SPECIES SELECTION IN SECONDARY WOOD PRODUCTS: PERSPECTIVES FROM DIFFERENT CONSUMERS

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ABSTRACT

This study investigated adult consumer perceptions of several wood species to determine if word-based and appearance-based evaluations differed. The research replicated a 2001 study by the authors, which used undergraduate college students as a proxy for older and more experienced adult furniture consumers. The literature is somewhat inconclusive concerning the extent to which student samples represent "real" consumers. Using the mall intercept survey procedure at several furniture stores and trade shows in two Midwestern cites, participants were split into two groups and asked to rate six commercially important wood species on several semantic-differential items, based either on word association (word-based perception) or physical wood specimens (appearance-based perception). Results from the replicated adult consumer study were very similar to the student study suggesting that college students provide a reasonable picture of adult consumers' perceptions of wood species. The study confirmed that the word-based and appearance-based methods of evaluation sometimes produce different results. In general, the appearance-based respondents had difficulty identifying the species they were observing; however, the adult consumers were better at species identification than were the college students. This study provides further evidence that preconceived species perceptions play an important role in influencing the consumer's ultimate evaluation of wood. The research results can help secondary wood manufacturers better understand the implications of species on design and communication decisions.

Keywords: Wood, perception, species, college, student, consumer, proxy.

INTRODUCTION

Studies have shown that people have differing perceptions of different wood species (Nicholls et al. 2003; Bumgardner and Bowe 2002; Swearingen et al. 1998; Blomgren 1965). If recognized and understood, these perceptions can be leveraged for marketing and product development advantages (Hardwood Review Weekly 2002). This paper reports the findings of a replication of a previous species perceptions study by the authors (Bumgardner and Bowe 2002) with a sample of respondents with a very different demographic profile. A potential limitation noted in our previous study was the use of a convenience sample of college students as a proxy for "real" consumers. Indeed, the authors do not wish to imply that college students are not consumers; yet, with regard to furniture, college students would not generally fit the profile of a middle- to

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high-end furniture purchaser. At best, these students represented future consumers whose opinions are similar to current consumers in the market for furniture, cabinets, and other secondary wood products. At worst, these students failed to mirror adult consumers who, perhaps because of age and experience with purchasing such products, have very different perceptions and better knowledge of wood species.

BACKGROUND

In our previous study, we noted the role that species selection plays in the product development process for secondary wood products. There are increasing indications that such decisions can play a role in U.S. competitiveness as well. In a survey of exhibitions at the Spring 2002 Furniture Market in High Point, North Carolina, it was noted that use of rubberwood (*Hevea brasiliensis*), a species common to Southeast Asia, had nearly tripled in a 3-year period, increasing from 41 bedroom and dining room groups in 2000 to 112 groups in 2002. Rubberwood accounted for 3% of all bedroom and dining room groups shown at the Market including groups made from nonwood materials. This was comparable to the domestic species of alder (*Alnus rubra*) and ash (*Fraxinus* spp.) (Appalachian Hardwood Manufacturers, Inc. 2002). And, a hint as to the future of rubberwood products in U.S. markets may have been provided in a recent report in the Malaysian Timber Bulletin (2003), which projects demand for rubberwood sawtimber by the Malaysian furniture industry to increase from 1.2 million cubic meters in 1998 to 3.0 million cubic meters by 2020. The report also notes that 80% of Malaysia's furniture exports are manufactured from rubberwood. Malaysia is an important exporter of wood household furniture to the United States (Buehlmann and Schuler 2002).

Familiarity with U.S. species has been discussed as a possible source of competitive advantage for domestic manufacturers of secondary wood products (Hardwood Review Weekly 2003; Lawser 2002), and research has shown that industry practitioners generally concur with this belief (Buehlmann et al. 2003). However, we found that most college students could not identify common hardwood species, although they maintained definite perceptual images of those species. The Appalachian Hardwood Manufacturers, Inc. (2002) report on the recent High Point Market noted that rubberwood and other foreign species were often stained to look like cherry or referred to as "Asian oak" or "Asian cherry." Combined with consumers' perceptions but limited knowledge of wood species, these factors contribute to confusion on the part of consumers and a missed opportunity for domestic manufacturers.

