (1996). *The social psychology of leisure*. New York, NY: Penguin Books.
- Azevedo, F. (2005). *Serious play: A comparative study of learning and engagement in hobby practices*. Unpublished PhD dissertation. UC Berkeley, Berkeley, CA.
- Azevedo, F. S. (2011). Lines of practice: A practice-centered theory of interest relationships. *Cognition and Instruction*, 29(2), 147-184. doi: 10.1080/07370008.2011.556834
- Banks, J. A., Au, K. H., Ball, A. F., Bell, P., Gordon, E. W., Gutiérrez, K. D. Heath, S. B., Lee, C. D., Lee, Y., Mahiri, J., Nasir, N. S., Valdés, G. & Zhou, M. (2007). *Learning in and out*

of school in diverse environments: Life-long, life-wide, and life-deep. Seattle, WA: The LIFE (Learning in Informal and Formal Environments) Center.

- Bell, P., Lewenstein, B., Shouse, A., & Feder, M. A. (2009). *Learning Sciences in Informal Environments: People, Places and Pursuits*. Washington, DC: National Academies Press.
- Berendsen, M. (2005). Conceptual astronomy knowledge among amateur astronomers. *Astronomy Education Review*, 4(1). Washington, DC: Association for Universities for Research in Astronomy, Inc. Retrieved from <http://aer.noao.edu/AERArticle.php?issue=7andsection=2andarticle=1>
- Berendsen, M., & Storksdieck, M. (2007). Knowledge of astronomy among amateur astronomers. In Gibbs, M.G., Berendsen, M., and Storksdieck, M. (Eds.). *Science educators under the stars: Amateur astronomers engaged in education and public outreach*, pp. 43-56. San Francisco, CA: Astronomical Society of the Pacific.
- Bergin, D. (1992). Leisure activity, motivation, and academic achievement in high school students. *Journal of Leisure Research*, 24(3), 225-239.
- Blumenfeld, P. C. (1992). Classroom learning and motivation: Clarifying and expanding goal theory. *Journal of Educational Psychology*, 84(3), 272-281.
- Chang, S.L. (2009). Information research in leisure: implications from an empirical study of backpackers. *Library Trends*, 57(4), 711-728. doi: 10.1353/lib.0.0062
- Cox, A.M., Clough, P. & Marlow, J. (2008). Flickr: a first look at user behavior in the context of photography as serious leisure. *Information Research*, 13(1). Retrieved from <http://informationr.net/ir/13-1/paper336.html>
- Cox, A. M. & Blake, M. K. (2011). Information and food blogging as serious leisure. *Aslib Proceedings*, 63 (2/3), 204-220. doi: 10.1108/00012531111135664
- Csikszentmihalyi, M. 1990. *Flow: the psychology of optimal experience*. New York, NY: Harper & Row.
- Dewey, J. (1913). *Interest and effort in education*. Boston, MA: Houghton Mifflin.
- Dilley, R., & Scraton, S. J. (2010). Women, climbing and serious leisure. *Leisure Studies*, 29(2), 125-141. doi: 10.1080/02614360903401927
- Eurostate. (2004). How Europeans spend their time Everyday life of women and men: data 1998-2002. Office for Official Publications of the European Communities, Luxembourg. Retrieved from <http://bookshop.europa.eu/en/how-europeans-spend-their-time-pbKS5804998/>
- Falk, J.H. (2009). *Identity and the museum visitor experience*. Walnut Creek, CA: Left Coast Press.

- Falk, J.H., Ballantyne, R., Packer, J. & Benckendorff, P. (2012). Travel and learning: A neglected tourism research area. *Annals of Tourism Research*, 39(2), 908-927. doi: 10.1016/j.annals.2011.11.016
- Falk, J. H., & Dierking, L. D. (2000). *Learning from museums: visitors experience and the making of meaning*. Walnut Creek, CA: Alta Mira.
- Falk, J.H. & Dierking, L.D. (2002) *Lessons without Limit: How free-choice learning is transforming education*. Lanham, MD: AltaMira Press.
- Falk, J.H. & Dierking, L.D. (2010). The 95% Solution: School is not where most Americans learn most of their science. *American Scientist*, 98, 486-493.
- Falk, J.H. & Dierking, L.D. (2013). *The Museum Experience Revisited*. Walnut Creek, CA: Left Coast Press.
- Falk, J. H., Dierking, L. D., & Adams, M. (2006). Living in a learning society: museums and free-choice learning. In S. J. Macdonald (Ed.) *Blackwell Companion to Museums*. London: Blackwell Publishing.
- Falk, J. H., & Needham, M. D. (2013). Factors contributing to adult knowledge of science and technology. *Journal of Research in Science Teaching*, 50(4), 431-452.
- Gelber, S. M. (1999). *Hobbies: leisure and the culture of work in America*. New York, NY: Columbia University Press.
- Hannover, B. (1998). The Development of Self-Concept and Interests. In L. Hoffman, A. Krapp, A. Renninger, & J. Baumert (Eds.), *Interest and learning: Proceedings of the Seon Conference on Interest and Gender* (pp. 105-125). Kiel, Germany: Institute for Science Education (IPN) at the University of Kiel.
- Hidi, S., & Renninger, K.A. (2006). The four-phase model of interest development. *Educational Psychologist*, 41, 111-127.
- Hvenegaard, G. (2002). Birder specialization differences in conservation involvement, demographics and motivation. *Human Dimensions of Wildlife*, 7, 21-36. doi: 10.1080/108712002753574765
- Heo, J., Lee, Y., Pedersen, P., & McCormick, B. (2010). Flow experience in the daily lives of older adults: An analysis of the interaction between flow, individual differences, serious leisure, location, and social context. *Canadian Journal on Aging*, 29, 411-423. Retrieved from http://www.calvin.edu/~yl33/documents/HeoCJAarticle_000.pdf
- Iso-Ahola, S.. (1999). Motivational foundations of leisure. In Jackson, E. & Burton, T. (Eds.),

