LEGO, Origami ve Daha Fazlası: Uzamsal Biliş Gelişimine Yönelik Müdahale Yöntemleri

Maltepe Üniversitesi 7. Psikoloji Günleri
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Koç Üniversitesi
Dil ve İletişim Gelişimi Laboratuvarı

Ben kimim?

* Tekirdağ Fen Lisesi, Biyoloji
* Koç Üniversitesi ARHA, PSYC, MAVA
* Çocuk gelişimi ve görsel tasarım
* Bir persona olarak “çocuk”
    * Çizgi filmler
    * Resimli çocuk kitapları
    * Oyuncaklar

Uzamsal biliş (spatial cognition) nedir; neden önemlidir?

Bireylerin görsel alanı tarayabilme, görsel olarak algıladıkları nesnelerin biçimlerini, şekillerini ve konumlarını kavrama, zihinsel olarak bu biçimleri, şekilleri ve konumları temsil edebilme ve bu temsilleri zihinsel ve fiziksel olarak manipüle edebilme yetenekleri (Carroll, 1993).

- Günlük işler: araç gereç kullanımı, yer yön tayini (Mix ve ark., 2018; Newcombe ve ark., 2013)
- STEAM alanlarında başarı (Lowrie ve ark., 2019; Uttal, Miller, ve ark., 2013; Wai ve ark., 2009)
- Geliştirilebilirlik (Casey ve ark., 2008; Uttal, Meadow, ve ark., 2013; Yang ve ark., 2020)

Uzamsal bilişin kavramsal çerçeveleri

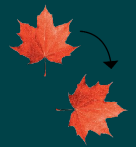
Uzamsal biliş, tek bir birim olarak değil, birkaç boyuttan oluşur. (Chatterjee, 2008; Eliot & Smith, 1983; Hegarty & Waller, 2004; Mix ve ark., 2018; Newcombe & Shipley, 2014; Ramful ve ark., 2016; Uttal, Meadow, ve ark., 2013; Yang ve ark., 2020)

Uzamsal algının çok boyutlu olduğu konusunda bir fikir birliği olsa da, alt faktörlerin sayısı hâlâ tam olarak belirlenmemiştir. (Mix ve ark., 2018; Ramful ve ark., 2016; Uttal, Meadow, ve ark., 2013)

* İkili kavramsallaştırma (Hegarty & Waller, 2004)

Tablo 1.

Uzamsal becerilerin 2x2 sınıflandırması ve örnekleri (Uttal, Meadow, ve ark., 2013'dan uyarlandı)

Uzamsal beceri	Tanım	Örnek
İçsel - durağan	Dikkat dağıtıcı arka plan bilgisi üzerinde nesnelerin, yolların, veya mekânsal yerleşimlerin kavranması.	
İçsel - hareketli	Nesneleri daha karmaşık yerleşimlere taşıma, zihinsel olarak nesneleri döndürme veya 2 boyuttan 3 boyuta dönüştürme.	
Dışsal - durağan	Yataylık ve dikeylik gibi soyut uzamsal prensipleri tanıma ve kavrama.	
Dışsal - hareketli	Çeşitli bakış açılarından bir ortamı tam şekliyle zihinsel olarak temsil etme.	

Tablo 2.

Uzamsal yeteneklerin üç katmanlı çerçevesi (Ramful ve ark., 2016)

Uzamsal beceri	Tanım
Uzamsal Oryantasyon	Çeşitli bakış açılarından bir ortamı tam şekliyle zihinsel olarak temsil etme.
Zihinsel Döndürme	Nesneleri daha karmaşık yerleşimlere taşıma, 2 boyutlu ya da 3 boyutlu nesneleri zihinsel olarak belirli bir açıda döndürme.
Uzamsal Görselleştirme	Uzamsal bilgiyi manipüle etmek veya dönüştürmek yeni görüntüler üretmek.