College students as proxies

There is considerable literature concerning the use of college students as research subjects. Taken together, these studies generally suggest that the answer to whether students adequately represent actual consumers is that *it all depends.* Khera and Benson (1970), for example, suggest that the suitability of college students depends upon whether they have an adequate background for the research task. It also depends upon their frame of reference, which can be manifested in a major area of study (e.g., engineering, business). John (2001) claims that college student samples might lack certain characteristics that reduce their effectiveness as proxies for nonstudents, including basic preconditions such as prior beliefs about existing product categories, manipulated factors of interest such as developmental differences by age, and variance in specific factors of interest (e.g., nonusers vs. heavy users of a particular product). Kardes (1996) argues that student samples are more appropriate for basic research on causal mechanisms than for applied research on specific predictions. Sheth (1970) suggests that if situational differences (classroom or laboratory settings vs. in-house interviews or other "naturalistic" settings) in studies can be minimized, college student samples will yield similar results to nonstudent samples. James and Sonner (2001) even make a distinction between "traditional" and "nontraditional" college students and

provide evidence that the increasing numbers of older adult students are quite similar to adult consumers but different from traditional students.

The role of experience

Given the ambiguity found in the literature, it is unclear how representative college students are as a proxy for "real" consumers. However, some factors would seem to suggest that differences might well exist. For one, data collection in the previous study we conducted was done in the classroom and not on the premises of stores or other field locales. Moreover, based on the previous discussion, one could question whether college students have adequate experience with middle- to high-end furniture to represent those consumers who are already in the market for, and have purchased or shopped for, such products. Previous studies have shown that experienced persons are more likely to approach judgment tasks in a statistical way than are inexperienced persons, i.e., they are less likely to make errors of regression or to make causal inferences based on extreme cases or small sample sizes (Holland et al. 1986; Nisbett et al. 1983). In other words, people learn from their experiences.

On the other hand, Kardes (1996) claims that people tend to learn relatively little from unstructured experience, that large differences in years of experience often do not translate into large differences in basic judgment tasks, and that experience is a poor teacher when the relationship between variables is probabilistic, as is often the case with furniture and other fashion-oriented wood products. For example, a consumer might conclude from a few furniture-shopping experiences that all casually styled furniture is made from oak. However, when coupled with the assertion by Frye (1996) that there is less correlation between species and style than in the past, it is conceivable that experience might actually lead to wrong conclusions concerning wood species. Brehmer (1980) claims that people, regardless of their level of experience, tend to make inferences about the relationships between variables in a deterministic or causal fashion rather than in a statistical or probabilistic fashion. When the outcomes of judgments are specific actions, such as purchasing furniture, there is a very limited set of critera upon which to evaluate one's judgments. In such cases, little may be learned from experience.

Objectives

The objective of this study was to compare college students' perceptions and knowledge of wood species as reported in Bumgardner and Bowe (2002) with those of older and more experienced consumers surveyed at furniture stores and trade shows in the same general geographic area. This will help address whether there is a general perception and level of knowledge of different wood species among consumers or whether they change with age and experience. Answers to this question will have implications for the design and promotion of wood products, the design of future studies investigating such topics, and the education of consumers.

METHODS

Data collection

As a comparison to the college student data from the 2001 study, adult consumers (25 years of age or older) were targeted for a follow-up study that took place from August 2002 through May 2003. The University of Wisconsin Survey Center (UWSC) was contracted to collect the data. The same survey instrument that was developed, pretested, and employed in the 2001 college student study was used in the adult consumer study. The title *University of Wisconsin Survey Center: Wood Study* and center logo were added to the questionnaire booklet to identify the survey organization.

The data collection procedure utilized a modified mall intercept method in two midwestern cities, Madison and Milwaukee, Wisconsin. Initially, furniture stores were identified for the survey locations. Two companies in Madison and one company in Milwaukee offered space to con-

duct the survey. After several trials, it was determined that the data collection volume was too low in the furniture store locations to achieve the data collection goals in a timely manner. Several relevant trade shows at local convention centers were identified as alternate survey locations. Booth space was provided for the UWSC personnel, and the data collection results were positive.

A simple display of forestry and forest products pictures was arranged in the booth space to pique interest in the study. A UWSC banner was prominently affixed to the display to identify the organization. Incentives of candy bars and soda were used to entice potential respondents to participate in the study.

