RUNNING HEAD: Guided Group Discussion

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Guided group discussion and attitude change:

The roles of normative and informational influence

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Abstract

Group discussion has effectively changed attitudes and behaviors compared to individually-targeted messages (Lewin, 1952; Werner, 2003). This study examines the roles of normative and informational social influence in this effect. High school students heard a message about replacing toxic products with nontoxic alternatives; classes were randomly assigned to hear the message delivered as a lecture or via guided group discussion. For female students (*N* = 250 in 26 classes), HLM mediation analyses suggested normative influence predominated: Discussion was more effective than lecture and this effect was fully mediated by students' perceptions that other students endorsed nontoxics. Content analyses of students' comments indicated that three kinds of remarks led female students to this perception: 1) sharing knowledge about nontoxics; 2) asking questions about nontoxics; and 3) little praise for toxic products. For male students in separate HLM analyses (*N* = 107 in 19 of the same classes), informational influence was most apparent: Post-meeting attitudes were higher after discussion than lecture, and this effect was partially mediated by cognitive elaboration about the message (but not perceptions others endorsed the message). In addition, males' quiz grades were higher after discussion, and students' comments fully mediated the discussion to quiz grades relationship. Results support the importance of hearing others' promessage comments for changing socially motivated behaviors, although the routes of influence appear to differ for these samples of male and female students.

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Since Lewin (1952) first published his research on group discussion based attitude and behavior change, psychologists have tried to understand the processes that led to his dramatic results. The present research uses a modified version of Lewin's procedures by "guiding" the discussion more and updating his theoretical approach with current thinking about information processing and persuasion. In previous research, Werner (2003; Werner & Adams, 2001) used a quasi-experimental design and found that guided group discussion was successful at influencing attitudes, self-reported behaviors, and behavioral intentions. The present project uses a true experiment to compare discussion with lecture, and explores the role of group discussion in the persuasion process. To examine normative social influence, we ask whether group-based persuasion and attitude change are mediated by perceptions that the group endorses the message, and we examine discussion content to ascertain what aspects of discussion lead participants to infer that the group endorses the message. To examine informational social influence, we measure cognitive elaboration (Petty & Cacioppo, 1986) and quiz performance.

This project is based on a holistic model that rejects single "silver bullet" approaches to attitude and behavior change (Brown, Werner, & Kim, 2003). Instead, we assume that new behaviors are embedded in larger social, environmental, economic, and policy contexts. The present research focuses on a small part of this holistic system and examines the importance of embedding attitudes and behaviors in a supportive social context.

Lewin (1952) reported a series of studies in which he compared lectures with discussions as contexts for changing behaviors. Lewin's discussions paralleled his lectures in content (e.g., reasons for and benefits of the change; problem solving and reactions to challenges) and were

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carefully managed to increase positive participation by audience members (e.g., encouraging input from women experienced with the behavior). Although it is easy to criticize the research for its small samples, experimental confounds, and public (rather than private) reports of post-meeting behaviors, Lewin's consistent finding was that people were more responsive to persuasive messages when others around them reacted positively to the message. Group discussion was always associated with more reported behavior change than lecture or one-on-one interaction, and typically, twice as many changed after discussion compared to lecture. Lewin attributed the change to a number of factors, but especially the importance of social standards: People use others' reactions during discussion to infer what is socially appropriate and then behave accordingly. Bennett (1955) replicated and reexamined Lewin's work, and stressed the importance of audience members perceiving that others accepted and would try a new behavior.

The topic for our presentations is reducing use of toxic home and yard care products. Everyday toxic products are of concern because overuse and improper disposal contribute to air and water pollution as well as creating health hazards in homes. In the U.S., local Health Departments encourage people to use safe and effective nontoxic alternatives instead of toxic home and yard chemicals (www.mcstoppp.org/; www.slvhealth.org/). For example, tricolasan, the antibacterial agent in most antibacterial soaps is effective and useful in medical settings, but is not necessary and even potentially harmful in everyday settings, and also pollutes rivers and streams (e.g., Wang, Falany, & James, 2004; Curwood, 2006). For these and other reasons, there is a growing market for home-made products (Berthold-Bond, 1990/1994) and commercially produced nontoxic formulations. The widespread use of household chemical products, concerns raised in the media, and the increasing popularity of nontoxic products make this topic readily adapted to guided group discussion.

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Using Lewin's (1952) theoretical reasoning and discussion strategy, Werner (2003; Werner & Adams, 2001) taught homeowners how to reduce their use of toxic household products. An important issue was whether use of chemical home and yard care products could be socially motivated and vulnerable to Lewin's "group carried changes" (p. 429). Extensive literature shows that people decorate and maintain their homes in accord with both individual preferences and community norms (Altman, 1975; Brown, 1987; Werner, Altman, & Oxley, 1985). If chemical use is socially motivated, nontoxics use can also be socially motivated: People should be more likely to switch to nontoxics if their social group endorses nontoxics and discourages use of toxic products. In Werner's research (2003; Werner & Adams, 2001), people who attended a guided discussion were more favorable towards nontoxics than were members of the group who had missed the meeting (i.e., a separate sample control group). These results support the idea that the meetings had been persuasive. Furthermore, group members who missed the meeting underestimated their friends' support for nontoxics. In essence, those who did not attend exhibited a "false consensus" (Marks & Miller, 1987), expecting their friends to agree with them. Both of these results were subsequently replicated in a second, larger sample which excluded participants who missed the meeting because the topic was not of interest (Werner & Stanley, 2007). Both studies support using group discussion to change the socially motivated use of toxic home and yard products.

The present project is guided by the long history of work on social influence, and by more recent work on attitude formation and change. Research on conformity and social influence (see Cialdini & Trost, 1998, for a review) shows that many socially motivated behaviors are designed to impress others (or at least to avoid their censure). Conformity and social influence research show that naïve participants do change their public behaviors in order

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to fit into a group, groups do exert conformity pressure on deviants, and individuals are often aware of their feelings of discomfort when they deviate from their friends. This "normative social influence" has two forms, and Cialdini's (2003) research shows that people are more influenced by others' behaviors ("descriptive norms") than by instructions for appropriate behaviors ("prescriptive norms"). Part of our interest is to use group discussion to make particular descriptive norms salient - to show that others endorse our message and report engaging in our behaviors. Normative social influence is distinguished from "informational social influence," which occurs not because of concerns about social sanctions, but is used heuristically, as when people turn to others' behaviors as guides for what is valuable or desirable (e.g., Pincus & Waters, 1977; Wittenbrink & Henly, 1996). Group discussion can involve both of these kinds of social influence.

Equally important to this project is Petty and Cacioppo's Elaboration Likelihood Model (ELM; 1986), and Chaiken's similar Heuristic Systematic Model (HSM, 1987). These models provide a conceptual framework for understanding how initial social influence -- with short-term effects on behavior -- can become internalized and result in long-term changes. Persuasion researchers use the concept of "strong attitudes" to describe attitudes that are resistant, persistent, and predictive of behavior (Petty, Haugtvedt, & Smith, 1995). That is, they are resistant to counterpersuasion, likely to endure over time, and likely to be readily accessible and therefore available to guide behavior. These attitudes develop as people listen to a message, think about it, add their own positive ideas or "elaborate" on it, and create a mental network of highly accessible, supporting cognitions. Numerous studies show that participants' reactions to a message are mediated by what they think about as they listen to it. Positive thoughts, or positive elaboration, are associated with more agreement with the message, whereas negative reactions,

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or negative elaboration, are associated with less agreement with the message. The greater the elaboration, the more durable and accessible are the attitudes. An additional feature of ELM and HSM theory and research is that "relevant messages," i.e., those having consequences for the recipient, are more likely to receive careful attention, more elaboration, and deeper processing (Petty & Cacioppo, 1979).

