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Standard Guide for Structured Small Group Product Evaluations[1]

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1. Scope

1.1 This guide covers those occasions in which a small group of individuals (generally between three and ten) with potentially different functional roles and degrees of training in sensory and product evaluation, evaluates a product or series of products for a specific objective, with a pre-identified decision to be made, but without the use of formal hypothesis testing or statistics. In the product testing industry, these are often referred to as "benchings," "cuttings," or "bench screenings" or, in the case of food products, "tastings," "informal tastings," "team tastings," or "technical tastings." In this guide, the term "Small Group Product Evaluation" (SGPE) is used.

1.2 The aim of this guide is to provide best practices to ensure that SGPE are conducted with sufficient rigor to enable the most appropriate decision or to yield the needed learning while considering the risk. Because the participants may be heterogeneous with respect to functional role, knowledge of the issue at hand, sensory sensitivity, and degree of sensory or product evaluation training, the likelihood of agreement on a path forward is not assured. Additionally, participants may have certain biases with respect to the issue to be decided, because of prior knowledge or their role within the organization. These potential derailers can be addressed through proper planning and execution of an SGPE. When SGPE are unstructured, unfocused and experimental error and biases uncontrolled, the outputs of SGPEs do not inform decisions or deliver the desired learning in a scientific manner. The goal of this document is to elevate the practice of small group product evaluations by outlining a structure, defining decision criteria in advance, and providing guidelines for implementation, drawing upon existing sensory theory and methods. Outputs from these SGPE are used to inform decisions and determine next steps including the risks involved with each of these.

SGPE are widely used, and when properly conducted, are an option in the sensory professional's toolbox. SGPE should be conducted only when the risks are known, stated, and shared. Limited timing and resources alone are not adequate reasons to utilize SPGE testing and forgo formal sensory testing. Risks in doing so must be clearly communicated and agreed to by all involved parties.

The proper uses of SGPE are several: to screen variables, to establish hypotheses, to gain information about a product set or category, to take a course of action where a low risk product decision is needed or for product learning throughout a development program. In all of these cases, the team must accept the risks that come with having SGPE outputs to inform a decision. One risk involved in SGPE is missing small differences among products (beta risk), when the goal of the evaluation is to find such differences, particularly those differences that might be important to the consumer. An SGPE failure to find differences does not mean that product similarity or equivalence is established, since much larger sample sizes than are common to SPGE's are required to establish similarity/equivalence.

1.3 This guide covers the planning and implementation processes, including objective setting, method determination, number and types of participants, ballots, sample preparation, decision criteria, products to be included, review of information collected, and management of the post-product evaluation discussion to arrive at a decision within the small group. Documenting and communicating SGPE outputs are also covered, as well as next steps if a decision cannot be reached. Worked examples across industries including food, household, and personal care are included. The different types of SGPE covered include those commonly executed but is not exhaustive.

1.4 This guide does not cover the use of small group evaluations to pilot research or test protocols before implementation in larger scale testing. In addition, the use of small group evaluations to substitute for larger evaluations that incorporate formal hypothesis testing and statistical analysis or to replace hedonic testing are neither recommended nor included within this guide. SGPE that are regular activities of a quality function and product reviews that are done for demonstration or informative purposes with no defined decision criteria are also not covered in this guide.

1.5 See 5.2 for a best practice recommendation for the role of the sensory professional or trained delegate in the planning, designing, conducting, or oversight of structured SGPE.

[1] This guide is under the jurisdiction of ASTM Committee E18 on Sensory Evaluation and is the direct responsibility of Subcommittee E18.05 on Sensory Applications--General.

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1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E1885 Test Method for Sensory Analysis—Triangle Test
E2139 Test Method for Same-Different Test
E2164 Test Method for Directional Difference Test
E2610 Test Method for Sensory Analysis—Duo-Trio Test
E3009 Test Method for Sensory Analysis—Tetrad Test

3. Summary of Guide

3.1 The aim of this guide is to provide best practices for small group product evaluations (SGPE), which are often referred to as "benchings," "cuttings," or "bench screenings" or, in the case of food products, "tastings," "informal tastings," "team tasting," or "technical tastings." SGPE are used to address learning objectives, make a product decision to conduct upcoming research, or make a product decision that has business implications when formal, larger scale testing is not required. Best practices are needed to ensure actionable outcomes or clarity in learning from SGPE when a small number of people are evaluating the samples and personal and political agendas may be in play among multiple stakeholders. This guide outlines a structure for planning and implementing an SGPE. Outputs from these SGPE will be more actionable and will lead to better informed decision-making or more clarity in learning than when these best practices are not followed.