The respondents were randomly split into two groups with approximately half completing a word-based perception questionnaire and half completing an appearance-based perception questionnaire. The respondents completing the word-based perception questionnaire were asked to evaluate six commonly used wood species based on the name of the species only. No visual cues were given other than the species name printed on the questionnaire form. The respondents completing the appearance-based perception questionnaire were asked to evaluate six sample boards, which were identified by question number (Fig. 1). Two sample board sets were constructed for the 2001 study and reused for the current study. The sample boards consisted of six species samples measuring 0.5 in. (12.7 mm) by 4.0 in. (101.6 mm) by 6.0 in. (152.4 mm) mounted on a plywood backing. The species evaluated included northern red oak (*Quercus rubra*), mahogany (*Swietenia* sp.), black cherry heartwood (*Prunus serotina*), black walnut heartwood (*Juglans nigra*), sugar maple (*Acer saccharum*), and eastern white pine (*Pinus strobus*). With the word-based perception questionnaire, the respondents were asked to evaluate each species based on the simplified common names of *oak, mahogany, cherry, walnut, maple,* and *pine*. On the word-based perception questionnaire, respondents were asked to evaluate the species under the scenario that they had just seen a magazine advertisement for bedroom furniture made from the species in question. On the appearance-based perception questionnaire, the scenario for evaluation was being in a furniture store showroom and seeing bedroom furniture made from the wood specimen in question.

FIG. 1. The sample board sets used for the appearance-based evaluations.

TABLE 1. *Theoretical factors describing household furniture and the items selected to represent each factor.*

Factor	Item
Quality	Fragile vs. Durable
Price	Expensive vs. Inexpensive
Style	Casual vs. Formal
	Old-Fashioned vs. Modern
	Stately vs. Modest
Visual Elements	Cold vs. Warm
Environmental Considerations	Sustainable vs. Depleting

Common components of both the word-based and appearance-based perception questionnaires were the semantic-differential scales employed and the theoretical factors they represented. Five theoretical factor categories used to describe wooden household furniture were identified for the 2001 study. One or more scale items were developed to describe each theoretical factor. The theoretical factors and corresponding items are show in Table 1. Specific details on the factor/item development and instrument pretesting can be found in Bumgardner and Bowe (2002).

To illustrate the word-based perception questionnaire, the respondents would consider the species *oak* and rate whether they thought it was *Fragile* or *Durable* (Fragile = 1 and Durable = 7) on a seven-point scale. This evaluation continued for the remaining 6 semantic-differential items and was repeated for each species. Likewise, in the appearance-based perception questionnaire, the respondents would examine the oak sample board and rate whether they thought it appeared *Fragile* or *Durable* on a seven-point scale. This evaluation continued for the remaining 6 semantic-differential items and repeated for each species in the sample board set. The scales were treated as interval in nature (Coombs et al. 1970; Aaker 1998), allowing for mean-based statistical comparisons.

Sample description

The number of completed questionnaires for the study was 912, which included 489 and 423 word-based and appearance-based perception questionnaires, respectively. Respondents were screened to exclude persons less than 25 years of age. Forty-one completed surveys were removed from the sample when the respondents were later found to be less than 25 years old. This brought the adjusted sample size to 871, which included 466 and 405 word-based and appearance-based perception questionnaires, respectively (Table 2). Only 21% of the questionnaires were collected through furniture store interviews. The remaining 79% were collected through trade show interviews. The sheer volume of attendees at the trade shows created an ideal setting for data collection. Fifty-three percent of the questionnaires were completed in Madison.

Demographic data were collected for the adult consumer respondents. Information on gender, age, household income, home ownership status, and recent furniture purchases was collected (Table 3). The sample was roughly split by gender with 51 and 49% female and male respondents, respectively. The median age of respondents was

TABLE 2. *Survey response rate by location.*

Location	Word-Based Responses	Appearance-Based Responses	Total Responses
Furniture Store – Steinhafels, Madison	27	36	63
Furniture Store – Slumberland, Madison	38	39	77
Furniture Store – Steinhafels, Milwaukee	26	16	42
Trade Shows – Home & Garden Show, Madison	106	109	215
Trade Shows – Corvette Show, Madison	65	37	102
Trade Shows – Home & Garden Show, Milwaukee	204	168	372
Total Adult Sample	466	405	871
2001 Student Sample[1]	146	107	253

[1] Bumgardner & Bowe (2002).

