הערך שמפיקים מורי מייקרס מסדנה רעיונית: שימוש בעקרונות עיצוב להמשגת למידה מייקרית

תקציר:

מאמר זה מציג ממצאים ראשוניים ממחקר שבחן כיצד מורי מייקרס (Maker teachers) משתמשים בעקרונות עיצוב פדגוגיים להמשגת הפרקטיקה שלהם ,ומה הערך שהם מפיקים מתהליך זה. מורי מייקרס פועלים בתחום חדשני ללא תכנית לימודים מובנית, ולכן נדרשים לתפקד כמעצבי מרחבי ותהליכי הלמידה שלהם. שילוב הבנה מעשית עם ממדים רעיוניים הכרחי לפיתוח יכולתם של מורי מייקרס כמעצבי למידה, אך העיסוק במימדים רעיוניים בהוראה ובהכשרת מורים מייקרים נותר חסר, פער זה עומד במרכז המחקר.

המחקר נערך במסגרת סדנה מקוונת בת שעה וחצי, שהיוותה השלמה לתוכנית פיתוח מקצועי אינטנסיבית בת שלושה ימים. בסדנה הוצגו 16 עקרונות עיצוב ממאגר Insights – פלטפורמה המחברת בין פרקטיקות הוראה למסגרות פדגוגיות סוציו-תרבותיות. המשתתפים חקרו את העקרונות והשתמשו בהם בקבוצות כדי לנסח מהי למידה מייקרית ולתאר סיפורי למידה מייקרית אישיים ששיתפו.

ניתוח תמטי של שאלונים שמולאו לאחר הסדנה, תוך שימוש במסגרת יצירת ערך של Wenger, זיהה ערכים מיידיים, כמו רפלקציה אישית ושיח עמיתים, וערכים פוטנציאליים, כמו שינוי בתפיסת הלמידה המייקרית ושימוש בעקרונות העיצוב ככלי לתכנון לימודים.

ממצאי המחקר מדגישים את המוכנות של מורי מייקרס לעסוק בהיבטים רעיוניים של למידה מייקרית ואת חשיבות שילובן של סדנאות רעיוניות בפיתוח המקצועי שלהם. בנוסף, המחקר מאשר את יכולתה של סדנה קצרה לחולל ערך משמעותי ולתרום להבנה מעמיקה בתחום זה.

Title: Values Gained Through Maker Teachers' Use of Design Principles to Articulate Maker Learning: Insights from Conceptual Professional Development

Abstract:

This paper presents findings from a study exploring how maker-teachers use design principles to articulate their conceptual understanding of maker learning and the value they gain from this process. A 1.5-hour workshop was implemented to complement a three-day intensive maker learning program, engaging 29 teachers with design principles from the Insights database (Authors et al., 2022). Through thematic analysis of post-workshop questionnaires, we identified nine categories of value gained by participating teachers and mapped them to Wenger et al.'s (2011) framework of value creation. Our findings highlight the importance of conceptual reasoning in maker education professional development, demonstrating that even within limited timeframes, such engagement fosters deeper pedagogical understanding and informs future practice.

Introduction & Background

Maker education emphasizes hands-on, experiential learning, positioning learners as creators using diverse technologies (Martin, 2015). While its potential to foster innovative learning is widely recognized (Rouse & Rouse, 2022), maker education often lacks predefined frameworks for implementation (Blikstein, 2018). Maker teachers typically operate at the far end of the spectrum of teachers as learning designers, independently crafting their learning goals, curricula, and learning environments without predefined curricula or pedagogical frameworks (Bevan, 2017). This challenging role is further complicated by the way maker education challenges traditional conceptions of knowledge, teaching, and learning (Sormunen et al., 2022). Supporting educators as teacher-designers, tailoring learning to their unique contexts, requires cultivating both practical and conceptual understanding of their practice (Bereiter, 2021; Author, 2011).

