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Domain Distance as a Criterion for Selecting Instructional Analogies in Psychology

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Abstract

The present research examined whether domain distance constitutes a useful criterion for selecting instructional analogies for psychological concepts. In Experiment 1, Psychology students and instructors rated interdomain analogies as more instructionally useful than intradomain analogies. Instructors' justifications suggested that this advantage stems from a higher perceived clarity and validity rather than from a higher familiarity. To explore the extent to which these ratings and justifications translate into learning outcomes, Experiment 2 assessed whether the comprehension elicited by both kinds of analogies surpasses that of a control condition receiving the literal, non-analogical explanations. While interdomain analogies boosted objective comprehension compared to the non-analogical control, intradomain analogies did not. These findings suggest that domain distance constitutes a more broadly applicable criterion than recipient familiarity for selecting instructional analogies, particularly in abstract domains such as psychology, where intradomain base analogs tend to be as abstract as their targets.

Keywords: analogy; instruction; psychology, semantic distance.

Introduction

Instructional analogies are profusely employed across a broad spectrum of disciplines and levels of education (Richland et al., 2015), as they allow learners to increase their comprehension of a novel topic (target analog) based on structurally similar situations (base analogs) that are better known or easier to mentally represent. On the basis of an initial set of correspondences between elements playing parallel roles in the base and the target, the reasoner can tentatively project base elements that did not find a counterpart in the target, thus enhancing its representation.

Analogies are especially important for teaching abstract disciplines that, as in the case of psychology, involve theoretical constructs that are not directly observable. As an example, consider early accounts of the “cocktail-party effect” wherein a listener can attend to what one person says without being distracted by the simultaneous verbal output of

other individuals. As the cognitive mechanisms involved in “early selection” models of attention are difficult for students to visualize, an instructor might compare the role of attentional mechanisms to a physical sieve that selectively allows only particles of a certain shape or size to pass through. By establishing correspondences between the physical properties of the objects (e.g., shape and size) and the physical properties of sensory stimuli (e.g., pitch or loudness), the student can project the causal mechanism of “selection before identification” onto the mental process. This mapping helps students understand an elusive cognitive theory through a more concrete mental representation, thus enhancing the learner’s comprehension of the phenomenon.

Drawing on results from basic research, several contributions in the field of education have compiled guidelines for optimizing the use of instructional analogies (Glynn, 1991; Duit, 1991; Erikson et al., 2024; Gray & Holyoak, 2021; see Harrison & Treagust, 2006 for reviews). A frequent recommendation prescribes the use of visual representations where similar colors and visual localizations facilitate the mapping between base and target elements playing parallel roles (e.g., the nucleus of a cell and the recipes in a kitchen).

With respect to the analogical inferences that follow from the prior establishment of correspondences, it is recommended that instructors not only make explicit those inferences that hold in the target domain, but also explicitly disconfirm those inferences that students might automatically generate but which do *not* hold in the target situation, as these could give rise to misconceptions derived from the analogy. Continuing with the attentional filter analogy, an instructor should clarify that, unlike a physical sieve where the particles that fail to pass through the mesh remain on its surface, cognitive stimuli do not “pile up” at a barrier. While stones on a sieve can be retrieved later, unselected information in the rigid filter model decays rapidly in the sensory register.

Although the most immediate objective of an instructional analogy is to export explanatory structures from the base analog to the target analog, a longer-term goal is for students to recognize future situations that could also be explained or represented by means of the same set of underlying structures. To facilitate the reactivation of the target analog in future analogous situations, it is often recommended that students explicitly extract the generic features common to both analogs, thereby enabling the construction of abstract schemas (e.g., Gick & Holyoak, 1983; Gentner et al., 2003; Kurtz et al., 2001; see Trench & Minervino, 2020 for a review).

In contrast to the extensive attention given to alternative ways of *presenting* a given analogy, comparatively little research has examined *which* base analogs should be presented. The default recommendation is that instructors should choose base analogs that are sufficiently familiar to students (e.g., Harrison & Coll, 2008). While intuitively compelling, this advice is often impractical—if not impossible—to implement. Assessing recipients' familiarity with the base situation is especially challenging when the analogy is communicated to a large group rather than in-person, synchronous setting. Focusing on the use of analogies to explain psychological content, the present study sought to identify parameters that could guide the selection of base analogs in ways that are more broadly implementable.