4. Significance and Use

4.1 Using best practices for SGPE ensures that decisions made will be based on scientific principles, and the outputs obtained will be more objective than those evaluation sessions conducted without this planning, structure, focus, and best practices. These small group evaluations contrast with more formal product tests that include a prequalified participant sample, hypothesis testing, and statistical analysis. Without best sensory practices and procedures, SGPE may be unstructured, unsystematic, difficult to manage, and may lead to outputs that are unclear, not credible, or ignored. Additionally, the use of proper sensory practices reduces bias among participants with specific sample knowledge or a desire to advance an agenda. This guide provides a framework for conceptualizing, organizing, and executing these SGPE.

TABLE 1 Comparison of Not Best Practice SGPE Versus Best Practice SGPE

Feature	Not Best Practice SGPE	Best Practice SGPE
# Participants	Variable	3–10
Rationale for selecting participants	Availability	Specified
Decision criteria	None	Specified
Structured ballot	No	Yes
Hedonic response	Sometimes	No
Product presentation	Unsystematic	Balanced as possible
Independent judgments	Sometimes	Yes
Discussion	Variable	Yes
Decision is data-driven	Sometimes	Yes
Output and decision recorded	Sometimes	Yes

4.2 SGPE are used in situations in which formal, hypothesis-driven product evaluations are not required. These include situations in which the decision risk is small or stakeholders feel comfortable in making a decision with the attendant risks, or both. Examples of these situations may include limited availability of samples or other resources, potential patent exposure, or low incidence of target population. The SGPE could be an initial screening step or a precursor test before a more formal product test. In the proper context, SGPE can also be a decision-making tool in and of itself. Using the framework presented here provides a degree of rigor that may be absent when a few people evaluate a product without controlled conditions. A poster presented at the 2009 Pangborn Sensory Science Symposium (**1**)[3] reported the results of a survey on SGPE. 59 % of respondents (N = 92) stated that, at their place of employment, typically, non-sensory professionals organized SGPE. Table 1 summarizes key differences between a typical unstructured product evaluation with a small group not following best practices and an SGPE that follows the best practices outlined in this guide.

5. Definition—SGPE

5.1 An SGPE generally consists of three to ten people chosen based on one or more of the following criteria: sensory acuity, prior knowledge, availability, or investment in the outcome of the evaluation to make a decision concerning a product, products, or a product category. Participants complete a given sensory task that may be quantitative or qualitative in nature, or both, as instructed by a sensory professional. Responses are collected by the sensory professional, compared to pre-defined decision criteria, and a discussion of the responses and larger context ensues. A consensus decision and next steps are reached, recorded, and communicated.

5.2 *Sensory Delegate*—Planning for an SGPE should be done by the sensory professional. If it is not possible for the sensory professional to plan the SGPE or to attend the evaluation session, a delegate should be appointed by the sensory professional. The sensory professional coaches the delegate in conducting the SGPE. The delegate assumes the roles and responsibilities of the sensory professional with particular emphasis on conducting an unbiased evaluation

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The boldface numbers in parentheses refer to a list of references at the end of this guide.

session. The delegate should maintain contact with the sensory professional pre- and post-product evaluation session. If the organization conducting the SGPE does not employ a sensory professional, a staff member, or members, may be trained to do so using the tools and techniques outlined in this guide.

6. Issues to Consider Before Planning SGPE

6.1 *Effect Size Matters*—The processes of planning, conducting, overseeing, and interpreting the outputs of an SGPE described in this guide include the collection of both quantitative (numerical) and qualitative (verbal or written comments) data. Both of these data types may be used to inform the final conclusion. It is expected that there will be patterns in respondents' numerical ratings. It is also expected that there will be patterns or themes in the respondents' product descriptions. If an effect is large, it is likely detected by even a small group. Thus, the likelihood of missing large differences among products or not detecting an intense sensory property in a single product is likely to be small. However, if an effect is small, there is a greater likelihood of it being missed by a small group, especially considering differences in sensory sensitivity, product knowledge, and varied degrees of sensory training.

