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Exploring Different Facilitator Roles in Maker-based Learning

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Abstract: The purpose of this study is to investigate how different facilitator roles (educator, adult caregiver, peer and self-facilitation) influence children's learning engagement--specifically, the learning practices of seeking and sharing resources (SSR)--in a museum's makerspace. We address two research questions: 1). In what ways do learners' engagement vary when facilitated by different facilitator roles? 2). In what ways do different types of facilitators influence SSR practices across age ranges? The results show that facilitation from caregivers and self-directed facilitation is associated with significantly more SSR practices. Additionally, we found that the influence of different types of facilitators on learning engagement varies across ages. Self-directed learning is associated with an increase of SSR as children grow, while facilitation from caregivers is associated with a decline of SSR as children age. Based on these findings, we discuss implications for facilitation in museum makerspace.

Introduction and background

Facilitated museum makerspaces can function as a nexus for creative learning experiences. However, learning does not come inherently with a museum makerspace. Facilitation is a key element of supporting children's learning and development that can boost satisfaction and create a gateway for equitable access through personalization of a learning experience to learners' needs and interests (Gutwill et al., 2015; White et al, 2021). In successful facilitated making, the educator helps a child progress in the complexity of learning, connects the child to activities at a reasonable challenge level, and encourages interest and engagement (Gutwill et al., 2015).

The focus of prior research on facilitation in museums, more generally, often centers on educators; more research is needed to investigate the influence of different types of facilitators in a museum makerspace (Krange et al., 2019). In this paper, we explore how the facilitator role influences children's learning engagement -- specifically the learning practice of seeking and sharing resources (SSR). In this study, we address two research questions: 1) In what ways do learners' SSR vary when facilitated by educators, adult caregivers, peers, or working independently? 2) In what ways do different types of facilitators influence the SSR practices across age ranges? Through this study, we gain insight about which facilitator role tends to support learners to seek and share resources and how this varies by age. The more we understand how to differentially support learners across developmental stages, the more we can train educators and offer suggestions to caregivers to be meaningful partners in learning. Second, this work builds upon previous research to understand how to conceptualize and study learning through making (e.g. Wardrip & Brahms 2015). In particular, this work can more explicitly articulate learners' engagement in seeking and sharing resources through the lens of the Learning Practices of Making framework and how facilitators are partners in the learning process.

Theoretical and methodological approaches

The perspective of overt learning behaviors guides this work. *Overt* behaviors that learners display in a learning environment can help researchers to understand and analyze learning engagement (Chi, 2009). The Learning Practices of Making framework articulates forms of overt learning behaviors in a museum makerspace. One such behavior is seeking and sharing resources (Wardrip & Brahms, 2015). The practice of seeking applies to tools, information, or other supports. Sharing refers to an individual offering to others material objects, help or support, suggestions, or ideas.

We used the SSR Tool (White et al, 2022) to measure learners' seeking and sharing practices in the makerspace. This study included 51, 3-minute video clips including one focal learner (ages 0-18) engaging in a maker activity. The video included seeking and sharing resources prompted by 4 facilitator roles including educators, caregivers, peers, and children themselves. Two researchers coded the video clips with the SSR tool and yielded a high interrater reliability for SSR practices (alpha=0.94).

Initial findings and implications

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To explore whether different types of facilitators played a role in SSR practices in a museum makerspace (RQ1), we conducted a one-way ANOVA. The result indicated that facilitation from caregivers and self-directed facilitation is associated with significantly higher SSR practices than facilitation from peers or educators. Compared to educators, when facilitation is prompted by caregivers ($p<0.01$), and when learners self prompted ($p<0.05$), they yield a higher amount of SSR practices. This highlights the important role that caregivers and self-directed facilitation can play in a makerspace.

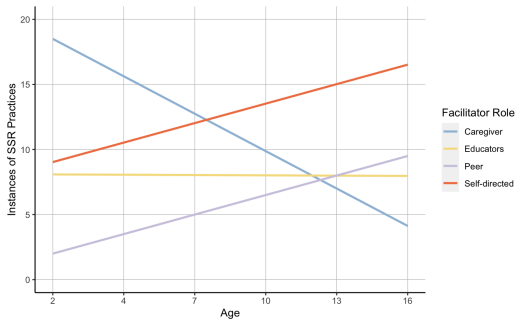
Table 1

*One-way ANOVA & Regression Models (Standard errors in parentheses, ** p<0.01, * p<0.05)*

	Model (1) ANOVA	Model (2) REGRESSION
	SSR Practices	*SSR Practices*
Age		-4.065 *(2.514)*
Peer	-1.023 *(3.061)*	-24.92 *(27.29)*
Self-directed	4.172* *(1.581)*	-17.88* *(7.743)*
Caregivers	6.727** *(2.054)*	Reference group
Teaching artist	Reference group	-17.31* *(7.546)*
		Interaction Effect
Peer#Age		5.565 *(6.561)*
Self-directed#Age		5.562* *(2.749)*
Teaching artist#Age		4.041 *(2.649)*
Constant	8.023** *(1.060)*	25.42** *(6.827)*
Observations	51	51
R-squared	0.240	0.312

Figure 1

Predicted linear regression of each type of facilitators across age



The multivariate regression results (Table 1) suggested an interaction effect between age and facilitation among groups of caregivers and self-directed learning. As children age, we expect to see fewer instances of SSR when facilitated by caregivers and more instances of SSR when engaged in self-directed facilitation. A graph of predicted linear regressions for each type of facilitator illustrates the interaction effect of the caregiver group and self-directed group (Figure 1). In the self-directed facilitation group, SSR practices increase as children grow older. On the contrary, children's SSR practices decline when the facilitation is led by their caregivers as they age. Additionally, we see a slight downward trend in the educators' facilitation as children's age increases. Facilitation from peers also showed a positive correlation with SSR as age increases. Multivariate regression analysis indicated that the influence of different types of facilitators on learning engagement varies across ages.(RQ2) In our analysis, we see an incline in self-directed facilitation in the makerspace as learners get older, with older learners tending to seek and share resources independently. We also observed that peers play an increasingly important role in makerspaces for children in the early adolescent stage.

These findings opened up additional potential approaches to further support and promote engagement in informal learning environments. First, it would also be beneficial to provide support and guidance for caregivers so that they can better facilitate childrens' learning other than just supporting educators. Our study suggested that museums also encourage self-directed learning of young learners. Future design decisions, including the exhibit and facilitation design, should also consider how to further enhance the self-directed learning of young learners.

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