The Effect of Schemas on Memory and Conjectures

David Cremins, Claire Genre, and Sebastian Cevallos

Students of Professor Burke, Pomona College

I. Abstract

Cognitive schemas have been shown to contribute to false memory effects and aid in the confirmation of stereotypes. Our interest was to what extent embedded schemas could also influence conjectures as to a fictional character's future actions. Participants (N=20) were presented with a story either taking place at Pomona or Pitzer College (distinctive and distinguished liberal art's colleges in Claremont, CA), and they later were asked questions testing their memory as well as their predictions about the protagonist's life. We expected answers to certain questions to be heavily primed and affected by the variable of which school was presented. Most (8/10) of our predictions were confirmed to some degree (average difference=26.4% for those in the expected direction). We concluded that exposure to schemas have at least a moderate effect on college student's understanding of the environment they live in, although the stereotypes in this case were not as prejudicing as in other studies.

II. Introduction

Bartlett (1932) showed through his subject's repeated reproduction of a fictional story (the famous "War of the Ghosts" tale) that memory tends to be falsely constructed and reconstructed in order to match people's pre-existing beliefs, cognitive frameworks, constructs, scripts, or, more succinctly, schemas. This effect was replicated in more controlled settings by Bergman and Roediger (1999) who confirmed that the profound interest in schematic distortions prompted by Bartlett's research— and how they relate to memory and prejudice— came from a sound basis. Over eighty years of intricate, often contradictory, research into schemas since Bartlett has resulted in a wealth of literature for us to analyze. We found two papers in particular to be clear and useful in formulating our ideas for this experiment. Vernon (1955) argued that when the natural stimuli of the world are numerous and ambiguous, what is most vital in our clean perception of reality are the simplifying schematics of our brain. Vernon also noted that it is unrealistic to expect schematic responses to be universal because they are most influenced by the individual's experience which may not agree with cultural trends. That said, Bernsten and Koppel (2013) found that a cultural (such as a Danish or Peruvian) life script holds strongly as a cognitive schema by influencing recognition and recall about a fictional character's life events and actions within that culture. Could this effect extend to our participants making guesses about the likelihood of life events and actions that fall in line with schematic life scripts? We based some of our methods for this experiment off of Shechory, Nachson, and Glicksohn (2010) who studied stereotype-driven responses among Russian and Ethiopian immigrants in Israel by presenting a fictional life story, in which the variable was the character's ethnicity, followed by a questionnaire. Shechory et al. demonstrated an interactive effect on memory from both

stereotypes primed in their story and suggestions implicit in their questions. We adopted this model of testing and combined it with an interest in the schematic script of the "cultures" of college campuses. We hypothesized that Pomona College students' schemas and stereotypes about their own school and their neighbors' would consistently influence their memory of a story taking place either at Pitzer or Pomona college and change their conjectures about the likely life of the character in that story.

III. Methods

III.a Participants— The participants for this study were selected from the Pomona College Class of 2018 (ages 18-19). The participants were friends of our research team who were approached and selected in Pomona dorm buildings. They were chosen based on their status as students who have been exposed to school stereotypes in the Claremont Consortium of undergraduate colleges, as well as by their gender. 10 females and 10 males were tested, and they were split evenly among the two variables (ie. 5 boys and 5 girls were exposed to the Pitzer College variable).

III.b Materials— Mac laptops were used to both present the subjects with stimuli and record their responses. The stimulus was a fictional story of 235 words (see Appendix) which contained 5 repetitions of either "Pitzer" or "Pomona" College. The story was designed to present a recognizable character to our college-aged participants while at the same time containing distinct details that would lead them to pay attention before we tested for memory. It also contained details stereotypically associated with Pitzer or Pomona College (e.g. we balanced, respectively, a fondness for marijuana and a tendency towards pretension) to start priming some connections between our particular story and characteristics of a student body as a whole. The dependent

variable in this experiment was participant's responses on a questionnaire containing memory and conjecture questions. These questions were designed to be responded to either neutrally or more strongly for one school over the other. We arrived at our predictions for each question due to our own impressions as students in the Claremont colleges and some fact-finding at pitzer.edu and pomona.edu.

III.c Procedure— This experiment took place in various, isolated bedrooms in the Blaisdell and Wig dorms of Pomona College. On the first day (D1), 5 boys and 5 girls from each of these dorms were asked to participate in a short, anonymous study on memory and a later follow-up survey (we purposefully left out the conjecture aspect of our research at this point so as not to distract from them just absorbing the story and school names). As stated above, the participants were divided equally by gender as to what variable school name they were exposed to. They read through the story once at a speed they felt was appropriate to retain information. Five days later (D2), the participants were presented in similar conditions with a document which reminded them once of what school name their story had contained and then 15 questions, 6 of which dealt with memory (later rated 0 and 1 for incorrect and correct answers) and 9 which dealt with their conjectures as to the fictional character's future actions rated on a likeliness scale of 1-5 (5 being highest). They completed this questionnaire, signed their initials, then were thanked and left alone.