In research on analogical reasoning, a central dimension concerns whether the base and target situations belong to the same domain (intradomain analogies) or to different domains (interdomain analogies). For example, consider an instructional target whereby addressing the surface beliefs associated with a phobia without unveiling its underlying causes leads to the emergence of new fears. An intradomain analogy would compare this situation to the individual-level treatment of pathological symptoms within a dysfunctional family without changing the parents' interactional pattern that underlies this behavior. In contrast, an interdomain analogy might compare the phenomenon to the appearance of damp patches on a wall, where drying the surface without fixing the internal pipe leak inevitably results in new moisture stains elsewhere.

If the target analog is sufficiently concrete, an intradomain base analog may offer several advantages. Because the elements of the target situation are perceptually similar to those of the base situation, the establishment of the intended correspondences may be more transparent, reducing the need for extensive scaffolding (Gentner et al., 2007; Jee et al., 2010). Furthermore, this domain proximity makes it less likely that learners, while understanding the parallelism between both situations, will ultimately reject the possibility that the underlying structures of the base analog legitimately apply to the target scenario (Clement, 1993). Domain similarity, however, may hinder the intended mapping when the base element with which a target element must be matched competes with semantically more similar base elements that play mismatching roles (i.e., *cross-mappings*, Ross, 1989). When the target situation is more abstract, as it is often the case with psychological constructs, intradomain base analogs

will likely be abstract as well, rendering their representations and their analogical correspondences more difficult to visualize. In these cases, interdomain analogies drawn to concrete base analogs may facilitate their mental representation. Another potential drawback of intradomain analogies is that they presuppose a level of familiarity with the target domain that novice learners do not yet possess: while advanced students may adequately grasp other cases within the target discipline, beginners will likely lack this background knowledge.

Considering domain distance as a variable more readily accessible to instructors than students' prior knowledge of a base situation, Experiment 1 aimed to assess the impact of this dimension on the perceived usefulness of analogies among psychology instructors and students. Given that instructors occupy a dual role as both selectors of analogical materials and interpreters of their explanatory potential, their judgments of perceived usefulness become especially informative. With regard to students, while their subjective perception of instructional usefulness does not guarantee learning gains, it plays a crucial role in whether analogies are attended to, accepted, and integrated, making it a necessary condition for instructional effectiveness. In addition to replicating the higher ratings granted to interdomain analogies, Experiment 2 sought to determine the extent to which intradomain and interdomain analogies yield measurable gains in objective comprehension of the target psychological phenomena, compared to a standard condition in which the literal explanations are not accompanied by analogical scaffolding.

Experiment 1

Method

Participants and Design A total of 120 participants volunteered to take part in the experiment. The sample of psychology instructors ($N = 60$, $M_{Age} = 41.85$, $SD = 12.39$, 57% female) comprised participants who were either currently teaching or had taught, within the past five years, psychology courses at middle-school level (6.67%), undergraduate level (96.67%) and/or graduate level (63.33%). The sample of students ($N = 60$, $M_{Age} = 25.67$, $SD = 10.34$, 78.33% female) consisted of first-year psychology students who had not yet completed any other psychology course in their undergraduate program. Domain distance of the instructional analogies (two levels: intradomain vs. interdomain) was manipulated within subjects. The dependent variable was the perceived instructional usefulness of the presented analogies.

Materials To approximate situations in which instructors must decide between intradomain and interdomain analogies, we selected four psychological phenomena that are often covered in introductory courses of psychology, and which could plausibly be explained using either type of analogy. The selected phenomena were: (1) “early selection” models of selective attention, (2) deep versus superficial treatment of phobias, (3) common failure to recall known names (“tip of the tongue” phenomenon) and (4) bottom-up processing in word comprehension.

Table 1: Sample instructional analogies, Experiments 1 and 2

When attempting to reverse an irrational behavior—such as avoiding things that feel dangerous but are not—, a common approach is to reduce the anxiety these elements evoke by replacing the person’s initial beliefs with more realistic estimates of the actual danger posed by those objects. Although this strategy is sometimes successful, failing to uncover the unconscious, underlying causes that originally motivated the avoidance often leads those hidden causes to manifest shortly afterward as fears of a new element that previously did not trigger them.

