Hive Research Lab Interim Brief
Innovations and Hive NYC
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Networked Innovation Research Strand

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Hive Research Lab Interim Briefs are designed to provide the Hive NYC community with ongoing frameworks, findings and recommendations related to the Lab's two research areas: supporting **youth interest-driven trajectories and pathways**, and developing the Hive as a context for **networked innovation**. The briefs are part of a broader effort to connect current research and emerging findings to issues of practical importance to the community in order to improve network activity. Recommendations are preliminary and based either on existing literature or observations of practice within the network.

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I. Introduction

Hive NYC has a stated commitment to "build innovative and transformative educational experiences for youth" and to "develop new approaches and tools with learning innovators" (HiveNYC.org). But how do we understand what an innovation is? As educators, how do we know if something we develop is "innovative"? And should we be thinking about all innovations in the same way?

This brief represents some of the emerging understandings that we at Hive Research Lab have developed as we've been engaging in our study designs and preliminary analyses of fieldwork we've done to date. Rather than offering definitive research findings, this brief aims to shed light on issues related to innovation in the network and help start conversations within the Hive community about the nature and goals of innovation. Specifically, it hopes to contribute to how Hive NYC educators think about innovation by providing the following: (1) a framework for considering different dimensions of innovations (Section II), (2) a reflection on this framework in terms of activity in Hive NYC (Section III) and (3) an "innovation snapshot" of projects, technologies, curricula and more that might be considered current innovations within Hive NYC (Appendix A).

II. Dimensions of "Innovations"

In this section, we provide a framework that Hive NYC educators can use to consider the idea of "innovations." The framework is made up of seven dimensions that might be applied to an innovation - value-add, degree, novelty, form, complexity, origin and spreadability. All of these dimensions are interconnected, but considering each on their own raises distinct issues. The intention in sharing these is to create greater clarity through adding nuance and complexity to this often taken-for-granted term of 'innovations'.

Indeed, one of the challenges of studying innovation is that the word has become so loaded in contemporary discourse, and in particular within the world of education. Its ubiquity too often renders it meaningless, and so in thinking about how Hive NYC might be a context for the development of 'innovations', it's important for practitioners to be reflective about the meaning of the word.

Like most others, the word 'innovation' exists in our language in various forms. For example, take these four ways of using the word in context:

- "Our organization needs to produce more innovations!" (noun form)
- "Our organization needs to do more innovation!" (verb form)
- "The thing that organization made is totally innovative!" (adjective form modifying a noun)
- "The experimentation that organization does is so innovative!" (adjective form modifying a verb)

In this brief, we'll focus specifically on the noun form, i.e., the "things" that we might call innovations.[1] In considering the meaning of the word in the context of the work of Hive members, we felt it was less useful to impose an absolute definition, but rather to explore a number of dimensions of the construct. This way, educators can use these distinct dimensions to come up with a way of thinking about innovations most useful for them. Mostly this is because we take a pragmatic view of language - the definition of a word is only as good

[1] Throughout this brief we default to using the word "innovations", plural, to indicate the noun form of the word, rather than "innovation" which can easily be confused as either the noun or verb form. See our forthcoming brief "Innovation Practices and Hive NYC" where we discuss the verb form of innovation, which comprises the actions and processes that lead to innovations.

as what it's going to be used for. Given that, we want to give Hive members the tools to consider what aspects of the idea of "innovations" are keyed to their context, goals, and organizational culture.

Through a synthesis of literature on innovation we came up with seven dimensions that we thought might be useful when discussing innovations present in Hive NYC[2]:

1. **"Value Added" or Beneficence of an Innovation** – this dimension speaks to the normative qualities of an innovation. Is a given practice, technology or idea "better" than what came before it? This, of course, begs a number of questions: "better" according to whom? And by what measure? The dimension of "value added" always implies some sort of evaluation of whether or not something is beneficial according to a certain standard.
2. **Degree of an Innovation** – is an innovation a *radical departure* from existing approaches, or an *incremental improvement*? Degree can be seen as an aspect of the "value-added" dimension, aiming to shed light on how much value a given innovation adds. Degree can be contextually determined - something might be a radical departure from existing practice in one organization, but is considered just an incremental improvement for another, or for the field an organization locates itself within.
3. **Novelty of an Innovation** – almost all scholars looking at innovation focus to some degree on whether something might be considered new. Novelty is, like degree, acknowledged as variable based on context ("absolute" vs. "relative" novelty). New to an individual, new to a team, new to an organization, new to a field, etc., can all be taken into account when we consider whether something is novel or not. Relatedly, one can also think about novelty as something that is "perceived" by a given actor, rather than something more objective.
4. **Form of an Innovation** – innovations are often grouped according to some form that they take, such as product innovations, process innovations (which refers usually to innovation processes themselves, e.g., – a rapid prototyping approach, assembly lines, supply chains, etc.), or organizational model innovations. This can be extended in other ways, making distinctions between various innovation forms such as ideas, frameworks, technologies, practices, program models, design principles, etc. Different forms of innovations have distinctive qualities in terms of how they develop, circulate and get adopted or recontextualized.
5. **Complexity of an Innovation** - related to the "form" dimension, some innovations might be considered more or less complex than others. This, again, is also something that is context dependent - a person with extensive prior knowledge of related innovations might find a certain innovation to be less complex, whereas someone with less familiarity would experience that same innovation as more complex.
6. **Origins of an Innovation** – was the innovation internally conceived or externally adopted, or some combination? Obviously, on a micro level, all innovation draws on prior ideas in some way or another. However, different ways of looking at an innovation's origins has important implications in terms of things like attribution and intellectual property within the context of organizational collaborations.
7. **Spreadability of an Innovation -** different innovations with distinct attributes, of course, spread in different ways (Coburn et al., in preparation; Rogers, 1962). Many of the dimensions we've already discussed (e.g., complexity, form, value-added) are factors in how a given innovation does or doesn't spread, as are other factors we don't address here (e.g., cost, legitimacy, compatibility). The spreadability of a given innovation is something that can both be considered from an "inventor" perspective, who might think through how to make a particular design reach more people, as well as

[2] The first and third dimensions, value-added and novelty, were synthesized from a number of popular definitions of innovation including those of Rogers (1962), Schumpeter (1939), Van der Meer (1997) and Crosson & Apaydin (2010). These dimensions were discussed alongside the sixth dimension, origins, in Crosson & Apaydin's (2010) literature review on the subject of innovation, which we draw on here. Tushman et al. (1997) discuss the degree dimension in terms of radical versus incremental improvement, and Rogers (1962) speaks to the dimension of complexity as important in diffusion of innovations, among others.

from an "adopter" perspective, who might consider whether the incorporation of an innovation is actually viable in their context.

Of course, there's quite a bit packed into these different dimensions. In considering your own work and relationship to innovations, a good place to start in terms of making sense of all of these is to ask if a given dimension listed here has practical importance in the context of your work. In short, as your organizations deals with different innovations, what "work" would it do for you and your colleagues to think about one dimension or another? If you are developing a curriculum that you intend to bring to many organizations, for example, perhaps consider its level of complexity. If you're an organization that constantly experiments and regularly brings new technologies into your programs, perhaps spend time focused on what the potential value add is of each of your new initiatives or technologies you're exploring. If you're responsible for bringing in new technological systems for your organization, consider what issues might impact its spread within the teams meant to adopt it. Naturally, these considerations are ones that many organizations in Hive NYC are likely engaged in already, we mostly aim here to provide language that might help facilitate these sorts of discussions.

III. Innovations in Hive NYC

In this section, we'll take some of the dimensions discussed above and more directly apply them to the Hive NYC context. First, we discuss the different forms of innovations present in the Hive and the implications that innovation form might have for practice. Following that, we discuss issues of 'degree' of innovations as they apply to the network.

Forms of Innovations in Hive NYC

There are of course different ways to think about forms of innovations, and not all forms are relevant for us here in Hive NYC. We offer a number of different forms of innovations below that were derived through ethnographic fieldwork, document analysis and review of web resources associated with the network, and specifically speak to innovation forms related to education and learning.[3] Below are the categories we see as most prominent in the network. See Appendix A for a "snapshot" of many of the innovations present in the Hive NYC network.