TABLE 3. *Survey locations and demographic profiles for the survey respondents.*

Demographic Variables	Furniture Stores Madison	Furniture Store Milwaukee	Home & Garden Show Madison	Home & Garden Show Milwaukee	Corvette Show Madison	Overall
Gender (% female)	48.5	58.3	59.5	49.4	36.7	50.6
Age (median)	42.0	44.0	50.0	51.0	50.0	49.0
Household Income (%):						
≤ $50,000	35.2	37.1	33.9	26.6	17.2	29.3
$50,001 – $100,000	40.6	37.1	56.1	57.9	56.3	53.4
> $100,000	24.2	25.7	10.1	15.5	26.4	17.3
Own a home or townhouse (% yes)	82.4	74.3	88.3	90.5	89.2	87.8
Work experience in wood products? (% yes)	28.6	31.4	28.0	30.1	27.2	29.1
Involved in major furniture purchase in the past 6 months (% yes)	46.6	33.3	19.4	29.6	28.6	30.0

49. Nearly 71% of respondents earned more than $50,000 per year. In addition, more than 87% of respondents owned their own house or townhouse. Thirty percent of respondents had been personally involved in a major furniture purchase in the past six months. Twenty-nine percent of respondents indicated having work experience in or related to the forest products industry.

RESULTS AND DISCUSSION

Claimed vs. ability to identify species

On the word-based perception questionnaire, the respondents were asked if they *thought* they could correctly identify each of the six species if given the opportunity. On average across all species, 69% of the adult respondents claimed they could identify the species while only 50% of student respondents from the previous study claimed such ability. On the appearance-based perception questionnaire, the respondents were asked to identify each sample board in question. On average across all species samples, 36% of adult respondents correctly identified the sample while only 18% of student respondents correctly identified the sample. A substantial discrepancy exists between what the respondents claimed they could identify correctly and what the respondents actually identified. As shown in Fig. 2, the adult respondents were more successful in correctly identifying the sample boards than the student respondents; however, the average difference between *ability* and *claimed ability* was 34 percentage points for the adults and 32 percentage points for the students across all species. Additionally, the pattern of claimed vs. actual ability was quite similar between the adults and students. For example, with both groups, oak was the species generating the highest claimed ability, but pine was the species most correctly identified.

The student group had a particularly difficult time identifying *mahogany* on the appearance-based perception questionnaire, while *maple* provided the greatest challenge for the adult group. *Walnut* presented the least problems with a 6-percentage point difference between *ability* and *claimed ability* for both groups.

Evaluation of word-based and appearance-based perceptions

The results for the word-based and appearance-based evaluations are shown in Table 4 and Table 5. A two-tailed t test (alpha = 0.05) was used to determine if the means were significantly different than the midpoint (4.0) for each semantic differential pair.

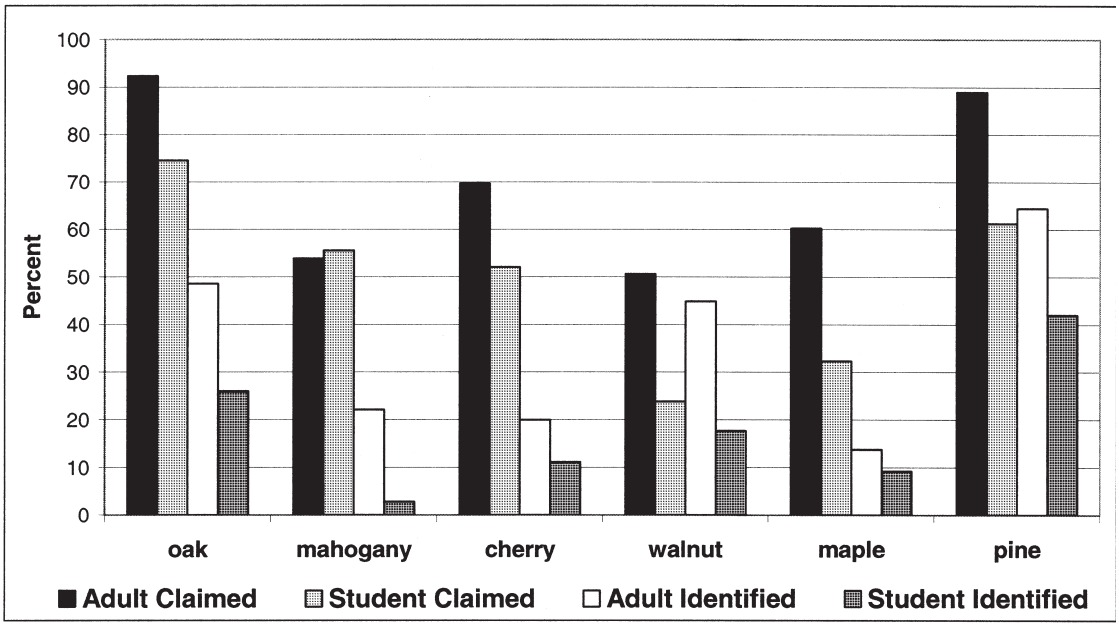

FIG. 2. Adult consumer vs. college student samples: proportion of respondents claiming ability to identify wood species on the word-based perception questionnaire and proportion of respondents correctly identifying wood species on the appearance-based perception questionnaire.