IV. Results

Our results were not consistent in confirming our hypothesis yet still described a general trend in the direction of the responses we anticipated. 8/10 of the questions we had expectations for matched our predictions, but only half of those could be considered statistically significant with a

bar of ≈20%. To analyze our data, we separated our results into five categories: neutral memory and likeliness questions, expected Pitzer memory and likeliness questions, and expected Pomona likeliness questions. The mean averages for these results and percent increases between conditions are shown in Tables 1-5. The percentage differences were calculated for questions we had expectations for by taking the difference between the two means, dividing that difference by the smaller mean value and multiplying by 100. The answers to memory questions were coded as a 1 for a right answer and a 0 for a wrong answer. The answers to likeliness questions were coded on a scale of 1 to 5 with 5 indicating the highest likelihood. Table 1 shows subjects had fairly consistent memory about neutral memory questions (for example, averages of 0.9 for the subjects exposed to Pomona and 0.8 for those shown Pitzer in response to a question about whether the word “grandfather” was in the story signifies that 85% or 17/20 participants got this question correct). Table 2 contains one likelihood question about whether the character would study abroad that should be discounted for reasons discussed in the next section. Table 3 indicates significant differences in answers to the two memory questions we expected to lean towards the Pitzer group. For both the "intended major" and the "word 'organic'" questions, we calculated an average increase of around 55% between the Pomona and Pitzer conditions. To the expected likeliness questions (Tables 4 and 5), we received mixed answers with average differences ranging from 2.9% to 27.0% (the means corresponding with this latter value were 1.6 for Pomona and 2.1 for Pitzer in Table 4). Table 4 contains the likeliness questions expected to be answered more highly by the Pitzer group— the two questions to which we got most distinctive answers to in this table were "get in trouble with the administration" and "skip class", with positive differences of 22.2% and 27.0% respectively. Two questions from the expected

Pomona likeliness results (Table 5) went against our expectations: the character's likelihood to "share an accomplishment with peers" was virtually identical with means of 3.4 and 3.5 (2.9%) and the "speak too much in class" question went in favor of the Pitzer version of the story with a difference of 26.7% (2.6 average for Pomona and 3.4 for Pitzer). Between Tables 4 and 5, there were three questions we had expectations for which only had differences of about 10% including "engaging in environmental activism", "experimenting with hard drugs", and wearing a "button-down shirt."

V. Discussion

Our data indicated that first-year students at Pomona College have already been exposed to enough stereotypes about the Claremont Consortium they live in to significantly affect their responses to certain memory and conjecture questions, although not to the level of consistency we expected in our hypothesis. This indicates that the sample size we tested were not as swayed by schematic prejudices as were those we read about in the literature such as Bergman and Roediger's (1999) or Shechory et al.'s (2010). This failure to replicate similar studies universally in our experiment could be due to the relative lack of strong cultural scripts in the Claremont colleges or to some of the limitations of our experiment. Some of the questions were poorly designed or too ambiguous to prompt consistent results. For example, the question "How likely is Ryan to study abroad?" (Table 2) went in the favor of Pomona when in reality far more Pitzer students study abroad and exposure to that fact may have impacted some answers. This question also serves to show that it is impossible to conclude whether any correlations of responses were caused more by Pomona students' view of themselves or their, usually more negative, view of Pitzer students. For this reason, it was additionally difficult for our research team to design this

project about bias without relying too much on our own bias about what Pomona students would be likely respond, some of which inferences were disproved. Lastly, on D2 the reminder to participants about which school they had been exposed to seemed to have been often skimmed or skipped over and therefore may not have had quite the priming and recency effect we hoped for. That said, we did confirm many of our intuitions about how schemas influence memory and conjecture questions in the Claremont colleges, even without the ideal application and testing of our variables. Some respondents reported not even being consciously aware of what school the character went to on D2, yet their answers still fell relatively in line with the stereotypes for that school. Our strongest effects were with the memory questions, conforming to findings from Bartlett (1932) to Koppel and Bernsten (2013) about schematic effects on false and reconstructed memory. Specifically, participants exposed to Pitzer nearly were nearly twice as likely to conflate the word "vegan" or similar ideas in the story with the presence of "organic" and more than twice as likely to remember the major of "International Relations" because Pitzer is known for the social sciences. The most interesting (and at times ambiguous) results came from the 8 conjecture questions designed to elicit certain responses. 3/8 of the conjecture questions— wear a button-down shirt for Pomona, experiment with hard drugs, and engage in environmental activism for Pitzer— did not meet the bar of statistical significance (≈20% increase) but still tended in the direction of our hypothesis. The connotations of these questions likely were not explicit enough in either direction. The question about sharing an accomplishment with peers was answered nearly identically by both groups. Of the 4/8 conjecture questions which essentially equaled or surpassed a level of statistical significance, the one "positive" trait (double majoring) went in favor of Pomona students while the three more negative traits (getting in

trouble with the administration, skipping class, and speaking too much in class) were associated with Pitzer. Even though the speaking too much in class question went against our initial hypothesis, these four key questions speak clearly to Pomona student's schematic perception of themselves in relation to other schools. Our limited results echo Vernon (1955) by showing that when we are asked to synthesize novel and non-contextualized information in order to make inferences and predictions about the world, our minds have a tendency to resort to simplifying cognitive frameworks and cling to what we already know, such as schemas about schools.