Zihinsel Döndürme

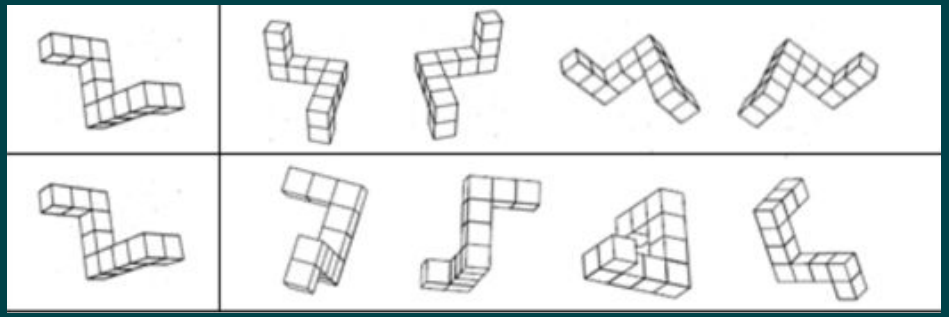
* prototipik uzamsal temsil (Bruce & Hawes, 2014; Frick ve ark., 2013; Mix & Cheng, 2012).

* bir nesnenin zihinsel temsilinin belirli bir açıda döndürülmesi (Hawes ve ark., 2015; Lauer ve ark., 2015; Shepard & Metzler, 1971).

* katı dönüşüm (rigid transformation) (Atit ve ark., 2013; Harris ve ark., 2013, Resnick & Shipley, 2013).

Zihinsel Döndürme için Eğitim Metodları

* **test maddelerini çoğaltmak** (Contreras ve ark., 2018; Meneghetti ve ark., 2015; Wright ve ark., 2008)



* en iyi eğitim metodları: video oyunları, bir fiil keşfetme ve oyun (Yang ve ark., 2020).

* yapı inşa oyuncaklarının parçalarının bir araya getirilmesi, farklı nesne konumlarının keşfedilmesini uyarır (Casey ve ark., 2008; Pirrone ve ark., 2015; Polinsky ve ark., 2022).

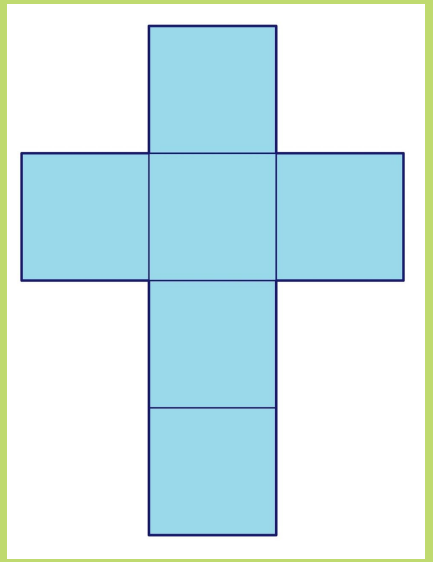
Zihinsel Katlama

* zihinsel döndürme ve zihinsel katlama ayrı (Harris ve ark., 2013; Milivojevic ve ark., 2003), ama birbirleriyle ilişkili beceriler (Hilton ve ark., 2022).

* şeklin özellikleri değişir (Hodgkiss ve ark., 2018; Resnick & Shipley, 2013; Toub ve ark., 2019), başlangıçtaki formun neresinden kaç defa katlandığına bağlı olarak sonsuz sayıda yeni şekil oluşturulabilir (Atit ve ark., 2013; Burte ve ark., 2017; Megahed, 2017).

* esnek dönüşüm (Harris ve ark., 2013; Ormand ve ark., 2014; Taylor & Hutton, 2013).

* STEAM başarısını anlamlı bir şekilde öngörür (Hodgkiss ve ark., 2018).



Zihinsel Katlama için Eğitim Metodları

* think 3d! (Burte ve ark., 2017; Taylor & Hutton, 2013)

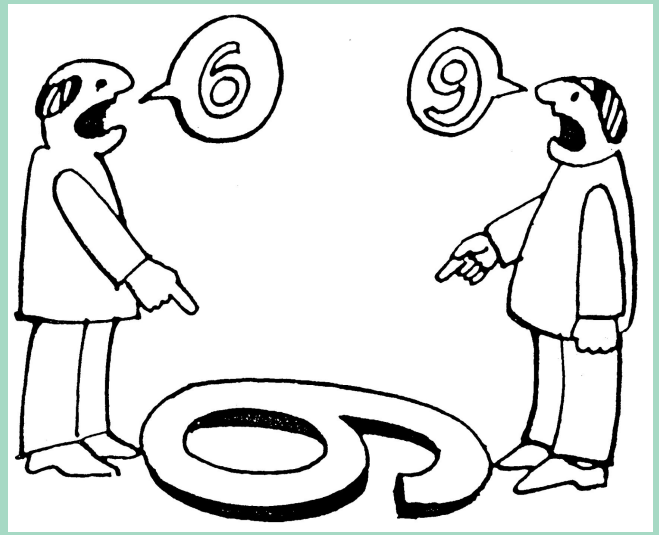
* kağıt katlama / origami (Wu & Sun, 2020).