- **Disciplinary oriented pedagogical approaches** - youth game design, citizen science, and youth journalism, for example, are all about engaging youth in learning experiences related to particular professional or disciplinary domains. Some Hive NYC organizations have identities that are highly intertwined with educating around particular disciplines and have deep specialization in these areas, others engage in a wider range but have less expertise in any given one.
- **Design principles** - creating learning environments that are interest-driven, designing opportunities for youth to share work in authentic contexts, having youth interact with disciplinary professionals during a program - all of these can be considered examples of design principles. One tricky aspect of design principles as a form of innovations is that we've seen few examples of design principles being explicitly articulated by Hive organizations. So while a program, on analysis, may "match" particular design principles, a lack of articulation of those principles has implications for how such principles, as innovations, develop, spread and get adopted. A principle that does not get articulated remains largely

[3] Below we considered innovation forms that are directly related to learning environments and educational experiences for young people, and did not include innovations that relate the work of organizations in other ways. Things not discussed might include workplace technologies (database tools, crowd-funding platforms, collaboration software, etc.), and work routines (meeting structures, professional feedback practices, etc.). In a separate memo we more deeply discuss work routines that lead to innovations, those being "innovation practices" such as prototyping and iteration.

tacit and thus is likely harder to spread. Of course, a prominent set of articulated design principles relevant to Hive NYC are the Connected Learning principles.

- **Technologies** - being a technology-oriented community, there are of course many innovations that fall into this category. Some are ones developed outside of the network and then adopted (like MIT's Scratch) and others developed within member organizations. Technological innovations in Hive NYC can be further broken down into three categories:
    - *Design Tools* - which enable the creation of media in different forms. For example, The LAMP's Media Breaker tool.
    - *Online Communities* - which enable sharing, peer-to-peer and peer-to-mentor interaction and distance learning, among other functions. An example is Carnegie Hall's Musical Exchange community.
    - *Combined Design Tools & Communities* - for example, Mozilla's Webmaker site includes design tools like Thimble as well as community functions that allow sharing, commenting and remixing of "makes".
- **Curricula and Program Models** - NySci's C3 citizen science program, Global Kids' NYC Haunts series of programs, and Girls Write Now's Digital Remix Portfolio are all examples of program models or curricula - structured models of engagement with associated learning goals that configure interactions between educators and youth through a combination of technologies, design principles, and pedagogical routines. This form of innovation is of course the one most often directly supported through the Hive Digital Media and Learning Fund. As an innovation form it is distinct within Hive NYC as it often is associated with a stronger organizational affiliation than innovation forms like design principles and event models (discussed next), a distinction that has implications for the ways such innovations are developed and spread.
- **Event Models** - pop-ups, hack jams and capstone events can be considered a distinct form of innovations within Hive NYC. We see a lot of activity and experimentation in this area, with formats such as Maker Parties, Pop-ups and events such as WNYC's Digital Waves Festival going through their own cycles of iteration and adaptation. Similarly, year-end capstone events such as Emoti-con also fit into this category.
- **Pedagogical Routines** - icebreakers, share-out mechanisms, feedback and assessment routines, and youth collaboration routines might all be considered under the umbrella of pedagogical routines. These pedagogical routines might find their way into a variety of different program models, may be used in within different disciplinary oriented pedagogical practices, and can also involve technological innovations. At the same time, knowledge about such routines can be distinct and can accumulate in and of itself as a distinct innovation form.

As we allude to in the descriptions, each of these different forms of innovations within Hive NYC has distinct qualities in terms of the dimensions we outlined in Section II. Some might be might involve more or less complexity (e.g., curricula are usually more complex than design principles, for instance), some more or less abstract (a design principle vs a technology), some more easily shared across organizations (a pedagogical routine, a technology) while others, perhaps, more complicated when it comes to sharing for a variety of reasons including issues of intellectual property or concerns around fidelity of implementation (as in the case of many program models or curricula).