The ELM emphasis on message processing and elaboration informed our choice of messages, our strategy for evaluating the strength of our message, as well as our strategy for evaluating participants' depth of message processing. With respect to developing an effective presentation, we used two themes drawn from ELM research. First, we used compelling rather than weak messages. Our arguments referred to the dangers of toxic products and evidence that such products had made people ill or caused environmental harm. Second, we increased processing by increasing the relevance of our message to the audience. Our communicators were instructed to personalize the message as much as possible by using personal pronouns instead of abstract references. For example, they were instructed to say "you could be overcome by the fumes" instead of "people have been overcome by the fumes"[1]. ELM also led us to consider how our presentation might be relevant for some students more than others. We hypothesized that our message would be more relevant to students who made purchase choices of products compared to students who simply used products purchased by their parents. To provide an individual difference measure of message relevance, we included questions about choosing and purchasing products.

With respect to coding discussion content, we coded each comment for its ability to convey a student's positive or negative reactions to the information. We expected that other students could interpret these comments as normative influence (i.e., as descriptive norms

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favoring or discouraging nontoxics use), or as informational influence, (i.e., signals from others that the information was worthwhile). We examined whether comments implied interest in the message (e.g., asking questions), enthusiasm for the ideas (e.g., challenges and ridicule vs endorsements), reports they already used nontoxics, and so on.

We delivered our presentations to classes of high school students in order to reach this "future generation," but also to obtain a separate questionnaire from each student (not possible in previous community presentations). We ask whether students' perceptions of normative group support explain or "mediate" why discussion is more effective than lecture. In explaining how experimental treatments lead to particular outcomes, Baron and Kenny (1986) distinguished between mediators and moderators. Mediators explain "why" a treatment has an effect, that is, what psychological processes are activated by the treatment. Evidence for mediation occurs when a) the experimental treatment affects the outcome, b) the experimental treatment affects the proposed mediator, and c) the treatment to outcome effect in the first step is reduced in significance when the proposed mediator is added to the analysis. Moderators indicate "who" is most and least likely to be affected by a treatment, which would be indicated by a treatment by moderator interaction. Thus, our individual difference measure of relevance (choice in purchases) might serve as a moderator, resulting in a treatment by relevance interaction predicting attitude change.

In the present experiment, consistent with Lewin's research, we propose that group discussion is more effective than lecture, and both normative and informational social influence could operate. For normative social influence, group discussion leads to attitude change because students perceive that others endorse the message. Furthermore, this effect should be moderated by relevance. That is, mediation through "perceived group endorsement" is most likely for

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individuals for whom the message is relevant (they choose or buy products). Possible paths to postmeeting attitude are portrayed in Figure 1. The upper portion shows simple mediation and the lower shows moderated mediation.

Informational social influence might also operate more in group discussion than lecture. By participating in the discussion, students signal the material is interesting to them, which might lead others to pay greater attention, process more deeply and elaborate more on the material. For informational influence, the lecture vs. discussion to attitude change relationship would be mediated by students' cognitive elaborations about the message (Petty & Cacioppo, 1986). This path might also be moderated by relevance. Compared to others, students who choose or purchase products should find the message more relevant, and process the information more deeply and elaborate on it more thoroughly. The mediation and moderated mediation models would be similar to those portrayed in Figure 1. Similar mediation models are examined at the group level to understand the role of discussion content in these two kinds of social influence.

Method

Overview

We used an experiment to evaluate normative and informational influence. Participants were high school students. We compared the same message delivered as a lecture versus a guided discussion, and used questionnaire data to measure students' cognitive elaboration and learning of the information, their attitudes, and the extent to which they perceived that other students agreed with the message. We analyzed discussion content to understand what kinds of verbal comments were associated with perceptions that others endorsed the message.

Message

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For this project, we adapted the message used in Werner's (2003) presentations to suit a teenage audience[2]. We emphasized products relevant to teens, including some socially oriented products that other students might notice, such as products that impart pleasant odors (e.g., safer alternatives to air fresheners for automobiles; alternatives to laundry products that make clothing smell fresh), and those that eliminate unpleasant odors (such as baking soda to deodorize shoes). We also included products that solve cleaning problems teens might encounter (such as cleaning car windows). To bring more serious issues to students' attention, we covered dangerous household products included in the adult version of the presentation (such as lye-based drain cleaners and outdoor pesticides). We also tried to balance the content so that it would be of interest to male and female students. Presenters went into meetings with up to 70 message points and 4 demonstrations of nontoxic products; they used subsamples of these points within the constraints of a 30 minute presentation.

Participants

Participants were high school students whose teachers invited us to give a presentation during regular class periods. Courses were chosen for their relevance to the topic of substituting nontoxic for toxic products (e.g., health; child development; foods and nutrition). Four classes (all assigned to the discussion condition) had only young mothers. Thirteen classes heard the lecture and 16 classes participated in discussion. Three of the discussion classes were omitted, one because of a tape recorder malfunction and the other two because they were statistical outliers for males and females (discussed below). An additional 4 male students -- the only males in one class -- were also statistical outliers and were omitted for analyses of males only. The final sample was drawn from 7 different schools and included 250 females in 26 classes (mean age estimated from grade levels = 15.6 years) and 107 males in 19 of those classes (estimated mean age = 15.5 years). The study was conducted over two years.

Design

We used a 2 (Presentation style: lecture vs. discussion) by 2 (Student sex) nested design, with class nested within presentation style and random assignment to presentation style. Identical information was delivered in two ways, either lecture or guided discussion. In the lectures, the presenter delivered standard information to the audience, including teaching about nontoxics, doing demonstrations with nontoxics, as well as raising and resolving challenges to using nontoxics. In guided discussion, the content was essentially the same, but instead of lecturing, the leader introduced the topic and guided the group towards positive statements about nontoxic alternatives. Group members who endorsed nontoxics were encouraged to speak, problems or counterarguments raised by the group were addressed by group members, the nontoxics demonstrations were done by group members instead of the presenter, and prochemical statements were treated with respect but negative consequences were acknowledged (e.g., "you could use that product, but it has side effects, so try a nontoxic first"). The content was similar, but discussions involved participants expressing interest, raising questions, endorsing the material, and so on, whereas lectures did not.

Procedure

Teachers at several high schools invited us to provide a presentation in their courses. One presenter was a graduate student and the other was a former school teacher skilled at leading guided discussions from prior research (Werner, 2003; Werner & Adams, 2001; Werner & Stanley, 2007). Both women memorized and delivered a prepared script that included props and demonstrations of nontoxic products. In the lecture condition, the presenter asked the students to

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hold questions until the end, delivered the information in a lively and entertaining way, and did 4 demonstrations to show each nontoxic alternative's effectiveness. In the discussion condition, the same script and positive tone were used, but instead of delivering the information, the presenter led a discussion. She encouraged students to participate with several strategies (asking questions, encouraging and waiting for answers, encouraging students to listen to one another, and asking if students had questions). In private and before the class began, the presenter asked the teacher to suggest the names of students who were popular with peers and who represented different social cliques at the high school. These students were asked to do the four nontoxic demonstrations. We used students from different cliques to be inclusive, but also because of Harkins and Petty's (1987) research showing that multiple distinct sources of persuasive information are more effective than a single source. That is, four students from the same social group would not be as effective as four students representing different groups (cf. Hass, 1981).

Measures

Two kinds of measures were analyzed at individual and/or group levels: questionnaires from individuals including quiz items about the presentation; class means across these individual scores; and content analyses of the meetings (presenter and audience remarks separately). The individual questionnaires are used in Hierarchical Linear Modeling (HLM) mediation analyses to test whether presentation style and relevance predict postmeeting attitude, and whether these effects are mediated by perceptions that the group endorsed the message and by amount of cognitive elaboration.

In addition, we wanted to know what comments during the meeting led to these individual perceptions. That is, content analyses of audience remarks allowed us to ask what kinds of comments from peers led students to increase their cognitive elaboration, remember

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message content, or infer that their peers endorsed the message. Thus, favorable discussion comments were the proposed mediator between the predictors and class means of perceived group endorsement (i.e., peers' comments explain "why" students believed others endorsed the message), class means of cognitive elaboration (i.e., peers' comments explain why students elaborated the message), or class means of memory (i.e., peers' comments explain why students performed better on the quiz). The content analyses represent a group-level measure whereas the questionnaires, cognitive elaboration and quizzes are measured at the individual level. In order to provide group-level attitude and perceived group endorsement measures for this Ordinary Least Squares analysis (OLS), we computed mean scores for each class and student sex (means across questionnaire items).