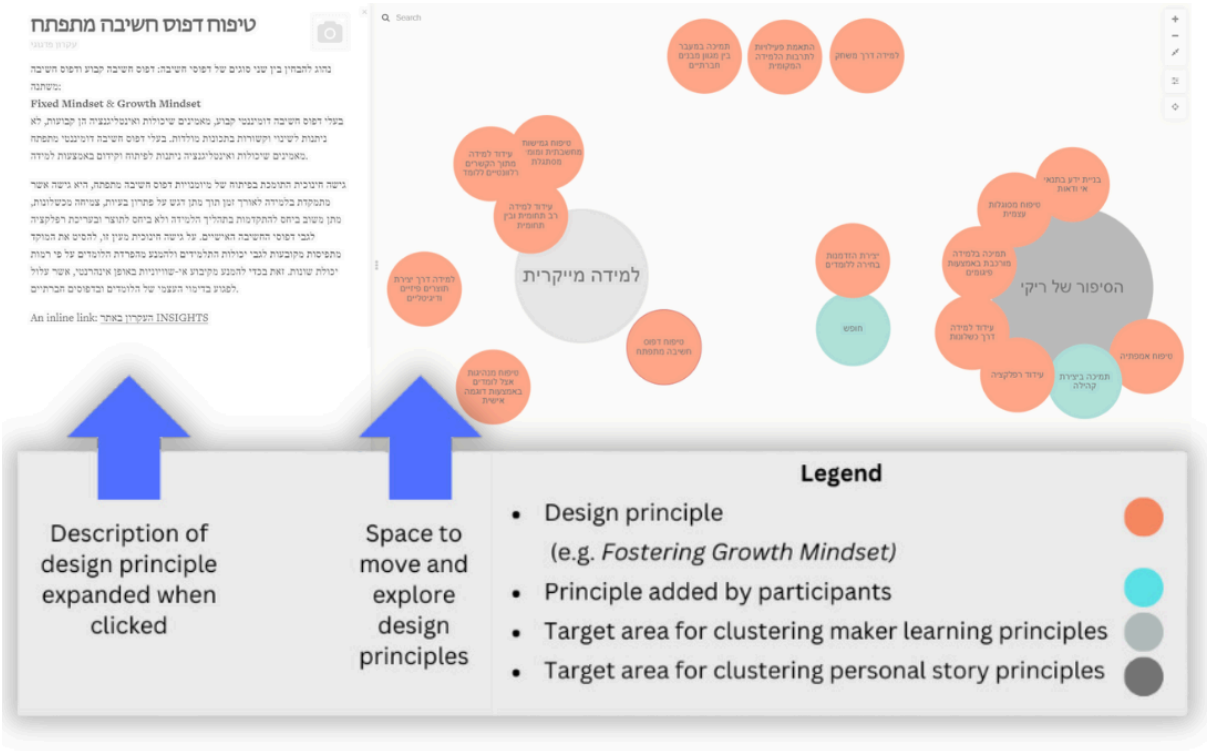
Currently, there is a significant conceptual gap in maker education stemming from two main factors: maker teachers' lack of awareness of the theoretical traditions underpinning their practice (Høibo et al., 2024) and the little attention paid to educational theory in professional development programs (Caratachea et al., 2023). Our research addresses this gap by introducing a 1.5-hour workshop designed to complement a learning Makeathon - an intensive, three-day maker professional development program for in-service maker teachers. The workshop encouraged groups of teachers to commonly articulate their experiences and conceptions of maker learning using 16 principles from the *Insights* database—a platform designed to connect teaching practice with research-based socio-cultural educational frameworks (Authors et al., 2022). An interactive visualization-tool was designed to allow participants to engage with the principles, supporting their exploration during the workshop.

Our goal was to investigate teachers' design knowledge of maker education and the value they derive from engaging with design principles. In this paper, we present preliminary findings on the value teachers gained through their communal articulation of maker learning using the design principles and the visualization-tool. Our evaluation draws on Wenger et al.'s (2011) framework for value creation, which emphasizes how educators derive both immediate and transformative benefits through collaborative and reflective learning experiences.