Intradomain condition: One way to explain this phenomenon to non-experts would be to compare the reemergence of fears with what happens in the development of pathological behaviors within dysfunctional families. When a child displays a recurrent pathological behavior without any apparent explanation, it is often the case that such behavior interrupts escalating cycles of violence between parents whose outcome may be potentially dangerous. Although “individual” psychological therapy may sometimes reduce the occurrence of this behavior, the fact that the parents’ interactional pattern remains unchanged tends to result, shortly thereafter, in the same child—or other children in the family—developing pathologic behaviors different from the original one.

Interdomain condition: One way to explain this phenomenon to non-experts would be to compare the reemergence of fears with what happens in the appearance of damp patches on floors and walls. When moisture stains appear on a floor or wall, they often originate from leaks in pipes or drains that create a steady flow of moisture into the structure. Although the external surface of the affected wall can sometimes be dried by isolating it from the interior, failing to address the actual source of the moisture typically leads, after a short time, to the appearance of new damp spots in places different from the original stain.

Indicate the extent to which you think this analogy would be effective in helping students understand why, when beliefs that justify an irrational fear are challenged, new irrational fears associated with different elements tend to emerge shortly afterward.

By way of example, a standard explanation for failures to recall proper names appeals to the blocking effect of successfully activated, phonologically similar lexical items. In the intradomain analogy, this phenomenon was compared to what occurs when attention to a verbal source is disrupted by the simultaneous presence of competing verbal input. In the interdomain analogy, it was compared to failures to tune into an intended radio station due to interference from FM signals transmitted at similar frequencies. For each of the selected phenomena, participants were first presented with the target phenomenon and its literal explanation. After reading this passage, the instructional analogy was presented. Table 1 displays a complete target phenomenon, with its associated analogies and rating task¹.

Procedure The study was administered online via Google Forms. After electronically signing an informed consent, participants in the experimental group read a brief

introductory text on the use of analogies in instruction. After reading this text, they received each of the four psychological phenomena explained through an analogy. For each phenomenon, participants were asked to (1) rate, on a 5-point Likert scale (1 = not useful at all; 5 = very useful), the extent to which they believed the analogy would be effective for explaining the phenomenon to students, and (2) briefly justify the rating they provided. Half of the participants received intradomain analogies for Phenomena 1 and 3 and interdomain analogies for Phenomena 2 and 4, whereas the other half received the complementary pattern.

Results and Discussion

Figure 1 displays the ratings of instructional effectiveness granted to intradomain and interdomain analogies by psychology instructors and students. To analyze the effects of participant type and domain distance on the perceived adequacy of instructional analogies we conducted a 2 x 2 mixed effects ANOVA with participants (instructors vs students) as between-subjects factor and domain distance (intradomain vs. interdomain) as within-subjects factor. The analysis revealed main effects of type of participants, $F(1, 118) = 17.5$, $p < .001$, $\eta^2 = .129$, and of domain distance $F(1, 118) = 29.7$, $p < .001$, $\eta^2 = .201$, but not a significant interaction between both factors $F(1, 118) = .167$, $p = .683$, $\eta^2 = .001$. Planned comparisons revealed that the scores produced by students were higher than those produced by instructors both for interdomain analogies $M = 3.98$, $SD = .89$, vs. $M = 3.5$, $SD = 1.07$, $t(118) = 2.644$, $p = .009$, and for intradomain analogies $M = 3.36$, $SD = .97$ vs. $M = 2.78$, $SD = .90$, $t(118) = 3.367$, $p = .001$. With regards to our main variable of interest, planned comparisons using paired-samples t-tests revealed that interdomain analogies were rated as more useful than intradomain analogies both by instructors, $M = 3.5$, $SD = 1.07$, vs. $M = 2.78$, $SD = .90$, $t(59) = 4.02$, $p < .001$, cohen’s $d = .52$, and by students, $M = 3.98$, $SD = 0.89$, vs. $M = 3.36$, $SD = .97$, $t(59) = 3.68$, $p = .001$, cohen’s $d = .47$.