Additional content analyses focused on the presenters' remarks and assessed argument relevance and quality. Lectures and discussions followed the same script so that they would be equal on these dimensions. If they are equal, differences in subsequent attitudes could be more readily attributed to the content of student discussion than to what the presenter had said.

Questionnaires were completed before the presentation (baseline), immediately following the presentation (postmeeting), and 2-3 weeks after the presentation (follow-up); completing a questionnaire was completely voluntary and anonymous. Except for quiz items and one question (baseline purchase choices), responses were made on 7-point scales, half worded positively and half negatively to avoid response biases. As appropriate, questionnaire items were reverse coded for analyses and the item label represents the high end of the scale. Baseline questionnaires measured an initial attitude toward using nontoxics, which the presenter defined as "things like vinegar and baking soda that people can use instead of chemical products" (1 = "extremely unfavorable", 7 = "extremely favorable"), their self-rated knowledge of "nontoxic alternatives to

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toxic home, auto, and yard products" (1= "nothing"; 7 = "11or more ideas"; we did not measure whether the ideas were positive or negative). Topic relevance was measured as students' control over brand choice for several products, where 1 = "other always chooses," 3 = "joint decision," and 5 = "I always choose"; unknown to the students, the products would be covered in the presentation. Product choice scores were highly skewed, and did not differ for males and females, on the 5-point scale, males, $M = 1.38$, $SE = 2.3$, and females, $M = 1.25$, $SE = 2.0$, $t(359) = -.06$, $p > .20$. For simplicity, we used a dichotomy, so that students who never made independent choices were considered "low" on topic relevance, and students who "usually or always" chose or purchased at least one product were considered "high" on topic relevance. Forty-one percent of the females and 46% of the males were in the high relevance group;

Immediately following the presentation, students completed questionnaires, hereafter referred to as "postmeeting" measures. A manipulation check asked their estimates of how much the group participated, and an equivalency check asked how likeable the presenter was. Twelve attitudinal items were factor analyzed for all participants as well as separately for males and females (omitting 3 classes). Scree tests of Principal Components Analyses indicated there were two factors, and the factor structure was similar for males and females. One factor, postmeeting attitude, contained 5 items and accounted for 23% of the variance for females (Cronbach's alpha = .69) and 25% for males (alpha = .81); items asked how well nontoxic products work, whether the student would choose a nontoxic if given the opportunity, the importance of using nontoxics, and so on. The second factor, perceived group endorsement, contained 5 items and accounted for 26% of the variance for females (alpha = .79) and 30% for males (alpha = .78). One item, health concern, loaded equally on both scales and was omitted from analyses. Another item, concerns about the natural environment, did not load on either scale and was also omitted. Items

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in each scale were unit weighted and averaged for HLM analyses. As described previously, students' scores were averaged to create class means for the OLS analyses. Quiz questions testing knowledge of the meeting content were last in the questionnaire and included two short answer questions with three responses each, and a multiple choice question, for a total possible score of 7 (Cronbach's alpha = .52). One coder rated all of the short answer questions and a second independent rater coded a random 70%; inter-rater reliability for the summed short answer questions was high, $r(251) = .98$.

An open-ended question measuring cognitive elaboration (Greenwald, 1968; Petty & Cacioppo, 1986) asked, "What were you thinking about during the presentation?" These answers were coded as positive elaboration (e.g., "This is great"; "I can't wait to tell my mom"), repeating the message (e.g., "Vinegar is safer than ammonia") and negative elaboration (e.g., "This is dumb"; "There is no way I am making my own cleaning products"). These answers were combined into a single index (positive + repeating – negative) for each individual for HLM analyses, and these were averaged for each class for the OLS analyses. Agreement between two raters on the individual level index was $r\ (272) = .84$.

Group discussion. The meetings were tape recorded and transcribed, and students' comments were content analyzed. Two trained coders read all of the students' comments and assigned them to 6 categories, only three of which occurred with sufficient frequency to use in analyses: "nontoxics knowledge", "questions about nontoxics," and "praise for toxics." "Nontoxics knowledge" included statements about using or seeing others use nontoxic products ("my mom uses vinegar for washing windows"), "questions about nontoxics" included any requests for more information about nontoxics or problems with toxics (e.g., "how much vinegar did you use?"); and "praise for toxics" were students' comments that they liked a toxic product

("I like the smell of car trees [tree-shaped automobile deodorizers]"). Toxics praise was elicited by the presenters as a way to increase discussion, such as asking "do you know what this is?" and "why do you use it?", and was always accompanied by a critique of the product. Interrater reliabilities and group means for these measures are presented in Table 1. A single index of the amount of positive interest was computed by adding together the frequencies of the two pronontoxics statements and subtracting out the praise for toxic products, viz: "index of favorable discussion content" = knowledge + questions - toxics praise (intercoder reliability r(24) = .98). Additional comments that might convey normative information were endorsements (e.g., "wow, that works great", $r(24) = .98$, per class $M = 1.2$), intentions (e.g., "I'll try that," $r(24) = .76$, per class $M = 0.1$), and challenges (e.g., "vinegar stinks," $r(24) = .95$, per class $M = 1.6$), however, these were infrequent, did not contribute to predictive ability, and were omitted.

Message equivalence. The transcripts were also coded for what the presenter said so that we could compare presenter content in lecture and discussion. The presentations could contain up to 70 different topics, and the presenters' basic format was to describe a home, auto, or yard care problem, describe and praise a nontoxic solution, and state how the toxic commercial product might negatively affect the students' health. These messages were created to be "relevant" and "cogent" by ELM guidelines and were based on pilot testing of persuasive messages (Isaac, Werner, Adams, Haggard, Sansone, & Huong, 1999; Werner & Sorod, 2001). Trained coders read each transcript and for each topic, indicated whether the presenter described strong negative effects of the toxic product (e.g., "causes liver disease"), and also indicated whether the presenter had made the dangers relevant to the students by explicitly connecting the potential problem to the students (e.g., "this could give you liver disease" instead of "this causes liver disease"). Message cogency and relevance were each coded 0 (not present) or 1 (present).

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An index of "message persuasiveness" was computed for each topic by multiplying relevance X strength, and summing these products. Thus, message persuasiveness could range from 0 to 70, and indicated, on the whole, how many topics were presented with substantive reasons and made relevant to the student audience.

Follow-up questionnaire. Two to 3 weeks after our presentation, the teacher administered a follow-up quiz and final questionnaire to assess any sustained impact of our meeting. There were 2 open-ended quiz questions to test memory and knowledge for the presentation (11 points possible). The first asked students to recall the product demonstrations from the presentation, and the second asked how to unclog a drain without harsh chemicals. These items were graded by two trained raters for 89 of 114 answers; interrater reliability on the sum of these scores, $r(87) = .99$. Three items using 7-point scales tapped attitudes towards nontoxics (favorability towards nontoxic alternatives, likely to start or continue using nontoxics, and satisfaction with nontoxic alternatives). These items were summed for a single attitude index, reliability alpha = .69. A final item asked about their motivations for trying or using nontoxics (Sansone & Smith, 2000; Sansone, Weir, Harpster, & Morgan, 1992; Werner & Makela, 1998). These were coded as reasons for or against nontoxics (effective and inexpensive; interesting to learn new information; not interesting), which were weighted +1 or -1 to indicate valence towards nontoxics, and summed into a single index of "reasons for trying," interrater reliability $r(68) = .95$.

Results

Manipulation and Equivalence Checks

Two measures verified that discussions differed from lectures in appropriate ways. First, students in the discussions perceived there had been more class participation ($M = 4.61$, 7-point scale) than did students in the lectures (M = 3.85), means adjusted for 1 teacher contrast (described below), ANCOVA $F(1, 334) = 23.85$, $p < .000$, $MSE = 1.63$, partial $\eta 2 = .07$; these perceptions did not differ for males and females, Sex by Presentation Style $F(1, 334) = 0.37$, $p > .20$, $MSE = 1.63$, partial $\eta 2 = .00$. Second, at the class level, the presenters encouraged significantly more participation during discussions (M = 45.32 encouraging remarks per group) than in lectures (M = 3.22), means adjusted for 1 teacher contrast, ANCOVA $F(1, 23) = 68.38$, $p < .00$, $MSE = 128.35$, partial $\eta 2 = .75$.

