Guiding Oral Conversations: How to Nudge Users Towards Asking Questions?

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What questions can you ask a voice assistant?

I have many role models. In March, let’s celebrate women in particular!
Just ask, "Alexa, who is your female role model?"

WEEKLY SPOTLIGHT

- "Alexa, play the GameStar Podcast on Amazon Music"
  With Amazon Music you have from 3.-16. March the chance to win one of 50 PlayStation packages. Eligibility requirements and learn more.
- "Alexa, surprise me!"
  Try what happens when you let me surprise you!
- "Alexa, what is celebrated on International Women’s Day?"

TO TRY

- "Alexa, play the ‘Centerpiece’ playlist"
- "Alexa, set a timer for 5 minutes"
- "Alexa, how will the weather be this weekend?"
- "Alexa, how long was Neil Armstrong on the moon?"
- "Alexa, connect my phone"
- "Alexa, how is the dog doing?"
- "Alexa, add toothpaste to my shopping list"
  Before you forget, put it on your shopping list. More on that.
What questions can you ask a voice assistant?

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What you can ask Google Assistant

You can ask Google Assistant for info and for help with everyday tasks.

Important: Some queries won't work on all devices and in all languages.

For ideas about what Google Assistant can help with, ask "What can you do?"

What Google Assistant can do

Get local info
- Weather: What's the weather today?
- Food: Find pizza restaurants nearby.
- Business hours: Is Walgreens still open?
- Navigation: Navigate home.

Plan your day
- Traffic: How's the traffic to work?
- Reminders: Remind me to do laundry this evening. Remind me to call Mom every Sunday.
- Calendar events: When's my first meeting today? Add a meeting to my calendar.
- Flights: Is United flight 1463 on time?

Ask Google
- Game updates: Who won the Warriors game?
- Calculations: What's 20% of 80?
- Dictionary: What does "gregarious" mean?
- Translations: How do I say "Nice to meet you" in French?
- Finance: How's the S&P 500 doing?
- Unit conversions: How many kilometers in a mile?
- Search: Search for summer vacation ideas.
- Image search: Find pictures of kittens.
- Web answer: How do you remove wine stains from a rug?

Play media
- Music: Play some Jazz music.
- Podcasts: Play the latest episode from This American Life.
- News: Play the news. What's the latest news from BBC?
What questions can you ask a voice assistant?

<table>
<thead>
<tr>
<th>Category</th>
<th>Example Questions</th>
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<tbody>
<tr>
<td>Music and Podcasts</td>
<td>Hey Siri, play something I can dance to</td>
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<tr>
<td>Smart Home</td>
<td>Hey Siri, turn the patio lights off in an hour</td>
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<td>Everyday Tasks</td>
<td>Hey Siri, split a $213 check three ways</td>
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<td>Sports</td>
<td>Hey Siri, what schools are in the Big Ten?</td>
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<td>Knowledge and Answers</td>
<td>Hey Siri, what causes a rainbow?</td>
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<td>Hey Siri, Apple Pay $75 to Phillip</td>
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<td>Calls and Texts</td>
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<td>TV and Movies</td>
<td>Hey Siri, who’s playing baseball tonight?</td>
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<td>Hey Siri, turn on subtitles</td>
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<td>Sports</td>
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<td>Smart Home</td>
<td>Hey Siri, play a song I like in the kitchen</td>
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<td>Hey Siri, find movies starring Anne Hathaway</td>
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- "Alexa, how long was Neil Armstrong on the moon?"
- "Alexa, connect my phone"
- "Alexa, how is the dog doing?"
- "Alexa, add toothpaste to my shopping list"

*Before you forget, put it on your shopping list.* More on that later.
What questions can you ask a voice assistant?

How about highlighting topics a question can be asked about?
What questions can you ask a voice assistant?

How about highlighting topics a question can be asked about?

→ How can we do that in a voice assistant setting?
Nudging Example
Nudge a user towards asking about “Bauhaus School”

“Walter Adolph Georg Gropius was a German-American architect and founder of the Bauhaus School, who is widely regarded as one of the pioneering masters of modernist architecture.”
Nudging Example
Nudge a user towards asking about “Bauhaus School”

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“What else do you want to know about the Bauhaus School?”
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Nudging Techniques
Nudge a user towards asking about “Bauhaus School”

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“Walter Adolph Georg Gropius was a German-American architect and founder of the **Bauhaus School**, who is widely regarded as one of the pioneering masters of modernist architecture.”
Nudging Techniques
Nudge a user towards asking about “Bauhaus School”

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Nudging Techniques
Nudge a user towards asking about “Bauhaus School”

“Walter Adolph Georg Gropius was a German-American architect and founder of the <reverb> Bauhaus School </reverb>, who is widely regarded as one of the pioneering masters of modernist architecture.”
Research Questions

**RQ1**  How effective are these nudging techniques?

**RQ2**  Does nudging make it easier for the user to ask a question?

**RQ3**  Does nudging affect the perceived naturalness of the speech?
Research Questions

RQ1  How effective are these nudging techniques?