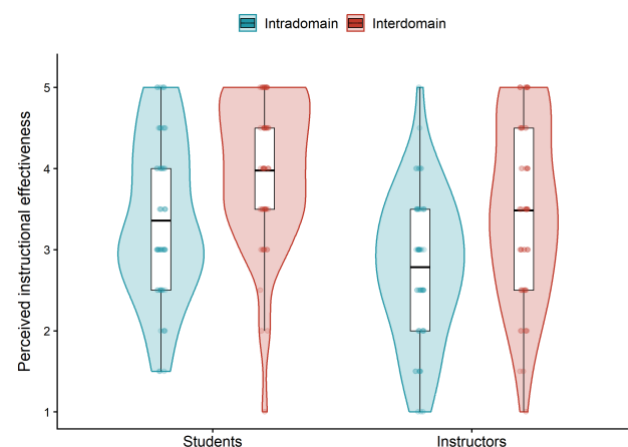


Figure 1: Usefulness scores granted by students and instructors to intra and interdomain analogies.

¹ All materials and data are available at <https://osf.io/jkb7d>

Participants' written justifications were classified into four non-exclusive categories that emerged from a qualitative analysis of the responses. Responses were classified within the category "familiarity" whenever they alluded, either positively or negatively, to the extent to which the base domain of the analogy was known by the recipients of the analogy. They were classified under the category "clarity" whenever they alluded, either positively or negatively, to the extent to which the parallel between the target situation and the analogous case was understandable. Finally, responses were classified within the "validity" category whenever they made reference to the veracity of the base situation, or the extent to which the base and target situations were in fact comparable. All responses not alluding to any of the above dimensions were sorted into the "other" category. Table 2 summarizes instructors' and students' justifications for the scores assigned to intra and interdomain analogies.

Consistent with their effectiveness ratings, instructor's justifications referring to a lack of *clarity* were more frequent among intradomain than among interdomain analogies, (38.33% vs. 23.33%), $t(59) = 3.03, p = .004$, with positive references to clarity being only numerically more frequent for interdomain than for intradomain analogies, (20.83% vs. 12.50%), $t(59) = -1.52, p = .133$. A plausible interpretation of this difference may be that instructors make frequent mention of the lack of clarity of intradomain analogies based on the consideration that psychological base analogs are, just as the psychological targets, relatively abstract as compared to interdomain analogs.

Also consistent with instructors' subjective ratings of effectiveness, references to a lack of *validity* among their justifications were more frequent for intradomain than for interdomain analogies (30.83% vs. 7.50%), $t(59) = 4.34, p < .001$, with positive references being more frequent for interdomain than for intradomain analogies (28.33% vs. 10.83%), $t(59) = -3.49, p < .001$. A likely explanation for this result could be that task demands might have encouraged instructors to capitalize on their comparatively higher knowledge of the psychological domain for scrutinizing the relation between two psychological phenomena in a more stringent manner than between the target phenomenon and a distant analog with which they were barely familiar.

In contrast to spontaneous references to clarity and validity, instructors' justifications making reference to a lack of *familiarity* were more frequent among interdomain than among intradomain analogies (34.17% vs. 12.50%), $t(59) = -4.14, p < .001$, with positive references to familiarity not differing across conditions, $t(59) = -0.21, p = .837$. One possible explanation for these results is that instructors had intuitively represented their hypothetical audience of students as possessing a rather advanced prior knowledge about psychological phenomena at large. Albeit less charitable, another possibility is that—akin to Olguin et al.'s (2017) results with a non-expert population—, instructors were inconveniently employing their own prior knowledge of the target domain as a proxy for that of their students.

Table 2: Mean percentages of positive and negative references to features of the analogies among participants' justifications

	Intradomain analogies		Interdomain analogies	
	negative	positive	negative	positive
Clarity				
students	27%	37%	18%	44%
instructors	38%	13%	23%	21%
Familiarity				
students	3%	13%	17%	15%
instructors	13%	9%	34%	10%
Validity				
students	14%	33%	5%	36%
instructors	31%	11%	8%	28%

Students' justifications revealed a somewhat more balanced consideration of intra- and interdomain analogies, with references to a lack of validity being more frequent for intradomain than for interdomain analogies (14.17% vs. 5%), $t(59) = 2.65, p = .010$, and references to a lack of clarity being marginally more frequent for intradomain than for interdomain analogies, 26.67% vs. 17.50%), $t(59) = 1.79, p = .078$. Just as .52 with instructors' justifications, students' references to a lack of familiarity were more frequent for interdomain than for intradomain analogies (16.67% vs. 2.5%), $t(59) = -3.75, p < .001$, with positive references not differing between conditions $t(59) = -0.62, p = .536$.