Table 2 shows that discussion groups had more favorable initial attitudes, adjusted for 1 teacher contrast, ANCOVA $F(1, 356) = 5.53$, $p < .02$, $MSE = 1.11$, partial $\eta 2 = .02$, and that self-reported prior knowledge about nontoxics yielded a significant presentation style by participant sex interaction, ANCOVA $F(1, 356) = 6.70$, $p < .01$, $MSE = 1.53$, partial $\eta 2 = .02$. These variables were included in analyses to assess and control their influence on the models.

Other measures evaluated the consistency with which the material was conveyed to students in lectures and discussions. Importantly, as shown in Table 3, lectures and discussions were approximately equal in ratings of message persuasiveness as defined by ELM (number of relevant cogent messages), they covered approximately the same number of topics, and they included approximately the same number of product demonstrations; the multivariate F for these variables was not significant, Multivariate $F(3, 21) = 0.89$, $p > .20$ partial $\eta 2 = .11$.

There was a marginally significant tendency for students to like the presenter more after a discussion (M = 5.45) than after a lecture (M = 5.13), $F(1, 346) = 3.50$, $p < .06$, $MSE = 2.05$, partial $\eta 2 = .01$; and females liked the presenter more (M = 5.47) than did males (M = 5.11), $F(1, 346) = 4.15$, $p < .04$, $MSE = 2.05$, partial $\eta 2 = .01$. Liking for the presenter did not play a role in HLM analyses and was dropped from further consideration.

Except for the all female classes, males and females participated fairly equally in the discussions. Overall, females made 51% of the audible comments (59% when all female classes are included); on average, males (11.3) and females (11.2) made almost the same number of comments (with all female classes included, females averaged 19.8 comments per session).

Table 4 shows adjusted means for postmeeting attitudes and the two potential mediators, perceived group endorsement and cognitive elaboration. These means are adjusted for the covariates that proved significant in HLM analyses, initial attitude and one teacher contrast (the contrast of that teacher vs. all others; Sampson, Raudenbush, & Earls, 1997). The means are provided for descriptive purposes.

Data analyses

We used Hierarchical Linear Modeling analyses (HLM) in Baron and Kenny's (1986) multi-step process for testing for mediation of experimental treatments (Krull & MacKinnon, 1999). HLM analyses were used to test hypotheses regarding presentation style (lecture vs. discussion), moderation of presentation style by relevance, and the mediation of these effects by perceptions of the group's endorsement and by cognitive elaboration. We conducted a series of three HLM analyses: females only, males only, and males and females together (omitting outliers in all cases). The unconditional Step 1 HLM tests of postmeeting attitudes yielded significant results, demonstrating the need for an analysis like HLM which takes group interdependence (such as nesting) into account, females X^2 (df = 25, N = 250, J = 26) = 42.10, $p < .02$; males X^2 (df = 18, N = 107, J = 19) = 27.03, $p < .08$; males and females X^2 (df = 25, N = 361, J = 26) = 54.41, $p < .001$. In all cases, the model fit was improved to a significant extent by the predictors in our models (see details below).

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Content analyses of the class discussions represent a level 2 variable, however level 2 variables cannot serve as outcome variables in HLM. Therefore OLS Regression was used in additional mediation analyses to examine whether our index of "group discussion" led students to perceive their peers endorsed the pronontoxics message, led to more cognitive elaboration, or led to better retention of the information (quiz scores). Scale scores were grand mean centered when used as predictors in both OLS and HLM analyses. As appropriate, we used robust standard errors to take advantage of their increased statistical power.

As suggested by Raudenbush, Bryk, Cheong, and Congdon (2000), data were checked for suitability for HLM analyses. Five of the groups contained no male participants (4 were the classes of young mothers), reducing the group *n* for males. As noted previously, 1 discussion class was eliminated because we had no recording of the discussion. In addition, preliminary OLS regression analyses indicated that two of the original 16 discussion groups were outliers (Mahalanobois distance scores=15.6 & 20.6 next closest = 11.8; scatterplots confirmed these two classes did not fit the pattern of the others) and they were eliminated from further analyses. In the remaining groups, all measured variables were tested for normality overall and within the female and male samples. The primary dependent variable, postmeeting attitude, was normally distributed; for initial attitude, perceived group endorsement, and cognitive elaboration, skew and kurtosis were within acceptable ranges (Tabachnick & Fidell, 1989).

The four female only classes and relatively smaller number of males raised the question of whether to analyze males and females separately. HLM analyses of combined males and females yielded 3-way interactions among participant sex, topic relevance, and presentation style (lecture vs. discussion) when predicting postmeeting attitude (Steps 1 and 3), 3-way interaction coefficients: Step 1, $B = -.16$, $t(351) = -3.14$, $p < .002$; Step 3, $B = -.13$, $t(349) = -2.42$, $p < .02$, Step 3, improved model fit X^2 (df = 11, N = 361, J = 26) = 133.58, $p < .000$). These interactions indicated that males and females would have different mediation models and we decided to analyze males and females separately.

Results for Female Participants

Teacher effects. There were eleven different teachers for the 26 classes. Teacher was included as a variable because teachers can create an atmosphere which supports or discourages interest in our message. A series of dummy contrasts tested for teacher effects (each vector contrasted all of a teacher's students all of the other students, until *n*-1 teachers had been tested, cf. Sampson, Raudenbush, & Earls, 1997). To trim the number of variables, we included in the final models only teacher contrasts yielding significant effects. For females, only one teacher was included, a teacher who taught five classes of "returning students," four of which were exclusively for young mothers.

Mediation model. The mediation model for female participants is shown in Figure 2. As specified for testing mediation, in Step 1, we predicted postmeeting attitudes towards nontoxics with the Level 1 variables initial attitude (continuous) and relevance (dichotomous), and the Level 2 variables, 1 teacher contrast (returning students vs. others), presentation style (lecture/discussion), and the presentation style by relevance interaction. Three significant coefficients emerged: initial attitude, $B = .25$, robust *SE* (*RSE*) = .062, $t(244) = 3.99$, $p < .000$; the main effect for presentation style, $B = .12$, $RSE = .059$, $t(23) = 2.03$, $p < .053$; and the relevance by presentation style interaction, $B = .18$, $RSE = .049$, $t(244) = 3.62$, $p < .001$; improved model fit X^2 (df = 5, N = 250, J = 26) = 40.76, $p < .000$.

Step 2 asks whether presentation style or the presentation style by relevance interaction activates the proposed mediator, perceived group endorsement. The same predictors were entered in HLM analyses with perceived group endorsement as the outcome variable. A significant coefficient was obtained for presentation style, $B = .15$, $RSE = .072$, $t(23) = 2.08$, $p < .048$, however, the presentation style by relevance interaction was not significant, $B = .07$, $RSE = .055$, $t(244) = 1.33$, $p < .19$. Therefore, perceived group endorsement could mediate the main effect for presentation style but could not mediate the interactive effect; improved model fit X^2 (df = 5, $N = 250$, J = 26) = 21.34, $p < .001$.

In a separate Step 2 analysis, cognitive elaboration was also tested as a possible mediator, with presentation style as the single marginally significant coefficient, $B = .18$, $RSE = .111$, $t(23) = 1.66$, $p < .109$. Consistent with this weak effect, there was no improvement in model fit when the predictors were added, X^2 (df = 5, $N = 250$, J = 26) = 6.39, $p < .27$.

In Step 3, the predictors and proposed mediators were again used to predict postmeeting attitude to see whether the proposed mediators predicted the outcome, and in so doing, took variance from the significant Step 1 predictors. Results show that perceived group endorsement is a significant predictor of final attitude, $B = .43$, $RSE = .077$, $t(242) = 5.62$, $p < .000$. The Step 1 significant effect for presentation style is no longer significant, $B = .04$, $RSE = .055$, $t(23) = 0.64$, $p > .50$, and a Goodman test indicated that the presentation effect was fully mediated by perceived group endorsement, $z = 1.98$, $p < .048$, as indicated by bold lines in Figure 2 (Preacher & Leonardelli, 2007). The presentation style by relevance interaction remained (was not mediated), $B = .14$, $RSE = .043$, $t(242) = 3.12$, $p < .002$; improved model fit X^2 (df = 7, $N = 250$, J = 26) = 104.33, $p < .000$. Predicted scores for this interaction were consistent with expectations, and indicate that when relevance is low (female students do not choose or purchase products), there is a small difference between attitudes after lecture vs. discussion (4.82 vs. 4.70, respectively); when relevance is high there is a larger difference (4.54 vs. 5.14, respectively), with discussion considerably more effective than lecture at influencing attitudes.