6.1.1 The measure of effect size was made popular by Jacob Cohen in his 1988 book, *Statistical Power Analysis for the Behavioral Sciences* (**2**), and a calculation of effect size has been used in more quantitative, formal testing. The sensory professional should consider testing approaches other than SGPE if the effect size is small and the risk of missing the effect is large, such as when deciding if a product lot scheduled for release is tainted.

6.2 *Considerations Before Planning and Preparing SGPE*—Before designing and conducting an SGPE, the sensory professional should make the following assessments to determine if the execution of this structured evaluation is appropriate:

6.2.1 Can the issue or research question be structured and focused enough to be evaluated in a small group?

6.2.2 Will an SGPE address the objectives so a decision can be made?

6.2.3 How will the output be used? Will the output of an SGPE be used in the proper context keeping in mind its limitations?

6.2.4 Have the risks involved in using an SGPE been considered and communicated?

6.2.5 Can participants with the desired characteristics for an SGPE participation be found and are they available?

6.3 *When to Consider Using SGPE*—SGPE are appropriate and may be used in the following situations:

6.3.1 An SGPE can be used for a low-risk decision. A low-risk decision is one in which an erroneous decision by an SGPE will not have a major impact on the issue under consideration. Additionally, if the likelihood of an erroneous decision being identified and reversed in subsequent activities is high, then an SGPE can be considered low risk. The SGPE organizer needs to provide the necessary caveats upfront in the planning phase of the SGPE and the written documentation summarizing the SGPE results and decision made. The organization needs to accept these risks.

6.3.2 For projects involving screening of products,

6.3.3 In exploratory or discovery research,

6.3.4 When the discussion of product properties yields useful information and can provide guidance for next steps, and

6.3.5 When this guide's recommendations can be implemented.

6.4 *When Small Group Product Evaluations Are Not Appropriate*—There are situations when SGPE are not appropriate:

6.4.1 When results will be interpreted as formal and taken out of context by users of the information. While it is not possible to know ahead of time whether and how results may be misused, it is incumbent on those who organize, lead, and summarize the evaluation to outline clearly how the recommendation and next steps were decided and the attendant risks accepted.

6.4.2 When consumer/actual user information is required for the decision. If an organization has not conducted sufficient prior research with consumers (for example, drivers of liking, product optimization, or developed sensory based specifications) to be able to relay what consumers' responses are likely to be ("we know our consumers don't like heat/spice and this sample is quite hot").

6.4.3 When the product or product category is key to the business with respect to revenue, margin, or strategy and the decision risk is too high.

6.4.4 When detailed and more precisely measured product attributes and intensities are needed.

6.4.5 When statistical risk assessment is needed to support a decision.

6.4.6 When the recommendations provided in this guide meant to provide structure and rigor to these evaluations cannot be followed.

6.4.7 When the leader of the SGPE cannot issue a report that properly describes the SGPE process and the limitations and risks associated with the decision and next steps.

6.4.8 When the main question to be answered cannot be properly addressed because of the capabilities or knowledge of individuals available to participate in the SGPE. For example, if the main objective is whether samples can be differentiated and only nondiscriminators are available, an SGPE is not appropriate. Additionally, if the main question is whether or not product differences are detectable by consumers or untrained panelists, and only trained panelists are available, an SGPE is not appropriate.

6.5 *When SGPE MAY be Appropriate*—As previously stated in 6.3 and 6.4, an SGPE is appropriate in low-risk situations and may not be appropriate when the decision risk is high. The following conditions should be true to use an SGPE in high-decision-risk situations:

6.5.1 All stakeholders are aware of the risks inherent both in SGPE in general and those specific risks associated with the situation under consideration,

6.5.2 All stakeholders are willing to accept the risks noted above, and

6.5.3 The alternative to conducting an SGPE is making a decision with no product evaluation or input.

6.6 *Five Most Common Types of SGPE*—See Table 2 for a summary of the five most common types of SGPE or Rogeaux (**3**) for a slightly different classification scheme. An SGPE typically addresses, but is not limited to, one of the following five broad objectives:

6.6.1 *Check-in*—Check-in is conducted to determine if a sample(s) is on track to meet a sensory goal or goals. Post Check-in, the sample(s) may proceed to further testing or the Check-in may result in a market decision. Examples of Check-in include:

6.6.1.1 Determination as to whether sensory properties have been maintained between sample development steps (bench→pilot plant→manufacturing plant) or after an ingredient or process change. If the team concludes and accepts that the risk is small in these projects, the step following the SGPE could be a market decision. Whereas, when the concluded risk of the outcome of the SGPE in these projects is moderate or large, further testing, such as a formal sensory test, would be warranted.