Overall, few differences were found between the adult consumer and college student groups. The two groups were in agreement about 75% of the time with both the word-based and appearance-based evaluation (76.2 and 73.8%, respectively). There were only two instances where the adult consumers and college students were on opposite sides of a scale (as opposed to one group being neutral), and both occurred with the appearance-based evaluations. One case involved walnut, with adults rating this species as warm and students rating it as cold. This suggests that positive visual impressions of walnut may decline as upcoming consumer groups enter the market. The other case involved pine, with adult consumers rating this species as old-fashioned and college students rating it as modern.

In contrast, several differences were found between the word-based and appearance-based responses for the adult consumers (a similar trend was noted among college students in the previ-

TABLE 4. *Summary of the adult consumer and college student word-based results, based on two-tailed* t *tests (H_0: $\mu = 4.0$).*

Species	Casual vs. Formal	Cold vs. Warm	Expensive vs. Inexpensive	Fragile vs. Durable	Old-Fashioned vs. Modern	Sustainable vs. Depleting	Stately vs. Modest
Oak	* / formal[1]	warm	expensive	durable	* / old-fash.	sustainable	stately
Mahogany	formal	warm	expensive	durable	old-fash.	depleting / *	stately
Cherry	formal	warm	expensive	durable / *	old-fash.	* / sustainable	stately
Walnut	formal / *	warm / *	expensive	durable	old-fash.	sustainable	stately
Maple	casual	warm	* / inexp.	durable	old-fash.	sustainable	modest / *
Pine	casual	*	inexp.	fragile	old-fash. / *	sustainable	modest

* denotes means not statistically different from scale midpoint of 4.0 (alpha = 0.05).

[1] Response format: *adult response* / *student response;* a single entry indicates same response by both the adult and student groups.

TABLE 5. *Summary of the adult consumer and college student appearance-based results, based on two-tailed* t *tests (H_0: μ = 4.0).*

Species	Casual vs. Formal	Cold vs. Warm	Expensive vs. Inexpensive	Fragile vs. Durable	Old-Fashioned vs. Modern	Sustainable vs. Depleting	Stately vs. Modest
Oak	casual[1]	cold	* / inexp.	durable	modern	sustainable	* / modest
Mahogany	formal	warm	* / expensive	durable	old-fash. / *	sustainable	stately
Cherry	casual / *	warm / *	*	durable	* / old-fash.	sustainable	* / stately
Walnut	formal	warm / cold	expensive	durable	old-fash.	sustainable	stately
Maple	casual	cold	inexp.	*	modern	sustainable	modest
Pine	casual	cold / *	inexp.	fragile	old-fash. / mod.	sustainable	modest

[1] Response format: *adult response / student response;* a single entry indicates same response by both the adult and student groups.
* denotes means not statistically different from scale midpoint of 4.0 (alpha = 0.05).

ous study). While several of these differences involved neutral ratings for either the word-based or appearance-based evaluations, those involving opposite ratings are noted below.

For the adult consumers, cherry was rated as formal on the word-based evaluations and as casual on the appearance-based evaluations, suggesting that cherry's formal reputation surpasses its appearance. Oak was rated as warm on the word-based evaluation and cold on the appearance-based evaluation. Maple followed this same pattern. It seems wood in general, across species, is perceived as warm in name but might be perceived as cold in appearance, particularly lighter-colored species. Maple was rated as old-fashioned on the word-based evaluation and modern on the appearance-based evaluation. Interestingly, mahogany was rated as depleting on the word-based evaluation and sustainable on the appearance-based evaluation. This finding perhaps suggests the difficulty of rating this type of attribute on appearance and a general perceived belief that tropical woods are not being utilized in a sustainable fashion.