Not unexpected, Figure 2 also shows that initial attitude remains a significant predictor of postmeeting attitude, $B = .24$, $RSE = .058$, $t(242) = 4.05$, $p < .000$. Furthermore, cognitive elaboration is significant in the final step, $B = .11$, $RSE = .045$, $t(242) = 2.45$, $p < .015$; a Goodman test indicated the path from presentation style to attitude through cognitive elaboration was not significant, $z = 1.46$, $p < .14$. Thus, although it was not related to our intervention or topic relevance, positive cognitive elaboration did predict female students' attitudes at the end of the meeting[3].

Discussion content and perceived group endorsement. As just discussed, for female students, perceived group endorsement was a significant mediator between presentation style and postmeeting attitudes. That is, the more students perceived that their friends agreed with the presentation, the more favorable their postmeeting attitudes. What happened during discussion that led female students to perceive that their peers endorsed the message? Figure 3 shows the mediation model with the basic predictors plus discussion content predicting perceived group endorsement. This model is based on a series of three OLS regression models using group-level scores (means for females in each classroom) and our index of favorable discussion content (Knowledge + Questions - Toxics praise); this analysis also included the single vector for the teacher of young mothers classes. Figure 3 shows that our group discussion index is a marginally significant mediator between presentation style (discussion/lecture) and perceived group endorsement, Step 1, $F(5, 20) = 7.34$, $p < .000$; Step 2, $F(5, 20) = 10.25$, $p < .000$; Step 3, $F(6, 19) = 7.73$, $p < .000$, Goodman $z = 1.80$, $p < .07$. The teacher contrast (returning students) was significantly related to perceived group endorsement, and this effect was partially mediated by our index of favorable discussion content, Goodman z = 1.70, $p < .09$.

Note also that initial attitude has a significant and negative relation to perceived group endorsement ($B = -.31$), and this effect is not reduced by the addition of the discussion content index ($B = -.26$). Examination of the scatterplot between initial attitude and perceived group endorsement showed that this inverse relationship reflected a tendency for female students to hold initially unfavorable attitudes but -- after the meeting -- to estimate that others held more favorable attitudes. This pattern was stronger for discussion, $r(11) = -.47$, $p < .11$, than lecture classes, $r(11) = -.14$, n.s., as would occur if students' perceptions are based on actual comments by peers.

Discussion content and quiz performance. Females' postmeeting quiz performance -- an indicator of greater knowledge and message processing -- was similar in lecture (4.66 of 7 points) and discussion (4.92), adjusted for initial attitude and teacher contrast, ANCOVA F(1, 246) = 0.87, $p > .20$, $MSE = 4.18$, partial $\eta 2 = .00$, therefore no mediation analyses were conducted. There was no relation between quiz scores and final attitude, controlling for initial attitude, partial $r(247) = .09$, $p > .20$.

Mediation Model for Male Participants

Teacher effects and statistical outliers. For males, only one teacher contrast made a significant contribution, however there were only 4 males in the class and -- as discussed previously --they were all statistical outliers (Mahalanbois distance scores >29, with next closest distance score = 14); that class was omitted from the following analyses.

Mediation Model. The model for male participants is in Figure 4 and shows that perceived group endorsement was a significant and cognitive elaboration was a marginally

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significant mediator. The predictors entered in Steps 1, 2, and 3 are the same as those entered for female participants.

In Step 1, initial attitude was a significant predictor of postmeeting attitude, as was presentation style (lecture vs. discussion), *B* = .24, *SE* = .078, *t*(102) = 3.10, *p* < .003 and *B*= .26, *SE* = .096, *t*(17) = 2.70, *p* < .016, respectively, improved model fit X^2 (df = 4, *N* = 107, J = 19) = 18.02, *p* < .002. In Step 2 predicting the proposed mediator perceived group endorsement, initial attitude yielded a significant coefficient of .24, *SE* = .076, *t*(102) = 3.20, *p* < 002, and relevance yielded a marginally significant effect, *B* = .15, *SE* = .091, *t*(102) = 1.65, *p* < .10. Neither presentation style alone, *B* = .05, *SE* = .092, *t*(17) = 0.51, *p* > .50, nor in combination with relevance, *B* = -.09, *SE* = .093, *t*(102) = -0.99, *p* > .30, was related to perceptions of group endorsement, improved model fit X^2 (df = 4, *N* = 107, J = 19) = 13.13, *p* < .01. Thus, for male participants, initial attitude met the first two criteria for mediation: It significantly predicted the outcome variable, postmeeting attitude, and significantly predicted the proposed mediator, perceived group endorsement (Figure 4).

The second proposed mediator, cognitive elaboration, yielded a marginally significant improvement in model fit, and had a single significant predictor, presentation style, *B* = .28, *SE* = .115, *t*(17) = 2.39, *p* < .029, Step 2 improved model fit X^2 (df = 4, *N* = 107, J = 19) = 8.01, *p* < .09. Thus, for males, the Step 1 presentation style to attitude path could potentially be mediated by cognitive elaboration.

In Step 3, the main effect for presentation style is significant, *B* = .20, *SE* = .092, *t*(17) = 2.22, *p* < .04, and only slightly smaller than in Step 1. Cognitive elaboration is a significant predictor of postmeeting attitude, *B* = .15, *SE* = .075, *t*(100) = 1.97, *p* < .05, and the Goodman test is marginally significant for this path, indicating partial mediation from presentation style

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through cognitive elaboration to postmeeting attitude, $z = 1.61$, $p < .108$ (Figure 4, semi-bold lines); Step 3 improved model fit X^2 (df = 6, N = 107, J = 19) = 32.33, $p < .000$.

What, if anything, mediates the significant relation between initial attitude and postmeeting attitude for males? In Step 3, predicting postmeeting attitude with the basic predictors and the 2 proposed mediators in the model, initial attitude remains a significant predictor, $B = .16$, $SE = .077$, $t(100) = 2.03$, $p < .045$; although significant, the coefficient of .16 is lower than the corresponding coefficient from Step 1. Furthermore, perceived group endorsement, the proposed mediator, yielded a significant coefficient, $B = .31$, $SE = .094$, $t(100) = 3.32$, $p < .002$, and a Goodman test indicated that for males, the pathway from initial to final attitude is partially mediated by students' perceptions the group endorsed the message, $z = 2.36$, $p < .02$ (Figure 4, bold lines).

Presentation style, discussion content and attitudes. The individual level analyses for males (Figure 4) showed that presentation style did not predict perceived group endorsement. Therefore, we had no rationale for using group scores to examine the role of favorable discussion content in students' perceptions that others endorsed the message.

Presentation style, discussion content and quiz performance. Males' postmeeeting quiz performance was higher after discussions (4.74 of 7 possible) compared to lectures (3.65), means adjusted for initial attitude, ANCOVA $F(1, 104) = 6.27$, $p < .01$, $MSE = 4.73$, partial $\eta 2 = .06$. A 3-step group-level OLS mediation analysis asked whether presentation style predicted quiz scores, and whether this effect was mediated by discussion content (i.e., whether favorable discussion led to improved quiz scores). This group level analysis included the basic predictors and students' self-reported initial knowledge about nontoxics. For males, presentation style predicted quiz scores, and this effect was fully mediated by favorable discussion content

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(Knowledge + Questions - Toxics Praise); Goodman $z = 2.33$, $p < .02$. Step 1 predicting quiz scores, $F(5, 13) = 3.63$, $p < .028$, adj. $R^2 = .42$; presentation style $B = .92$, $SE = .302$, $t(13) = 3.04$, $p < .009$; Step 2 predicting discussion content, $F(5, 13) = 4.38$, $p < .015$, adj. $R^2 = .48$; coefficient $B = 3.35$, $SE = .970$, $t(13) = 3.46$, $p < .004$; Step 3 predicting quiz scores, $F(6, 12) = 6.51$, $p < .003$, adj. $R^2 = .65$; presentation style $B = .23$, $SE = .327$, $t(12) = 0.70$, $p > .50$. These analyses show that positive comments during discussions were related to higher performance on the postmeeting quiz but do not address whether this knowledge was related to attitude change. Analyses of individual-level scores showed that quiz scores were unrelated to postmeeting attitudes, adjusted for initial attitude, $r(104) = .08$, $p > .20$.