6.6.1.2 Determination as to whether a product is ready for larger scale or more formal sensory testing or for a market decision, such as an introduction,

6.6.1.3 Determination as to whether a quality issue has been addressed,

6.6.1.4 Determination as to whether an intended change to a specific sensory attribute has been addressed, and

6.6.1.5 Determination as to whether product functionality or sensory attributes deliver as expected.

6.6.2 *Narrow-down*—A Narrow-down session is designed to reduce a set of samples with a next step generally of consumer or sensory testing. The criteria for elimination may be defined before evaluation. Examples of objectives for Narrow-down evaluations include:

6.6.2.1 The elimination of redundant sensory profiles, and

6.6.2.2 Selecting samples within a desired range of sensory profiles.

6.6.3 *Clarify*—At times, product feedback is obtained from sources external to the project team or company. It is critical to understand the feedback before communicating a response or initiating product change. Examples in which clarification of feedback is needed may include:

6.6.3.1 Consumer complaints or praise,

6.6.3.2 Comments on social media, and

6.6.3.3 Assessing consumer response from formal testing such as central location tests, home use tests, or focus groups.

6.6.4 *Describe*—It may be necessary to describe the sensory attributes pertinent to a set of products before taking some subsequent action.

6.6.4.1 If a new product is introduced to the market, it may be prudent for a small group to compare it to the company's own products or other competitive products before a more formal evaluation.

6.6.4.2 Before testing products with consumers, an SGPE can provide a forum for initial exploration of consumer ballot development.

6.6.5 *Discover Sensory Dimensions*—Consumer research studies often involve exploration of an entire category. The organization should have all impacted parties agree on what sensory dimensions constitute category inclusion. Examples include:

6.6.5.1 Determination of product inclusion for a category appraisal, and

6.6.5.2 Determination of product inclusion for competitive assessment.

6.7 *Communicating SGPE Output to a Wider Audience*—The outputs and decisions from an SGPE result from a particular set of people evaluating a specific product set in a specified context. Thus, any communication of these findings should be done with the appropriate caveats.

7. Five-step Framework for SGPE

There are five steps to planning and executing an SGPE as shown in Fig. 1.

Step 1—Background and Decision Needed

7.1 *Gather Information to Define Issue*—Before executing an SGPE, an overall objective should be identified with a specified decision criterion. To set an objective that meets the needs of stakeholders, the sensory professional should discuss all relevant background with parties representing different functions. Thorough background investigation enables objective setting that considers all points of view of the stakeholders, their learning needs, the decisions to be made, and next steps. The sensory professional should be sensitive to the issues at hand while remaining unbiased, particularly when an issue has become or has the potential to become politically charged or when certain individuals have a personal agenda. Relevant background includes the business situation, business strategy, product information, and history associated with the issue,

TABLE 2 Summary of Five Common Sensory Objectives and Methods Used in SGPE

Type of Evaluation	Sensory Objective	Examples of Sensory Method or Task
Check-in	Determine if sample achieves the sensory goal	Compare to reference sample or description
Narrow-down	Eliminate sensory redundancy or choose products with desired sensory profiles, or both	Degree of difference products, sorting, qualitative mapping, and comparison to target sample or description
Clarify	Understand external feedback	Identify and describe attributes
Describe	Identify sensory attributes for consumer ballot or other communication	Identify and describe common sensory attributes of a sample
Discover Sensory Dimensions	Discover sensory dimensions relevant to the category	Discover and describe sensory attributes of a category and determine representative products