The fact that interdomain analogies received higher effectiveness ratings despite eliciting more frequent spontaneous references to lack of familiarity suggests that the role of familiarity in selecting appropriate base analogs may be more limited and nuanced than traditionally assumed. Despite receiving higher ratings of perceived effectiveness by instructors as well as students, the extent to which interdomain analogies yield a higher comprehension of the target topic remains an open question. To address this question, during the first phase of Experiment 2 a sample of non-expert participants either received the analogical explanations and rating tasks of Experiment 1, or else received the target explanations without the corresponding analogical support. During a subsequent phase, both conditions proceeded to answer comprehension questions about the target psychological concepts.

Experiment 2

Method

Participants and Design A total of 135 participants who had completed higher education volunteered to take part in the study ($M_{Age} = 38.71, SD = 12.21, 69\%$ female). After providing informed consent, they were randomly assigned to the analogical ($N = 66$) or to the control ($N = 69$) conditions. Among participants in the analogical condition, the domain distance of instructional analogies (2 levels: intradomain vs. interdomain) was manipulated within-subjects. The dependent

variables were the perceived instructional usefulness of the presented analogies and the degree of comprehension of the target instructional principles.

Materials The four target psychological phenomena and the instructional analogs were the same as in Experiment 1. In order to assess objective comprehension of the target phenomena, for each of the psychological topics we generated three multiple-choice questions, each followed by three response options (see Table 3 for an example). Because these same comprehension questions were also administered to the control group, which received the target explanations without corresponding base analogs, the questions focused on the target concepts rather than on their analogical support.

Table 3: Comprehension questions for the “tip of the tongue” phenomenon.

1. If we have someone’s name “on the tip of our tongue”:
a) The name of that person comes to mind without the need for cues or help.
b) We can’t get the person’s name to come to mind, even though we know it, but we could definitely recognize it from a list of options.
c) The person’s name would not come to mind, even if it were included in a list of options.
2. When we have the name of someone we know “on the tip of our tongue,” the most likely reason it doesn’t come to mind is that:
a) We thought we knew that person’s name, but in fact we didn’t.
b) The name is unconsciously associated with unconscious elements whose becoming conscious might be disturbing to us.
c) Another word with a similar sound comes to mind, and the mental presence of that word prevents us from recalling the word we’re trying to remember.
3. In which of these cases is it most likely that we fail to recall a person’s name but feel we have it “on the tip of our tongue”?
a) When the name we want to remember doesn’t resemble any other name we know.
b) When the name we want to remember is also a dictionary word.
c) When we know other names whose sound is similar to the name we want to remember.

Procedure The study was administered online via Google Forms. Participants in the experimental group read a brief introductory text on the use of instructional analogies. After reading this text, they received each of the four psychological phenomena explained through an analogy. For each phenomenon, they were asked to (1) rate, on a 5-point Likert scale (1 = not useful at all; 5 = very useful), the extent to which they believed the analogy would be effective for explaining the phenomenon to students, and (2) briefly justify the rating they provided. Half of the participants received intra-domain analogies for Phenomena 1 and 3 and inter-domain analogies for Phenomena 2 and 4, whereas the other half received the complementary pattern. After completing

these tasks for the four phenomena, participants were presented with each analogical explanation, this time followed by three multiple-choice questions designed to assess their understanding of the target phenomenon. The control group read the four target phenomena accompanied by their literal (i.e., non-analogical) explanations, and followed by the corresponding comprehension questions.

Results and Discussion

As in Experiment 1, participants in the experimental group rated interdomain analogies as more useful than intradomain analogies for explaining the psychological phenomena to students, $M = 3.98, SD = 0.88$, vs. $M = 3.54, SD = 1.02, t(65) = 2.77, p < .01$. The replication of the subjective ratings advantage for interdomain analogies in a less specialized sample suggests that the preference for interdomain analogies observed among instructors and students in Experiment 1 is not limited to populations with formal training in psychology.