Long-term Follow-up

Two to three weeks after our presentation, eighty-four female and thirty-five male students provided follow-up data, allowing us to ask whether students' attitudes, perceptions of group endorsement, and cognitions immediately following the presentation predicted the follow-up measures. We covaried initial attitude because it had been so influential in models of postmeeting attitudes. For females, consistent with ELM reasoning about the importance of cognitive elaboration and attitudes, we found that all three immediate postpresentation measures predicted follow-up attitudes towards nontoxics: perceived group endorsement, $r(81) = .40$; cognitive elaboration, $r(81) = .37$; and postmeeting attitude $r(81) = .57$. These variables also predicted female students' reported "reasons for trying" nontoxics in the interval between our meeting and the follow-up, supporting the importance of such intrinsic motives in behavior change, and also supporting the idea that students' behavioral intentions had been influenced during the meeting, r's(81) = .34, .19 ($p < .09$), .35; except as noted, all p's < .05. None of these variables predicted performance on the follow-up quiz questions, all r's(81) < .10, n.s.

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Despite their smaller numbers, males showed a similar pattern of correlations. For follow-up attitudes towards nontoxics, partial correlations (controlling for initial attitude) are: perceived group endorsement, $r(30) = .48$, $p < .01$, cognitive elaboration, $r(30) =.22$, $p > .20$, and postmeeting attitude $r(30) = .53$, $p < .002$. For reported "reasons for trying" nontoxics, partial correlations are: perceived group endorsement, $r(30) = .34$, $p < .06$, cognitive elaboration, $r(30) =.39$, $p < .03$, and postmeeting attitude $r(30) = .45$, $p < .01$. Unlike the females and consistent with their better quiz performance after discussion, males' follow-up quiz scores were predicted by perceived group endorsement (marginally), $r(30) = .32$, $p < .07$, and postmeeting attitude $r(30) = .42$, $p < .02$, but not cognitive elaboration, $r(30) =.22$, $p > .20$. First and second quiz performance was correlated, partial $r(30) = .42$, $p < .02$.

Discussion

Results support the view that group discussion is an effective context for persuasion, although how this played out was different for males and females. Results for females are consistent with Lewin's proposal that people hold views in accord with a social standard and are more likely to change when they perceive that others endorse a new or different standard. For female participants, the presentation style to attitude relationship was fully mediated by students' perceptions that others endorsed the message. These individual level results are complemented by group level analyses. First, the inverse relationship between initial attitude and perceptions of group opinions (Figure 3) suggests that females were influenced by peers' opinions; female students began the meeting with less positive opinions than they subsequently heard their friends expressing, and they, too, became more favorable by the meeting's end. Second, Figure 3 showed that -- at the group level -- the presentation style to perceived group endorsement relationship is partially mediated ($p < .07$) by our index of favorable discussion content. That is, the combination of comments showing positive interest in the topic (knowledge plus questions minus toxics praise) partially explained how female students came to perceive that others endorsed the message.

Consistent with Lewin's notions of group standards, these three kinds of comments are most similar to Cialdini's (2003) "descriptive norms" in that they provide behavioral information to others. By sharing knowledge, students indicated they or their families were using nontoxic products. By asking questions about how to use the products, students were signaling their interest in trying the products. And by describing why they use toxic products, students were making salient a descriptive norm, but one that favored toxic products. Thus, female students appeared to put considerable weight on their peers' opinions in forming their own views. The marginally significant mediation suggests that other aspects of the discussion also contributed to attitude change, and future research may identify those qualities. Similarly, the role of cognitive elaboration may be better understood with future research.

For females, our individual difference measure of relevance (making purchasing decisions) yielded mixed results. As expected, relevance interacted with presentation style to predict postmeeting attitude, and predicted scores indicated that when the topic was relevant, discussion was substantially more effective than lecture. This interaction was not mediated, possibly because our measure of relevance did not identify all of the participants for whom the discussion is relevant. Future research might use additional measures of personal relevance to clarify this effect, such as including people who have had negative experiences with toxic products (e.g., allergic reactions) or other issues that increase message relevance.

For male participants, presentation style had a direct relationship to attitude

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change, however, this path was not mediated by perceived group endorsement. Instead, males showed a marginally significant pattern of mediation via cognitive elaboration (Figure 4, $p < .11$); the marginally significant Goodman test could indicate a weak relationship or could be due to the small sample size and low power. The idea that males were stimulated to study and elaborate the message because of the discussion is consistent with their higher quiz grades after discussion compared to lecture, and the significant mediation of the lecture/discussion to quiz path by our index of discussion content. This pattern suggests that informational rather than normative influence was operating for male participants; they did not accept the message because others endorsed it, but they did pay more attention and think more about the material. Note that even after discussion, males' quiz scores were not higher than females' quiz scores.

That males' postmeeting quiz scores were not correlated with postmeeting attitudes is not surprising as, early on, Greenwald (1968) showed that accurate knowledge and the objective quality of cognitive elaboration are not as important as participants' subjective views of their own ideas. That is, Greenwald showed that in persuasion, what people remembered about their reaction to a presentation was more predictive of their attitudes than what the presenter had actually said or what participants could remember that the presenter had said. This does not mean that knowledge is not important, but rather that individuals do not always base attitudes on factual information.

The role of perceived group endorsement for males is more puzzling, as it appears to be unrelated to our index of discussion content. Instead, perceived group endorsement significantly mediates the initial attitude to postmeeting attitude relationship, independent of whether participants heard lecture or discussion. Perhaps when in a discussion, males focused on and remembered comments with which they agreed, or comments from students with whom they

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agreed. This path could also indicate that males interpreted others' comments to be consistent with their own views (a point discussed further under methodology, below)

The different models for males and females are consistent with meta-analyses examining sex differences in influenceability (Eagly, 1987): Females tend to be more influenced by others' opinions and males tend to resist group-based influence. However, our study did not include elements that traditionally lead to this pattern. In particular, our measures were taken anonymously and in private, whereas the meta-analyses show that females agree and males disagree when others in the group will see their opinions (see also Eagly, Wood, & Fishbaugh, 1981). Additional analyses will examine message and discussion content for more clues about the different mediation models, such as whether the presentation content was of greater initial interest to females compared to males. If there are differences in initial interest, the ability of discussion to create interest for males would be important.

It is also important to remember that for both males and females, initial attitude remained a significant predictor of postmeeting attitude, even controlling for the other variables in the equation. The durability of students' initial attitudes underscores the persistence of preexisting opinions and the difficulty of effecting any change in attitudes. Similarly, the role of the teacher in the discussion and in female students' opinions (Figure 3) should not be overlooked.

We were disappointed by the small number of students who provided follow-up data after three weeks, a reduced sample that precluded examining the long-term effects of presentation style. Our agreement with the school board had been that we would let teachers decide if they had time to collect follow-up data. The results from this small number were encouraging, and consistent with ELM ideas about depth of processing and long-term impact. For females and males, attitudes, cognitive elaboration and perceptions of group endorsement predicted follow-up

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behavioral intentions (reasons for trying nontoxics) and pronontoxic attitudes. Supporting the importance of attitudes as a repository of group processes, both males and females had particularly strong correlations between postmeeting attitudes and behavioral intentions (reasons for trying) and follow-up attitudes.

The results have implications for normative influence theories. We focused on attitude change and behavioral intentions, however, we could also focus on the characteristics of students who speak up in order to understand their motivations. If students really believe that the topic is counter-normative, why are they willing to share their knowledge and use of nontoxics? In guided group discussion, the presenter elicits participation by establishing a supportive context for message-consistent ideas while discouraging message criticism. This may be particularly effective with females in the audience, whose social role favors being communal and in harmony with the group (Eagly, 1987). If pluralistic ignorance creates fears of speaking up for fear of being a deviant (Prentice & Miller, 1996; Schroeder & Prentice, 1998), guided group discussion may overcome this reluctance and may do so particularly well for females.