Görsel Perspektif Alma

* görsel perspektif alma (bir sahnenin başka bir referans noktasından nasıl göründüğünü algılama), duygusal perspektif alma (başkalarının kendisinden farklı duygular hissedebileceğini anlama becerisi), bilişsel perspektif alma (başkalarının düşünceleri hakkında akıl yürütme becerisi) (Kurdek & Rodgon, 1975; Newcombe, 1989; Yadollahi ve ark., 2022)

* bilişsel perspektif alma Zihin Kuramı'nın (Barnes-Holmes ve ark., 2004; Selman, 1980; Apperly, 2012); duygusal perspektif alma ise empatinin ftemelini oluşturur (Erle & Topolinski, 2015; Ruby & Decety, 2004; Lamm ve ark., 2007).

* level 1 & level 2 perspektif alma (Fravell, 1974; Masangkay ve ark., 1974; Salatas & Flavell, 1976)

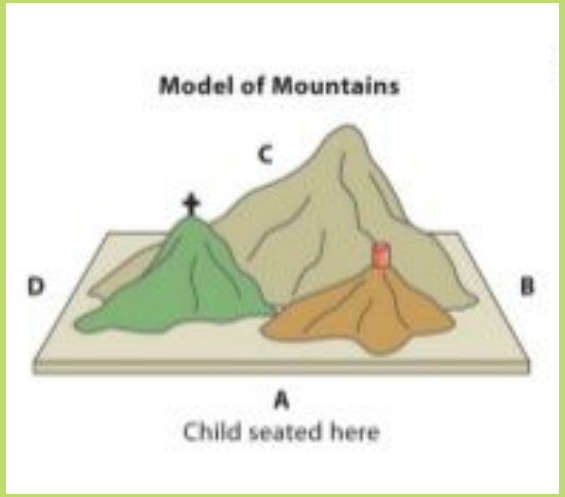


Perspektif Alma için Eğitim Metodları

* çoğu müdahale bilişsel perspektif almaya yönelik, birkaç tane duygusal perspektif almaya yönelik; ancak, görsel perspektif alma becerisine adanmış neredeyse hiç çalışma yok (Mori & Cigala, 2015; Newcombe, 2017; Vander Heyden ve ark., 2017)

* otizm çalışmaları ve Zihin Kuramı ile ilişkili araştırmalar (Parsons, 2015; Tian ve ark., 2021).

* sistematik olmayan müdahaleler (Vander Heyden ve ark., 2017).



Ne ile oynayalım?

LEGO

Magna Tiles

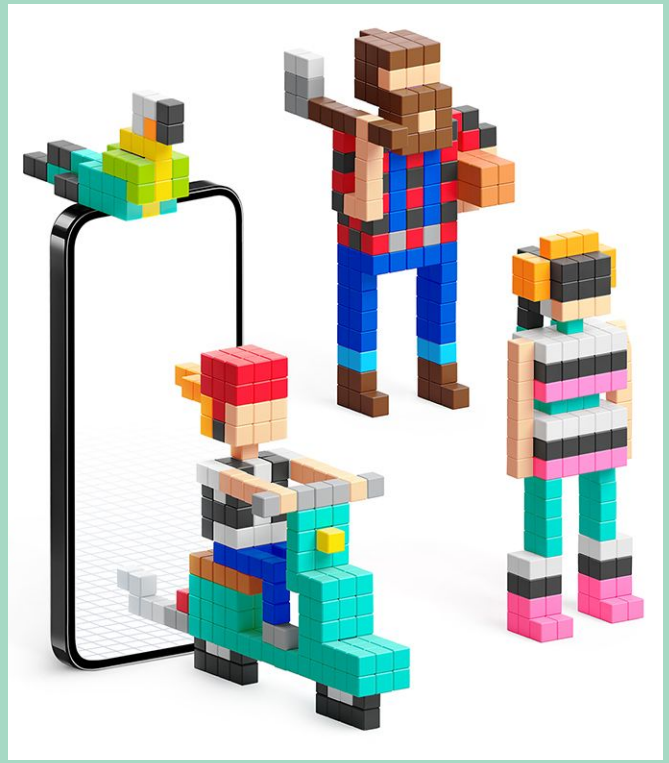
The Toy (Charles & Ray Eames)

Somut Kullanıcı Arayüzleri

* teknolojik oyuncaklarda keskin bir artış söz konusu (Hall ve ark., 2022; Ho ve ark., 2017; Wooldridge & Shapka, 2012).