VI. References

Bartlett, F.C. (1932). Remembering: A Study in Experimental and Social Psychology. Cambridge, England: Cambridge University Press.

Bergman, E. T., & Roediger, H. I. (1999). Can Bartlett's repeated reproduction experiments be replicated?. Memory & Cognition, 27(6), 937-947. doi:10.3758/BF03201224

Bernsten, D., & Koppel, J. (2013). The cultural life script as cognitive schema. Memory, 22, 949-971. doi: 10.1080/09658211.2013.859269

Shechory, M., Nachson, I., & Glicksohn J. (2010). Effects of Stereotypes and Suggestion on Memory. International Journal of Offender Therapy and Comparative Criminology, 54(1), 113-130. doi: 10.1177/0306624X08322217

Vernon, M. D. (1955). The functions of schemata in perceiving. Psychological Review, 62(3), 180-192. doi: 10.1037/h0042425

VII. Tables

Note: In these tables, when an answer is listed as "expected" for a certain school that means we anticipated the mean response would be a bigger number for that variable. All of these

expectations were met except for the second and third question in Table 5. In addition, the questions in these tables are not in the order that they were originally presented to the participants.

Table 1. Neutral Memory Questions

Question	Condition*	
	Pomona	Pitzer
Was the word “grandfather” in the story?	0.9	0.8
How many hours of sleep does Ryan get on average?**	0.3	0.7
Is Ryan involved with his school orchestra?	0.4	0.6
Is Ryan part of the student government?	0.7	0.7

*The number shown is the mean average of 20 participants, who were either given a 1 if correct or 0 if incorrect.
** This is a poorly designed question because the participants could have gotten it wrong either high or low. The difference of .3 to .7 should not be considered significant.

Table 2. Neutral Likeliness Question

Question	Condition*	
How likely is Ryan to:	Pomona	Pitzer
Study Abroad	3.7	3.1

*The number shown is the mean average of 20 participants, who were asked to rate the likeliness of Ryan’s actions on a scale of 1 (low) to 5 (high).

Table 3. Expected Pitzer Memory Questions

Question	Condition*		% Difference
	Pomona	Pitzer	
Is Ryan’s intended major International Relations?	0.5	0.9	57.1
Was the word “organic” in the story?	0.4	0.7	54.6

*The number shown is the mean average of 20 participants, who were either given a 1 if correct or 0 if incorrect.

Table 4. Expected Pitzer Likeliness Questions

Question	Condition*		% Difference
How likely is Ryan to:	Pomona	Pitzer	
Get in trouble with the administration	1.6	2.0	22.2
Engage in environmental activism	2.8	3.1	10.2
Experiment with hard drugs	2.6	2.9	10.9
Skip class	1.6	2.1	27.0

*The number shown is the mean average of 20 participants, who were asked to rate the likeliness of Ryan's actions on a scale of 1 (low) to 5 (high).

Table 5. Expected Pomona Likeliness Questions

Question	Condition*		% Difference
How likely is Ryan to:	Pomona	Pitzer	
Double major	2.8	2.3	19.6
Speak too much in class	2.6	3.4	26.7
Share an accomplishment with peers	3.4	3.5	2.9
Wear a button-down shirt	3.4	3.1	9.2

*The number shown is the mean average of 20 participants, who were asked to rate the likeliness of Ryan's actions on a scale of 1 (low) to 5 (high).

VIII. Appendix: The Story

Please pay close to attention to the following short story about Ryan Evans, a sophomore student at [Pitzer/Pomona] College.

Ryan came to [Pitzer/Pomona] at the age of eighteen from his hometown in Fairview, Illinois. He left behind a loving household which included his younger sister, parents, and grandmother.

Upon arriving at [Pitzer/Pomona], Ryan quickly became involved in a number of activities such as student government, a charity club, and the jazz band. He is still at least somewhat involved in each of these, although as his course load has gotten more serious he has had less time to stay

active in extracurriculars. Ryan loves his classes though, and he feels especially passionate about International Relations, which he hopes to major in at [Pitzer/Pomona.]

Ryan would describe himself as a pretty normal guy who did well in high school— but not exceptionally. People who don't know Ryan view him as a little bit pretentious. He does think he has some quirks (and a great sense of style), but at a place like [Pitzer/Pomona] that is to be expected. Ryan's friends would describe him as a chill, funny guy with a fondness for marijuana.

On an average day, Ryan sleeps between six and seven hours, studies for at least two hours, and eats at least two meals in the dining halls. His favorite foods are kale salad, vegan waffles, and mint chocolate chip ice cream.

The End.