- Leisure studies: Prospects for the twenty-first century* (pp. 35-51). State College, PA: Venture Publishing.
- Jones, I., & Symon, G. (2001). Lifelong learning as serious leisure: Policy, practice and potential. *Leisure Studies*, 20, 269–283. doi: 10.1080/02614360110098676
- Joseph, D., & Edelson, D. (2004). The interest-driven learning design framework: motivating learning through usefulness. *Proceedings of the 6th international conference on learning sciences*, pp. 166-173.
- Kelly, J. R. (1983). *Leisure identities and interactions*. London: George Allen & Unwin.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.
- Lifelong Learning Council Qld Inc. (2002). Lifelong learning and community based learning: background information paper. Prepared for Adult Learning Australia (Qld) Branch.
- Linnenbrink, E., & Pintrich, P. R. (2000). Multiple pathways to learning and achievement: The role of goal orientation in fostering adaptive motivation, affect, and cognition. In C. Sansone & J. Harackiewicz (Eds.), *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 195-227). San Diego, CA: Academic Press.
- Liu, C-C. (2012). *Serious fun: Life-deep learning of koi hobbyists*. Unpublished Ph.D. dissertation. Oregon State University, Corvallis, OR.
- Meece, J. L. (1991). The classroom context and students' motivational goals. *Advances in motivation and achievement*, 7, 261-285.
- Miller, J. D. (1998). The measurement of civic scientific literacy. *Public Understanding of Science*, 7, 203–223.
- Murray, D.W. (2011). Home Brewing and Serious Leisure: A Mixed Methods Examination. Unpublished Ph.D. dissertation. Auburn University. Auburn, AL.
- National Research Council. (1996). *National science education standards*. Washington, DC: National Academy Press.
- National Research Council (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academies Press.
- OECD. (2012). How do People in the Asia/Pacific Region Spend their Time? in OECD, *Society at a Glance: Asia/Pacific 2011*, OECD Publishing.

- Okamoto, K. (2001). Lifelong Learning and the Leisure-Oriented Society: The Developments and Challenges in the Far East. In: D. Aspin, J. Chapman, M. Hatton and Y. Sawano, eds., *International Handbook of Lifelong Learning*. Dordrecht: Kluwer Academic Publishers.
- Papert, S. (1980). *Mindstorms: Children, computers and powerful ideas*. New York, NY: Basic Books.
- Prigoda, E. & McKenzie, P.J. (2007). Purls of wisdom: a collectivist study of human information behavior in a public library knitting group. *Journal of Documentation*, 63(1), 90-114. doi: 10.1108/00220410710723902
- Renninger, K. A. (2000). Individual interest and its implications for understanding intrinsic motivation. In C. Sansone & J. M. Harackiewicz (Eds.), *Intrinsic motivation: Controversies and new directions* (pp. 373-404). San Diego, CA: Academic Press.
- Robinson, J. P., & Godbey, G. (1997). *Time for life: The surprising ways Americans use their time*. College Park, PA: Pennsylvania State University Press.
- Rutherford, F. J., & Ahlgren, A. (1993). *Science for all Americans*. New York, NY: Oxford University Press.
- Shiefele, U. (1991). Interest, learning, and motivation. *Educational Psychologist*, 26 (3&4), 299-323. Retrieved from http://www.unco.edu/cebs/psychology/kevinpugh/motivation_project/resources/schiefele91.pdf
- Stebbins, R. A. (1993). *Canadian football: A view from the helmet*. (reprinted ed.). Toronto, ON: Canadian Scholars Press.
- Stebbins, R. A. (2007). *Serious leisure: A perspective for our time*. New Brunswick, NJ: Transaction.
- Tennant, M. (1997) *Psychology and adult learning*. London: Routledge.
- Tsaur, S. & Liang, Y. (2008). Serious Leisure and Recreation Specialization. *Leisure Sciences*, 30 (4), 325-341.
- United States Bureau of Labor Statistics. (2010). American Time Use Survey-2009 Result. Retrieved from <http://www.bls.gov/news.release/pdf/atus.pdf>
- Wigfield, A. & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review*, 12, 265-310. Retrieved from <http://www.rcgd.isr.umich.edu/garp/articles/eccles92g.pdf>
- Wigfield, A. & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, 25, 68-81. Retrieved from

http://www.unco.edu/cebs/psychology/kevinpugh/motivation_project/resources/wigfield_ectles00.pdf

Yocco, V, Jones, E. & Storksdieck, M (2012). Factors contributing to amateur astronomers' involvement in education and public outreach. *Astronomy Education Review*, 11(1) 010109. Retrieved from http://aer.aas.org/resource/1/aerscz/v11/i1/p010109_s1?view=fulltext