* teknoloji ile artırılmış gerçeklik (Baykal ve ark., 2018; Pires ve ark., 2019)

* doğrudan deneyimin ötesinde uzamsal ilişkileri keşfetmek ve temsiller oluşturmak için sunulan fırsatlar (Pires ve ark., 2019).



Nasıl oynayalım?

* Oyun deneyimini tasarlamak, oyuncağın fiziksel özelliklerini tasarlamak kadar önemli (Black ve ark., 2016; Wooldridge & Shapka, 2012; Yamada-Rice, 2018)

* Dil girdisi (Casasola ve ark., 2020; Ferrara ve ark., 2011; Turan ve ark., 2021).

* Rehberli oyun (Borriello & Liben, 2017; Fisher ve ark., 2013; Ramani ve ark., 2014).

* Anlatı girdisi (Casey ve ark., 2008).

Tasarımcılara Öneriler

1. Zihinsel katlamanın da STEAM başarısı için önemi olduğundan oyuncak tasarımlarında zihinsel katlama bileşenlerine yer verilmeli.
2. Perspektif alma hem uzamsal hem de sosyal becerilerle ilişkili olduğundan bu beceriyi geliştirmek için büyük ölçekli ve/ya küresel formda oyuncaklar tasarlanmalı.
3. Oyuncakların tasarım sürecinde yalnızca fiziksel özelliklere odaklanmak yerine, kullanıcının tüm oyun deneyimi dikkate alınmalı.
4. Birlikte oynayan ebeveynler ve çocuklar gibi birden fazla kullanıcı profiline odaklanılmalı, böylece hem çocuk hem de yetişkin uzamsal becerilerin gelişiminden faydalanabilir.
5. Oyuncaklar mümkün olduğunca uzamsal dil, hikaye anlatımı ve jest kullanımını teşvik edecek şekilde tasarlanmalı.
6. Hayal gücünü sınırlandırabilecek baskın tematik ürünlerden kaçınılmalı. Anlatı, yapı inşa oyununu gölgelemeyen, tamamlayıcı bir özellik olmalıdır. Kullanıcılara, sembolik düşünmeyi uyaracak soyut tasarımlar sunulmalı.

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What was suggested for malleability of spatial skills in different accounts?

* Core knowledge theory, object module and geometry module (Spelke & Kinzler, 2007), but did not consider mental rotation (Newcombe ve ark., 2013).

* There is an empirical evidence for mental rotation ability during infancy (Moore & Johnson, 2008); however, it is not fully developed without manual exploration (Newcombe ve ark., 2013).

* Nativists approaches like core knowledge also accept malleability (Spelke & Kinzler, 2007).

* Newcombe and Stieff (2012) criticized the “the myth of fixed spatial ability”.

* Uttal, Meadow, ve ark. (2013) meta-analyzed more than 200 training studies.

Future Directions

* Notably, the conceptual definition of perspective taking is overshadowed by the Theory of Mind and Empathy studies, which are related to visual/spatial perspective taking to a certain extent. However, it is not correct to use those terms interchangeably.

* Contrary to mental folding and perspective taking, the malleability of mental rotation ability is studied excessively. However, building blocks were predominantly used as the training tool, only practicing rigid transformation in a small-scale activity. On the other hand, many alternative toy designs may contribute to spatial skill development. There is a need to detect common affordances of the various construction toys concerning different spatial skills' development.

* Adult spatial cognition is also malleable; hence, cooperative play with construction toys may contribute to both the adults' and children's spatial cognition.

* Because collaborative social scenarios are suitable for construction play, the utilization of social robots in that domain would also be an innovative approach, children can practice their social and spatial skills with social robots.

* Can construction toys be designed and marketed gender neutrally to lure females to spatial activities as an informal STEAM development tool?