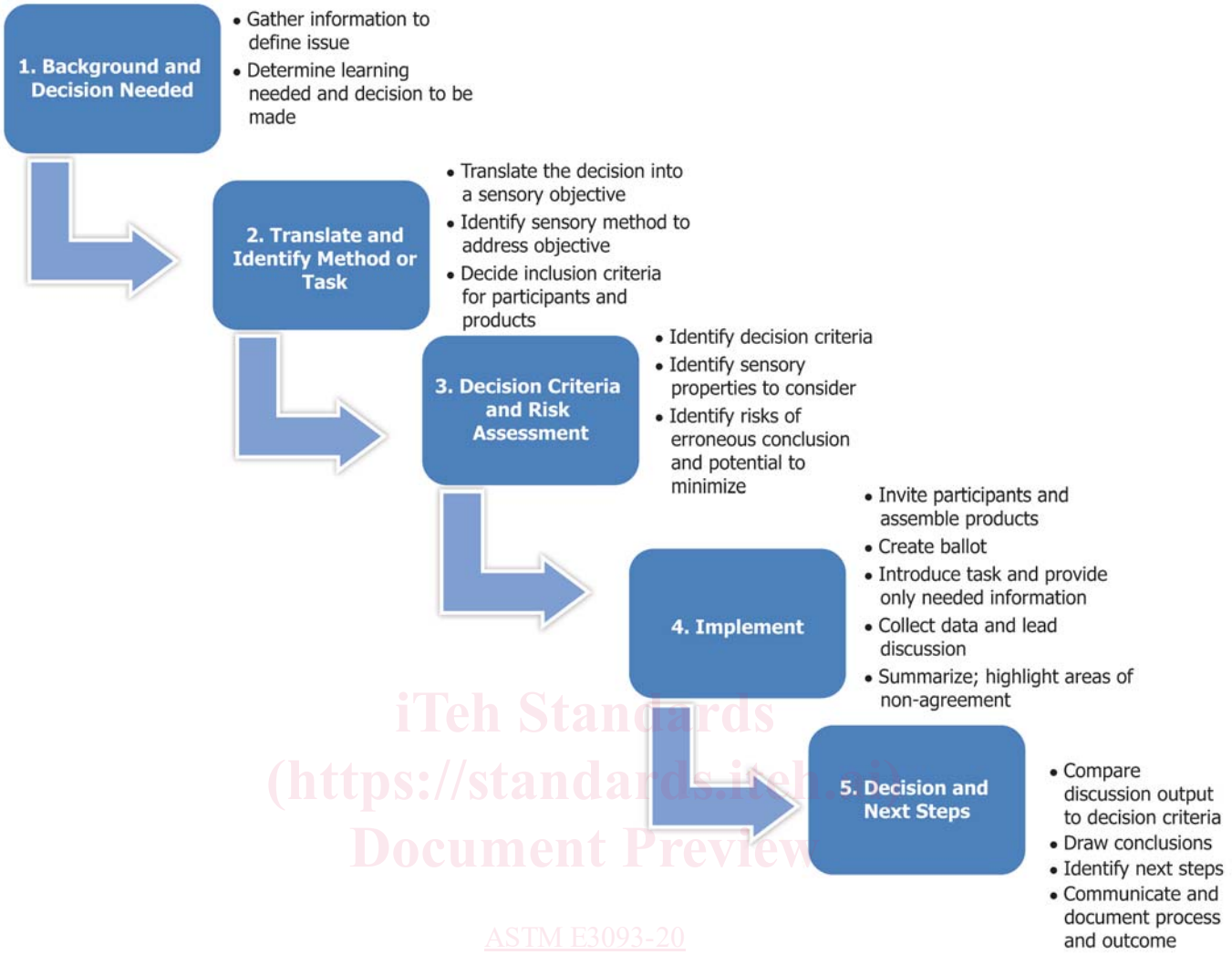

FIG. 1 Steps for Structuring SGPE

including any prior development and testing and feedback from internal or external sources.

7.2 *Determine Learning Needed and Decision to be Made*—Once the background and pertinent issues are identified, the sensory professional, in collaboration with the broader set of stakeholders, can identify the decision to be made or learning needed. The SGPE should provide input to enable making the decision based on independent product evaluations and a majority or consensus result. Examples of decisions from the five broad objectives include: Check-in: "determine whether the reformulated product is ready to move to the next phase of testing;" Narrow-down: "choose products among a larger product set to be included in subsequent testing;" Clarify: "understand consumer complaints to determine next steps;" Describe: "investigate the attributes to be included on a consumer ballot;" and Discover Sensory Dimensions: "identify products that represent the relevant sensory dimensions for a category appraisal."