The results also have implications for improving how guided group discussion is run. One issue is how to make sure knowledge and questions occur during discussion, and toxics praise does not. Toxics praise was specifically elicited by the presenter as a way to increase participation and could easily be eliminated from the discussion. However, for group members to contribute knowledge requires that they have information to share; this could be accomplished through reading assignments or provision of other information prior to the meeting. Similarly, stimulating students to ask questions requires that they be intrigued enough by the material and comfortable enough speaking up to ask for clarification. Enhancing the persuasive effects of discussion could also involve thinking of ways to encourage additional kinds of promessage

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comments. For example, in our content analyses, we measured group members' stated intentions to use nontoxic products, however such comments occurred very infrequently. Discussion's impact might be enhanced by specifically encouraging these kinds of remarks, such as asking for examples of when the group might use a particular product, how they might go about using the product, or how they could change their environment to support use of nontoxics. Similar analyses could be applied to other kinds of promessage comments. Naturally, additional research is needed to evaluate these ideas.

A number of methodological changes would allow us better to understand the processes of guided group discussion. First, it would be useful to be able to identify who speaks and connect their spoken comments with their attitudes and other measures. This would allow us to connect initial attitudes with level of endorsement during the meeting. For males in particular, it would also be useful to know what each student "heard" during the discussion. We could ask participants to summarize their discussions and compare our content ratings with their impressions of what was said. Friendship patterns among the group members could be used to estimate how much people are influenced by friends and reference group members relative to acquaintances or disliked others. Finally, we need to explore further how cognitive elaboration is involved in guided group discussion.

This project is based on a holistic model that rejects single "silver bullet" approaches to attitude and behavior change. Instead, we assume that new behaviors are embedded in larger social, environmental, economic, and policy contexts; barriers and supports for behaviors need to be identified throughout this system. For example, Brown, Werner, & Kim (2003) reviewed how U.S. public and economic policies, physical environment convenience, and social popularity all combined to support use of automobiles instead of buses (e.g., autos supported by extensive

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freeways, inexpensive and proximate parking, and negative images of transit and transit riders). In this context, providing free bus passes did little to increase transit use. However, when automobile use became difficult (congestion, lack of parking, etc.), and mass transit was made reliable and attractive in the form of light rail, people were willing to use transit and praised its convenience, affordability, social cachet and intrinsic rewards. Only when many aspects of the system were changed to increase benefits and reduce key barriers (cf. McKenzie-Mohr, 2000) did transit use achieve significant numbers.

The present project examined only a small part of this larger picture. Although it does underscore the importance of embedding persuasion in its social context, any real behavior change program would need to involve other levels of the system. For a nontoxics reduction program to be effective, we would need to change the system at broad as well as individual levels. At the social and political levels, we could address how toxic household chemicals are portrayed in advertising, continue to make salient government policies that discourage use of toxics (such as legal restrictions on using pesticides on ornamental plantings, Green, 2005), and change the prices of toxic products to cover clean up and health costs (indeed, many products currently carry a disposal surcharge). At the individual level, research should address how to sustain the attitude change over time. In this study, intrinsic interest ("reasons for trying") was related to attitude change up to three weeks after our meeting. Additional research is needed on how intrinsic interest operates to maintain new behaviors over longer periods of time. Group support might provide another avenue for sustained change. For example, Staats, Harland, and Wilke (2004) showed that groups who held monthly meetings to discuss environmental behaviors were more likely to maintain the behaviors; such follow-up and interaction might be also essential to sustain change after guided group discussion. Behavior change needs to be supported as well by the physical environment, such as by showing students how to arrange their homes and yards to make nontoxics easier to remember and easier to use. Such complex, multi-level change is difficult to effect but essential for supporting attitude and behavior change.

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Footnotes

1. Our discussion strategy differed from Lewin's (1952) in two ways. First, Lewin explicitly instructed his presenters to avoid saying "you" and to speak in general terms about potential negative consequences, whereas we emphasized personalizing the message to increase its relevance. In addition, in order to focus on perceived group endorsement, we did not ask students to make public commitments to try nontoxics (commitment manipulations have well known effects, e.g., Katzev & Johnson, 1987).

2. We thank Marilyn Nichols Hanks and Fern Nichols for helping to adapt the adult message for a teen audience.

3. Because the teacher of young mothers explained a significant amount of variance, a second series of mediation analyses was conducted omitting the young mothers and the corresponding teacher vector. The results were similar to those reported above, except the mediation path (presentation style-perceived group endorsement-postmeeting attitude) was just below significance, Goodman $z = 1.92$, $p < .055$. Therefore, the Figure 2 mediation pattern obtained for all females, although it was much stronger with the young mothers in the analyses.

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Table 1

Content analyses of class discussions

Types of comments; Average number per class period

	Presentation style	
	Lecture	Discussion
Class members praise toxics (.88)	0.1	3.2
Class shows knowledge of nontoxics (.99)	0.8	10.1
Class members ask questions (.98)	3.5	8.2

Note: Interrater reliabilities are in parentheses, $n = 26$.

Index of discussion content = knowledge + questions - toxics praise

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Table 2

Equivalency checks for individual students' knowledge and initial attitudes: Adjusted means (and standard deviations)

	Presentation style					
	Lecture			Discussion		
	Males *n* = 66	Females *n* = 141	Mean Lecture	Males *n* = 45	Females *n* = 109	Mean Disc
Knowledge/Attitude before meeting						
Know about nontoxics	1.99	2.38	2.18	2.42	2.05	2.23
	(.15)	(.11)	(.10)	(.19)	(.13)	(.11)
Initial attitude (favor nontoxics)	4.43	4.57	4.50	4.72	4.87	4.79
	(.13)	(.09)	(.08)	(.16)	(.11)	(.09)

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Notes: Adjustment is for one teacher contrast. These variables differed a priori and were controlled in subsequent analyses (knowledge and initial attitude were used as covariates to equate groups on these variables). Responses were made on 1-7 scales, and 7 corresponds to item label.

Table 3

Manipulation and equivalency checks for presenters' remarks: Adjusted means (and standard deviations)

	Presentation style	
	Lecture	Discussion
Content analyses of presenter's remarks, interrater reliability, *r*(24)		
	n = 13	*n* = 13
Rated message relevance and argument quality (.98)	21.11 (1.52)	17.59 (1.52)
Number of 70 issues covered (.99)	40.19 (1.87)	39.65 (1.87)
Number of 4 demonstrations given (.95)	3.52 (.17)	3.71 (.17)

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Table 4

Postmeeting attitudes and potential mediators as a function of presentation style and student sex: Adjusted means (and standard deviations)

	Presentation style			
	Lecture		Discussion	
Measure	Males	Females	Males	Females
Postmeeting pronontoxic attitude	4.38 (.12)	4.61 (.08)	4.72 (.14)	4.91 (.10)
Perceived group endorsement	4.44 (.11)	4.22 (.08)	4.54 (.13)	4.53 (.09)
Cognitive elaboration	0.51 (.17)	0.86 (.12)	1.03 (.21)	1.21 (.14)

Note: Adjustment is for initial attitude and the teacher contrast used in HLM analyses. Pronotoxic attitude and perceived group endorsement were measured on 7-point scales, with 7 most favorable. Cognitive elaboration is based on content analyses (positive elaboration + restating message – negative elaboration). All but four classes contained both male and female students.

Figure Captions

Figure 1. Diagrams showing possible mediators and moderators of group discussion.