RQ2  Does nudging make it easier for the user to ask a question?

RQ3  Does nudging affect the perceived naturalness of the speech?

Crowdsourcing Study
on Amazon’s Mechanical Turk

Task: While or after listening to an audio snippet, ask the first question that comes to your mind.
**Instructions**

- This HIT requires solid proficiency in American English.
- Use headphones and ensure a quiet environment: return the HIT if you cannot comprehend the audio snippets!
- When listening to the snippets, your focus should be on naming the first question that comes to your mind.
- Directly start typing the question as soon as you have one. Imagine you would interrupt the speaker to ask it.
- Avoid replaying a snippet. Only replay if you got distracted.
Study Design

Argumentation
For a political decision inform yourself about the pro and con arguments on UBI

Museum
Learn about the history of the Bauhaus in a museum exhibition.

Product Comparison
Compare products within a given category to make the best possible buying decision.

Photos: pexels.com
A study configuration for a participant consists of ten audio snippets...

- ... in the context of one scenario

- ... to which one random nudging technique is applied

- ... with one of three random nudging targets per snippet

> “Walter Adolph Georg Gropius was a German-American architect and founder of the Bauhaus School, who is widely regarded as one of the pioneering masters of modernist architecture.”
Study Design

1. Read Instructions
2. Read Scenario Description
3. Listen to Audio Snippet
4. Ask a Question
5. Fill out Questionnaire

10x
Study Design

- Read Instructions
- Read Scenario Description
- Listen to Audio Snippet
- Ask a Question
- Fill out Questionnaire

- Mental demand
- Temporal demand
- Performance
- Effort
- Frustration
- Physical demand

- Curiosity
- Snippet clarity
- Snippet naturalness

NASA Task Load Index
[Hart, 2006]

Additional questions
Study Results

Statistics:

- 9,650 collected questions
- 965 participants

<table>
<thead>
<tr>
<th>Questions</th>
<th>Questions about targets</th>
</tr>
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<tbody>
<tr>
<td>none</td>
<td>one</td>
</tr>
<tr>
<td>8,376</td>
<td>4,340</td>
</tr>
<tr>
<td>52%</td>
<td>44%</td>
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Number of non-discard questions and their proportions asking about none, one, two or all three defined targets.
### Study Results

**RQ1: Effectiveness?**

Relative frequency of questions about the nudged target \( n = 8,376 \)

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**RQ1:**
Study Results
RQ1: Effectiveness?

Relative frequency of questions about the nudged target ($n = 8,376$)

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RQ1: Explicit (~50%)
## Study Results

**RQ1: Effectiveness?**

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**RQ1**: Explicit (~50%) > Linguistic (~22%)
## Study Results

**RQ1: Effectiveness?**

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**RQ1**: Explicit (~50%) > Linguistic (~22%) > Natural (~18%)
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RQ1: Effectiveness?

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**RQ1: Effectiveness?**

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**RQ1**: Explicit (~50%) > Linguistic (~22%) > Natural (~18%) > Artificial (~15%)

The effectiveness of nudging depends on the scenario.
Study Results

RQ2: Nudging makes asking questions easy?

The diagram shows the results for Mental d., Temporal d., Performance, Effort, Frustration, and TLX ratings across different nudging techniques: Explicit, Repetition, Last, Ensemble, Breaks, and Reverb. The y-axis represents the rating scale from 0 to 60.
Study Results

RQ3: Effect of nudging on naturalness of speech?

[Bar chart showing the effect of nudging on naturalness and clarity ratings.]

- Explicit
- Repetition
- Last
- Ensemble
- Breaks
- Reverb

Naturalness Clarity rating

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Conclusion

We conducted a large-scale online study...

- ... with 965 participants
- ... which compares six nudging techniques
- ... in three scenarios

Study findings:

- **RQ1**: All techniques have a certain nudging effect
  explicit (50%) > linguistic (22%) > natural (18%) > artificial (15%)

- **RQ2**: No significant influence on task load
  repetition raises frustration and lowers satisfaction with performance

- **RQ3**: Low impact of nudging on naturalness of speech
  artificial emphasis affects the naturalness and clarity the most
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- **RQ3**: Low impact of nudging on naturalness of speech
  - artificial emphasis affects the naturalness and clarity the most

Code and Data:

https://webis.de/data/webis-nudged-questions-23.html

Thank you!