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Evaluating an Engineering Overview Brochure for Educational Outreach to Elementary Schools

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Outline of Presentation

- Background
  - Engineering outreach to K-12
  - Variety of media in engineering outreach
  - Hierarchy of effects model
- Current experiment
  - Overview of brochure design
  - Method
  - Results
- Conclusions & Implications

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Engineering Outreach to K-12

- US students show little interest in engineering studies
- Wide range of engineering K-12 outreach strategies
  - Integrate engineering into K-12 classroom
  - School visits by engineers, field-trips to engineers
  - After-school clubs, summer camps

Media in Engineering K-12 Outreach

- Computer-based presentation and interactions
- Hands-on activities
- Printed recruitment materials
  - Brochures
  - Flyers
  - Postcards
  - Handed out during outreach events/activities or mailed to students or schools

Hierarchy of Effects Model

- Dominant theoretical model concerning goals of advertisement materials: Steps:
  - 1) awareness of the product/brand
  - 2) knowledge of what it has to offer
  - 3) positive perceptions
  - 4) preference above other options
  - 5) desire to purchase
  - 6) purchase
- Primary functions of advertising:
  - cognitive functions, ideas and information (steps 1 & 2)
  - affective functions, attitudes and feelings (steps 3 & 4)
  - conative functions, consumer action (steps 5 & 6).

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Design of Brochure

- Collaboration with communications professionals in Ira A. Fulton Schools of Engineering at Arizona State Univ.
- Iterative process, our team of psychologists, educators, and engineers provided feedback, 7 iterations
- Brochure introduced 10 engineering fields

Excerpt from Brochure

Method

- Participants: 100 4th grade students (56% Hispanic, 13% Other, 11% Native American, 10% White, 8% African American)
- Procedure
  - Pre-survey
  - Brochure study (7 minutes)
  - Post-survey

Survey

- 1) Rej. gender stereot., Cronbach α = .74
- 2) Neg. eng. stereotypes, α = .75
- 3) Self-efficacy, α = .76
- 4) Interest, α = .77
- 5) Utility, α = .68
- Total of 15 items, three per construct
- Post-survey: 3 addl. items for "brochure liking"

	Pre-survey (N = 100) M (SD)	Post-survey M (SD)
Rejection of gender stereotypes	3.96 (0.71)	4.24 (0.77)
Neg. stereotypes of engineering	2.60 (0.74)	2.38 (0.70)
Self-efficacy	3.24 (0.87)	3.72 (0.89)
Interest	3.39 (0.95)	3.89 (0.92)
Utility	3.45 (0.80)	3.95 (0.77)

Results cont'd

- Significant pre- to post-survey improvements:
  - Rej. gender stereo, $t(99) = 4.55$, $p < .001$
  - Neg. eng. stereoty., $t(99) = 3.57$, $p = .001$
  - Self-efficacy, $t(99) = 5.28$, $p < .001$
  - Interest, $t(99) = 5.30$, $p < .001$
  - Utility, $t(99) = 6.47$, $p < .001$
- Brochure liking, $M = 4.20$ [out of 5], $SD = 0.83$)

Discussion, Conclusions

- Short exposure to print brochure had a significant positive impact on student perceptions toward engineering
- Expensive outreach activities, such as departmental open houses, summer camps, and mentorship programs, may be easily supplemented using low-cost print recruiting materials

Discussion, Conclusions 2

- Displaying a diverse set of students in brochure may improve the perception of the brochure due to the similarity-attraction effect
- Generally, students prefer to learn from agents that are similar to the students in external characteristics, such as age, gender, and ethnicity
- Limitations:
  - No control conditions without a brochure - > compare pre-post-survey surveys without exposure to brochure
  - Specific population (4^{th} graders, SW US) - > test in variety of K-12 grade levels and locations