Method

Out of 100 Makeathon participants, 29 voluntarily attended the 1.5-hour online workshop held two weeks after the Makeathon. Participants were first introduced to the interactive visualization-tool (Figure 1) and explored it individually by reviewing descriptions and selecting three principles central to their understanding of maker learning. Then, groups (4–8 participants) collaboratively mapped and clustered the principles, refining their shared understanding through discussion. Finally, in the same groups, participants analyzed a personal maker learning story shared by a group member and analyzed its underlying design principles. To evaluate the workshop's value for participants, a post-workshop survey was administered. Responses underwent inductive thematic analysis (Charmaz, 2006), followed by refinement using Wenger et al,'s (2011) value creation framework. The centrality of categories was assessed by the number of participant responses assigned to each category.

Figure 1
Clip screen of design principles' interactive visualization-tool used in workshop



Findings:

Thematic analysis of post-workshop questionnaires revealed four main categories of value aligned with Wenger et al.'s (2011) framework, with nine emergent sub-categories (Table 1).

Table 1
Value categories in teacher's responses to post-Makeathon workshop

Value cycle characteristics (Wenger et al. 2011)		Categories (emergent)	# participants
Immediate Value		**A**-Dialogue with maker educators	8
		B-Conceptual reflection on maker learning	5
		C-Reflection on the Makeathon	4
Potential Value	Resources	**D** -Design principles as resource	6
	Useful skill / practice	**F**-Conceptual practices	10
		G-Reflective practices	3
	Transformed ability to learn	**H**-Insights on maker learning	8
		I-Insights on maker design principles	7
		J-Maker learning in sociocultural context	4

Immediate Value was identified through expressions of direct and short-term benefits. For instance, one participant shared, "I had the opportunity to talk about my learning goals, hear additional perspectives, and refine myself and my teaching" (B).

Potential Value encompassed *Resources*, *Useful skills/practices*, and *Transformed ability to learn*. *Resources* included plans to apply design principles in future learning designs, as reflected in one comment: "The workshop inspired me and sparked curiosity to explore how the pedagogical principles would integrate when working with my first-grade class" (D).

Useful Skills/Practices captured intentions to implement new approaches. One participant noted, "The workshop helped me open up my thinking about which principles I emphasize and which I should consider adding in my maker teaching" (F).

Transformed Ability to Learn reflected new understandings of maker learning, including insights into maker education's core principles, its design frameworks, and its sociocultural context. For example, one participant remarked, "The workshop expanded my understanding of why I teach and helped clarify what is specific to maker education, as opposed to the broader pedagogical and value-based approaches" (J)

Discussion

The workshop's voluntary nature attracted significant engagement and interest, which may reflect teachers' self-perception as innovators (Høibo et al., 2024) and learning designers (Bevan, 2017). While maker teacher professional development often emphasizes practical skills (Caratachea et al., 2023), the substantial value educators reported across both immediate and potential value cycles highlights the relevance and importance they attributed to engaging with the conceptual aspects of maker education.

The compact design of our workshop demonstrates that meaningful conceptual engagement can occur within the limited time frames available for teacher professional development. Furthermore, the workshop provided a reflective space to revisit and consolidate tacit conceptual knowledge gained during prior practical experiences, reinforcing it and deepening teachers' understanding. Design principles embedded in the interactive visualization-tool effectively supported teachers in using theoretical principles and conceptual language to articulate their understanding of practice.

Finally, our findings also emphasize the importance of using design principles to reflect on and identify the unique aspects of maker education within a broader socio-constructivist framework. Maker education is often framed as the antithesis of traditional education, a binary view that limits both its conceptualization and the pedagogical imagination required for its effective implementation (Vossoughi et al., 2021). Engaging with design principles enabled teachers to develop a more nuanced understanding of their practice, situating maker education within a continuum of educational traditions while appreciating its shared foundations and distinctive features.

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