Step 2—Translate and Identify Method or Task

7.3 *Translate the Decision into a Sensory Objective*—Once the decision to be taken is identified and classified within the five broad objectives, the sensory professional should determine the specific sensory question that needs to be answered or task that needs to be completed as well as the appropriate methodology and participants for the SGPE. Sensory questions within the five broad objectives found in Table 2 may include:

7.3.1 *Check-in*—To determine if a sample meets a sensory goal:

7.3.1.1 If the goal is to demonstrate that a sample has or has not changed from a prior version or to determine whether a sensory issue has been addressed, the sensory question may include any of the following:

(1) Which sample is more (or less) *X*?

(2) Are these two samples the same or different?

(3) How are these samples different?

7.3.1.2 If the goal is to determine whether a sample is ready for further testing or market introduction, the sensory professional needs to determine the criteria that are to be met to achieve that goal. Examples include:

(1) How different is the sample compared to a reference?

(2) Is the *X* defect present in this sample?

(3) How different is the sample compared with competitor *X*?

7.3.1.3 If the goal is to determine whether sensory attributes deliver as expected, the question to be asked may be:

(1) How *X* is this sample?

(2) If I described this sample as *X*, would you agree or disagree?

7.3.2 *Narrow-down:*

7.3.2.1 In cases in which a set of samples needs to be reduced, the sensory question focuses on eliminating samples with redundant, irrelevant, and or inappropriate sensory profiles. Examples include:

(1) Group the samples into sets with similar sensory attributes. Narrow-down can be done by a sorting task whereby participants individually group samples into sets with similar sensory attributes or using check all that apply followed by grouping based on unique attributes, or using more complex multivariate sorting techniques such as qualitative multivariate analysis [consensus sorting of products based on predetermined sensory dimensions with qualitatively defined attributes (Beckley) (4)].

(2) Rank the samples in order of intensity for a sensory attribute.

7.3.2.2 If the goal is to select samples within a desired range of sensory profiles, examples include:

(1) Eliminate samples that are stronger (weaker) in attribute *X* compared with a reference.

(2) Rate the samples for attribute *X* on a scale.

7.3.3 *Clarify:*

7.3.3.1 When feedback needs to be clarified, a reference sample, if available, may be needed to compare against the sample in question:

(1) What differences are there between the Reference and Sample *X*?

(2) Which sample has more (or less) of attribute *X*?

(3) Or, if no reference is available: Would you agree that this sample has attribute *X* as described from an external source?

7.3.4 *Describe*—When the goal is to develop a consumer ballot or communicate sensory properties of a product to others, gathering open-ended comments is often appropriate:

7.3.4.1 *For Food Product*—Document all sensory attributes within the dimensions of aroma, appearance, taste, texture, feeling factors, and aftertaste.

7.3.4.2 *For Non-food Product*—Document sensory and or functional attributes as relevant to the products under study.

7.3.5 *Discover Sensory Dimensions*—When the goal is to develop an understanding of the sensory attributes of an entire category, the salient sensory attributes should be explored and agreed upon as a first step:

(1) What sensory attributes are common to this set of samples?

(2) What sensory attributes would set a sample apart from the others?

7.4 *Identify Sensory Method to Address Objective*—The choice of a sensory method is based on the nature of the task, the products' sensory profiles, and the ability of the participants to complete the tasks involved. Methods range from the simplest, such as recording sensory attributes of one or more samples, to more complex, such as rating, ranking, or sorting samples into categories. No matter the method chosen, best practices for sensory evaluation should be implemented: independent judgments, blind sample coding where appropriate, consideration of the number of samples to be evaluated in one session, appropriate temperature controls, proper rinsing and evaluation intervals, sample evaluation order, potential for sensory fatigue and carryover, minimization of sensorial distractions, and response recording as instructed. Structured ballots are best used for these evaluations. See Sensory Testing Methods, MNL-26 (5).

7.5 *Participants:*

7.5.1 *Number of Participants*—Generally, three to ten people participate in an SGPE. If there are more than ten