Perception moderating appearance-based evaluations

Student data from the 2001 study suggested that there might be a moderating role of percep-

TABLE 6. *Comparisons of item means and results of two-tailed* t *tests for those correctly and incorrectly identifying pine and oak on the appearance-based perception questionnaire.*

Item[1]	Adult group: Correctly identified	Adult group: Incorrectly identified	*p* value	Student group: Correctly identified	Student group: Incorrectly identified	*p* value
				PINE		
Casual vs. Formal	1.9	2.7	<0.01	1.7	2.4	0.01
Cold vs. Warm	3.7	3.8	0.63	4.1	4.5	0.20
Expensive vs. Inexpensive	5.2	4.5	<0.01	5.7	4.6	<0.01
Fragile vs. Durable	3.4	3.9	<0.01	2.8	4.1	<0.01
Old-Fashioned vs. Modern	3.4	4.2	<0.01	4.2	4.9	0.04
Sustainable vs. Depleting	3.1	3.8	<0.01	2.8	3.6	0.01
Stately vs. Modest	5.2	4.7	<0.01	5.5	4.6	0.01
				OAK		
Casual vs. Formal	3.1	2.6	<0.01	3.3	2.6	0.01
Cold vs. Warm	3.3	3.1	0.23	3.3	3.6	0.20
Expensive vs. Inexpensive	4.0	3.9	0.73	4.2	4.5	0.41
Fragile vs. Durable	4.9	4.0	<0.01	4.8	4.3	0.08
Old-Fashioned vs. Modern	4.2	4.3	0.56	4.4	4.4	0.79
Sustainable vs. Depleting	3.6	3.6	0.74	3.5	3.2	0.17
Stately vs. Modest	4.1	4.2	0.52	4.3	4.8	0.13

[1] The first word listed in an item was anchored as "1," the second word was anchored as "7."

tion on the appearance-based evaluations. The student respondents were able to correctly identify the pine and oak sample boards 42 and 26% of the time, respectively. Did their knowledge of the sample board species influence their appearance-based evaluations? Likewise, the adult group correctly identified the pine and oak sample boards 64 and 49% of the time, respectively. To test for this moderating influence, two-tailed *t* tests (alpha = 0.05) were generated for the pine and oak responses. Both the adult consumer and college student respondents that correctly identified the pine sample evaluated the species as more casual, inexpensive, fragile, old-fashioned, sustainable, and modest (Table 6). Only the cold vs. warm evaluation showed no significant difference. For oak, the adult respondents that correctly identified the sample evaluated the species as more formal and durable. In comparison, the college student respondents that correctly identified oak evaluated that species as more formal only, although the durable rating also approached statistical significance.

CONCLUSIONS

This paper sought to determine if age and experience with furniture affect perceptions and knowledge of common wood species. The results suggest that word-based and appearance-based perceptions associated with the species investigated were quite similar for college students and adult consumers. By investigating college students, it seems possible to get a reasonable idea of adult consumers' perceptions of wood species.

The adult consumers were generally better at identifying the species investigated, suggesting they possessed a greater level of knowledge. However, pine was the only species to have at least 50% correct identification. Overall, there seems to be a lack of wood species knowledge even among more experienced consumers. The pattern of correct identification was similar between both groups, suggesting that both groups struggle with the same species, particularly maple. The gap between claimed and actual ability was very similar for both the adult and student consumers.

The role preconceived perceptions can play in appearance-based evaluations was confirmed in this study. Similarly to the college students, adult consumers who correctly identified pine rated the wood sample differently than those who did not know it was pine. To a lesser extent, this finding also occurred for oak. This suggests the powerful role reputation can play in species promotion. Further discussion of the implications for species selection and communication in secondary wood products can be found in Bumgardner and Bowe (2002). One interesting finding regarding oak was noted in the previous college student study: that word-based evaluations of oak were often opposite to appearance-based evaluations. This trend was not as evident with adult consumers, though the word-based perception was *warm* while the appearance-based perception was *cold.* This suggests that adult consumers were not as enamored with the reputation of oak as were less experienced college students.

Study limitations

This study faced certain limitations, not least of which was use of store and trade show intercepts for data collection. With this survey method, there is only moderate control over the sample, and the potential exists for selection bias. We were able to collect demographic information to describe the sample, and we believe the stores and trade shows chosen enabled us to discern the perceptions of persons generally having more experience with furniture purchases than college students. We make this judgment based on the age, home ownership status, and income level of the sample, as well as reported work experience with wood products and recent furniture purchases. However, caution is warranted in generalizing the results to all furniture consumers. This study was also limited in that potential interactions between species and other design factors such as style, finish, and hardware were not possible using the small sample boards. Perceptions of species could vary by the product for which they are used.

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