Figure 2. Final HLM model showing significant mediation. Females (n = 250, 26 classes)

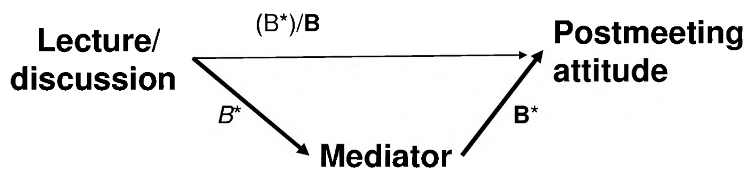
Figure 3. What aspects of discussion make a difference? (Female students, n = 26 classes)

Figure 4. Final HLM model showing significant mediation. Male participants (n = 107, j = 19 classes)

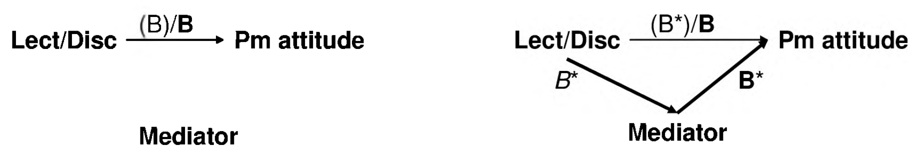
Figure 1

Diagrams showing possible mediators and moderators of group discussion.

1. Simple mediation. Discussion is more effective than lecture "because" of the mediator (individuals perceive the group endorses nontoxics; individuals positively elaborate the message).



2. Moderated mediation. Mediator operates for high relevance students but not for the others.



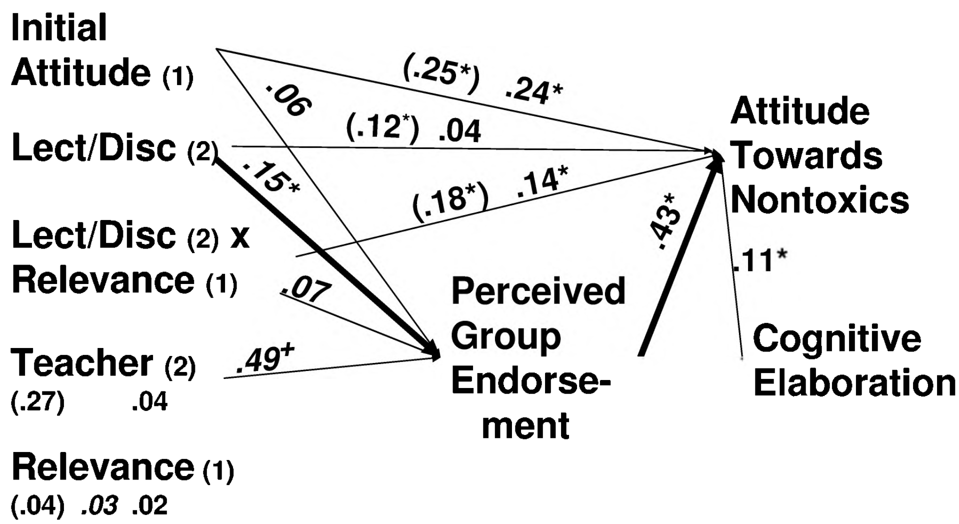
A) Low relevance: no effects
(no relation Lect/Disc to outcome)

B) High relevance: mediation
Lect/Disc has impact through mediator

Note: Step 1 (coefficients in parentheses). Something to mediate: Does treatment predict outcome? Step 2 (coefficients in italics). Does treatment predict or "activate" proposed mediator? Step 3 (coefficients in bold). Compared to Step 1, is the effect of treatment reduced in significance or eliminated when both treatment and mediator are used to predict the outcome? Significant B coefficients are indicated with *.

Figure 2

Final HLM model showing significant mediation (females students, n = 250, 26 classes)



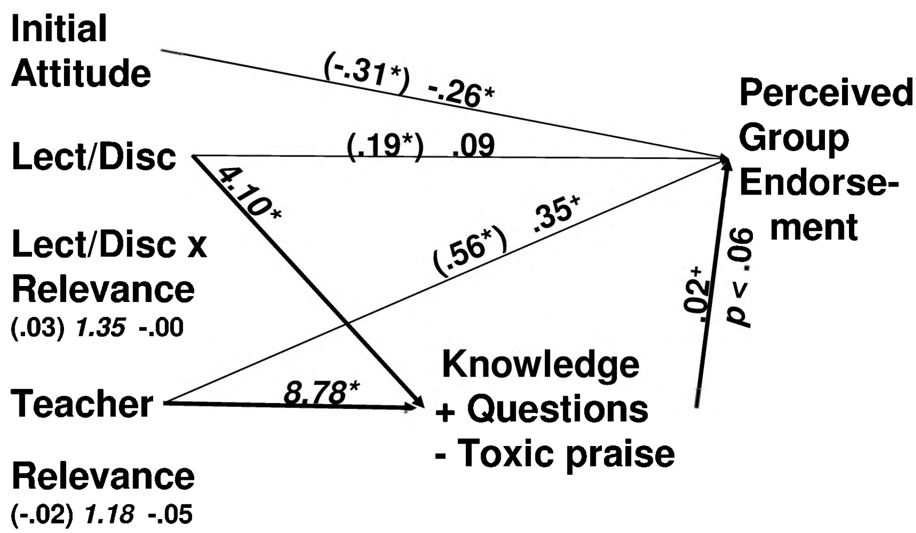
* $p < .05$ +$p < .10$

Note: Level within HLM indicated in parentheses. Coefficients in parentheses are from mediation analysis Step 1, coefficients in italics are from Step 2 predicting proposed mediator, and those in regular font are from the final equation.

Bold lines indicate significant mediation, Goodman $z = 1.98$, $p < .05$.

Figure 3.

What aspects of discussion make a difference? (Female students, $n = 26$ classes)



* $p < .05$ +$p < .10$

Note: Coefficients (Bs) in parentheses are from Step 1 in OLS mediation analysis, $F(5, 20) = 7.34$, $p < .000$, coefficients in *italics* are from Step 2 predicting the proposed mediator, $F(5, 20) = 10.25$, $p < .000$, and those in regular font are from the final equation, $F(6, 19) = 7.73$, $p < .000$. Bold lines indicate marginally significant mediation from lecture/discussion to perceived group endorsement, Goodman $z = 1.80$, $p < .07$ and marginally significant partial mediation from teacher to perceived group endorsement, Goodman $z = 1.70$, $p < .09$.

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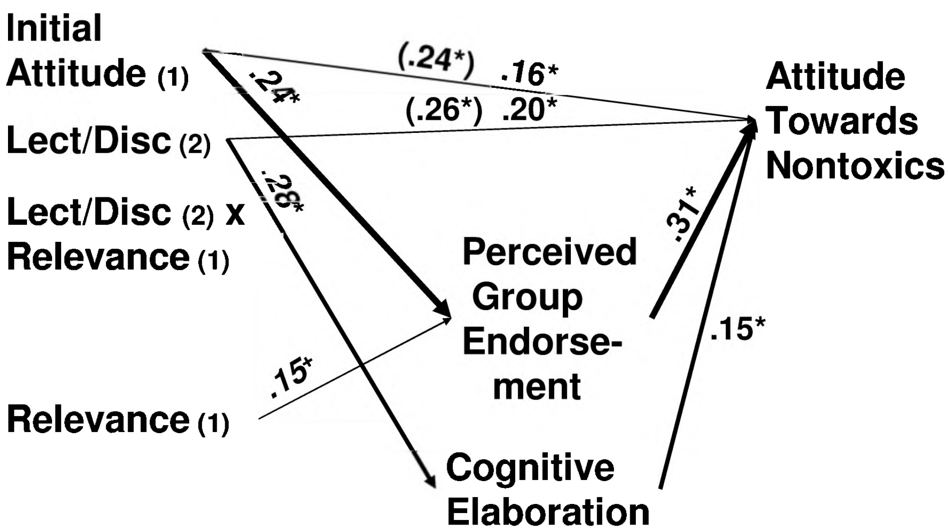
Figure 4

Final HLM model showing significant mediation. Male participants (n = 107, j = 19 classes)



* $p < .05$ $+p < .10$

Note: Level within HLM indicated in parentheses. Coefficients in parentheses are from mediation analysis Step 1, coefficients in italics are from Step 2 predicting proposed mediator, and those in regular font are from the final equation.

Bold lines indicate significant or marginally significant mediation, Goodman $z = 2.36$, $p < .02$.

For the path from Lecture/Discussion to attitude through cognitive elaboration, Goodman $z = 1.61$, $p < .108$.