With respect to comprehension of the target phenomena within the analogy group, a paired-samples t-test showed no significant difference as a function of whether the target phenomena were illustrated with an interdomain or an intradomain analogy, $M = .73, SD = 0.20$, vs. $M = .71, SD = 0.25, t(65) = 0.756, p > .10$, Cohen’s $d = .09$. However, whereas independent samples t-tests confirmed that interdomain analogies yielded higher comprehension of the target topics compared to the literal (i.e., non-analogical) explanations alone, $M = .73, SD = 0.20$ vs. $M = .67, SD = 0.17, t(133) = 2.07, p < .05$, Cohen’s $d = .38$, intradomain analogies were not found to boost comprehension above the levels achieved by the control group, $M = .71, SD = 0.25$ vs. $M = .67, SD = 0.17, t(133) = 1.141, p > .10$, Cohen’s $d = .24$.

General Discussion

Standard guidelines for the use of instructional analogies overwhelmingly focus on how a given analogy should be presented in order to render it more comprehensible and less misleading. By contrast, the question of which base analogs to select has received comparatively little attention and often reduces to stressing the importance of recipients’ familiarity with the base domain. Given that this criterion may not be realistically implementable in settings other than *in-person*, synchronous exchanges, the present research set forth to assess whether a less recipient-specific criterion could alternately guide the selection of appropriate base analogs. In view of the centrality of the intradomain/interdomain distinction within the cognitive study of analogical reasoning, we examined whether it also constitutes a useful criterion for selecting instructional analogies within the field of psychology, a domain characterized by unobservable dynamics for which the employment of analogical scaffolds may be particularly appropriate.

In Experiment 1, psychology students as well as psychology instructors provided subjective ratings of instructional effectiveness to intra or interdomain analogies targeting four representative psychological phenomena. Based on a conceptual

relation between the criterion under study (domain distance) and the more traditionally accepted criterion of familiarity, we anticipated that instructors would, to a greater extent than students, confer higher scores to interdomain analogies despite predictably lower levels of clarity and/or validity.

As predicted, subjective ratings of effectiveness by both groups favored interdomain over intradomain analogies. However, an analysis of the variables spontaneously invoked by instructors' justifications for their scores revealed a pattern that differs from the one we anticipated. Instead of being grounded in possibly higher degrees of perceived familiarity, the higher scores assigned to interdomain analogies appear to arise from a spontaneous attribution of greater clarity and validity, and *despite* a lower degree of perceived familiarity, possibly associated with an intuitive representation of the hypothetical recipients (students) as being largely knowledgeable about the target domain. Future studies using larger samples should examine whether this assumption reflects instructors' own experience in addressing graduate or advanced undergraduate courses, or if it more parsimoniously reflects—as observed by Olguin et al., (2017) with persuasive analogies among a non-expert population—, a dispositional inclination not to capitalize on available information about the recipients' prior knowledge.

The fact that instructors' references to clarity and validity in intra vs interdomain analogies were consistent with the higher scores granted to interdomain comparisons suggests the possibility that, at least in relation to psychological targets of instruction, intradomain analogies may generally be more difficult to understand than their interdomain counterparts. One reason for this difference could be that intradomain base analogs of psychological phenomena tend to inherit the abstraction of the target domain, whereas interdomain analogs can draw on more perceptually accessible domains. This covariation between semantic distance and concreteness may be structural rather than contingent in domains such as psychology, and future studies employing independent norming of analog concreteness could help disentangle the specific contribution of each factor.

Given that the apparent reasons behind the higher perceived effectiveness of interdomain analogies were less straightforward than anticipated, a sensible research question concerned whether the use of analogies yields an enhanced comprehension of the target psychological phenomena relative to literal explanation. In addition to replicating the higher perceived effectiveness of interdomain analogies with a less specialized population, Experiment 2 contrasted the degrees of comprehension elicited by each analogy type against a control condition receiving only the literal (i.e., non-analogical) explanations. Comparing interdomain against intradomain analogies yielded no significant difference in comprehension, confirming that the data does not support a clear interdomain advantage at the current sample size. However, pairwise comparisons nonetheless indicated a significant advantage of interdomain analogies over the literal condition ($d = .38$), whereas intradomain analogies produced no reliable difference ($d = .24$), a pattern that is

consistent with the subjective clarity and validity advantages attributed to interdomain analogies in Experiment 1. Future studies employing direct measures of analogical mapping should examine the extent to which gains in comprehension achieved by interdomain analogies are mediated by a greater facilitation of the mapping process.

From an educational standpoint, these findings suggest the need to reexamine the conventional emphasis on selecting instructional analogies on the basis of subjective attributions of students' familiarity with the base domain. While the common recommendation to prioritize familiar domains is intuitively appealing, our results indicate that domain distance offers a complementary—and often more accessible—parameter for instructors to consider, particularly when detailed knowledge of a diverse audience's prior experiences is unavailable. At least within abstract domains such as psychology, domain distance emerges as a practical tool that can be strategically managed to foster relational abstraction, thereby facilitating a more nuanced and robust grasp of the core principles underlying complex ideas.

References

- Clement, J. (1993). Using bridging analogies and anchoring intuitions to deal with students' preconceptions in physics. *Journal of Research in Science Teaching*, 30(10), 1241–1257. <https://doi.org/10.1002/tea.3660301007>
- Duit, R. (1991). On the role of analogies and metaphors in learning science. *Science Education*, 75(6), 649–672. <https://doi.org/10.1002/sci.3730750606>
- Eriksson, S., Gericke, N., & Thörne, K. (2024). Analogy competence for science teachers. *Studies in Science Education*, 1–29. <https://doi.org/10.1080/03057267.2024.2434797>
- Gentner, D., Loewenstein, J., & Thompson, L. (2003). Learning and transfer: A general role for analogical encoding. *Journal of Educational Psychology*, 95(2) 393–408. <https://doi.org/10.1037/0022-0663.95.2.393>
- Gentner, D., Loewenstein, J., & Hung, B. (2007). Comparison Facilitates Children's Learning of Names for Parts. *Journal of Cognition and Development*, 8(3), 285–307. <https://doi.org/10.1080/15248370701446434>
- Gick, M. L., & Holyoak, K. J. (1983). Schema induction and analogical transfer. *Cognitive Psychology*, 15(1), 1–38. [https://doi.org/10.1016/0010-0285\(83\)90002-6](https://doi.org/10.1016/0010-0285(83)90002-6)
- Glynn, S. M. (1991). Explaining science concepts: A Teaching-with-Analogies Model. In S. M. Glynn, R. H. Yeany, & B. K. Britton (Eds.), *The psychology of learning science* (pp. 219–240). Hillsdale, NJ: Erlbaum.
- Gray, M. E., & Holyoak, K. J. (2021). Teaching by analogy: From theory to practice. *Mind, Brain, and Education*, 15(3), 250–263. <https://doi.org/10.1111/mbe.12288>
- Harrison, A. G., & Coll, R. K. (Eds.). (2008). *Using analogies in middle and secondary science classrooms: The FAR guide--An interesting way to teach with analogies*. Corwin Press.

- Harrison, A. G., Treagust, D. F. (2006). Teaching and Learning with Analogies. In P. J. Aubusson, A. G., Harrison & S. M. Ritchie (Eds.) *Metaphor and Analogy in Science Education. Science & Technology Education Library*, vol 30. Springer, Dordrecht. https://doi.org/10.1007/1-4020-3830-5_2
- Jee, B. D., Uttal, D. H., Gentner, D., Manduca, C., Shipley, T., Sageman, B., Ormand, C. J., & Tikoff, B. (2010). Analogical thinking in geoscience education. *Journal of Geoscience Education*, 58(1), 2-13. <https://doi.org/10.5408/1.3544291>
- Kurtz, K. J., Miao, C.-H., & Gentner, D. (2001). Learning by analogical bootstrapping. *Journal of the Learning Sciences*, 10, 417–446. https://doi.org/10.1207/S15327809JLS1004new_2
- Olguín, V., Trench, M., & Minervino, R. (2017). Attending to individual recipients' knowledge when generating persuasive analogies. *Journal of Cognitive Psychology*, 29(6), 755–768. <https://doi.org/10.1080/20445911.2017.1304942>
- Richland, L.E. & Simms, N. (2015), Analogy, higher order thinking, and education. *WIREs Cognitive Science*, 6: 177-192. <https://doi.org/10.1002/wcs.1336>
- Ross, B. H. (1989). Distinguishing types of superficial similarities: Different effects on the access and use of earlier problems. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 15(3), 456–468. <https://doi.org/10.1037/0278-7393.15.3.456>
- Trench, M., & Minervino, R. A. (2020). *Distant connections: The memory basis of creative analogy*. Springer. <https://doi.org/10.1007/978-3-030-52545-3>