One thing you might notice in considering these various forms of innovations in terms of your own organization and initiatives is that there's often a "mash-up" effect that occurs across these forms - various innovation forms can be co-present in the context of a single initiative. As mentioned, pedagogical routines are often embedded within a particular curriculum. That curriculum might index a particular disciplinary oriented

pedagogical approach. A technology might be designed according to a specific design principle, and utilized in the context of an event model. And so on.

On the level of organizations, part of the value in teasing out these various forms is again to give Hive members more precise language to use when describing what exactly it is that they're working on, and when sharing those things across organizations. Organizations might have certain strengths and assets related to certain innovation forms, such as well-tested student feedback routines, or expertise in software development. Understanding where an organization's strengths lie in terms of the forms of innovations it specializes in can help it think better about both what it can offer as well as what it needs assistance in in the context of Hive collaborations. Additionally, this language can help organizations articulate where exactly they want to advance and refine their work and how they might circulate and spread different types of innovations they work on.

On the level of the network, thinking about the form of innovations has important implications for how the community envisions the impact it wants to have. For example, one way that Hive NYC as a collective might hypothetically conceive of "impact" could be by reaching as many youth as possible through development and spread of technologies nationally or even globally, be they design tools or online communities, since this innovation form can be distributed more easily than curricula. Another vision of impact might be through development and scaling of tried and tested program models or curricula that reach increasing numbers of youth either through community partnerships and hands-on "training the trainer" models, or, alternatively, through online distribution of curricula and less hands-on support for implementation. Or, impact might envisioned through the circulation and popularization of certain design principles or disciplinary-oriented pedagogies within national and international communities of educators.

Of course, these approaches to impact are not mutually exclusive, and the current state of Hive NYC points to priorities and capacities in all these areas of impact. The point here is that each vision prioritizes the spread of different forms of innovation and as such must conceptualize issues of spread differently. Each of these different strategies for achieving impact would need to think about strategies achieving scale in distinct ways (Coburn et al., in preparation).[4]

Degree of Innovations in Hive NYC

As discussed in Section II, one of the dimensions that might be considered in thinking about innovations is their "degree", which is often framed as "radical" versus "incremental" (Tushman et al., 1997). Again, this references the "value-added" dimension and therefore implies questions of how exactly something is radically better, or incrementally better, according to whom, and in what context. In terms of Hive NYC, we believe that this dimension, and its subjective and contextual nature, is quite important in terms of the implications it has for practice and the community's collective goals.

On the organizational level, we of course know that not all Hive organizations are the same, a diversity that can be considered part of the strength of the network. This diversity also means that for one organization an innovation might be considered a radical departure, whereas the same innovation might be seen as more standard for another. This is of course often the case in the context of organizational partnerships wherein the collaboration entails the usage of an innovation that is well established within one organization, but quite new to another. Alternatively, a given innovation might be seen an incremental improvement for one organization, but might still be considered a radical departure from the perspective of a broader field. Organizations can consider engagement with different innovations through these contextual lenses. Is their priority to be a field leader in terms of a certain area of innovation? Or does the current strategic direction of their organization

[4] The authors want to acknowledge and thank Cynthia Coburn and her team in advancing the HRL's understanding of this point regarding different strategies for fostering spread and achieving scale.

mean that they are looking more towards adopting existing innovations that others have pioneered as a means of adding value to existing program offerings? Of course, this again isn't necessarily an either/or question, but rather one that helps clarify the priorities and associated actions for a given organization.

On a network level, a consideration of this issue might mean the community prioritizes different objectives. One priority might be more oriented towards enabling the sort of capacity building that allows many Hive organizations to incorporate or adapt existing innovations and "level up", so to speak, in a variety of areas. Such a priority would perhaps mean that the fields Hive NYC is connected to would not experience radical departures in the form of innovations emerging from the network, but rather would mean that different organizations in the network *would*. Another priority, again not necessarily mutually exclusive, might be to support the development of innovations that could be considered radical departures on the level of the field, not just on the level of particular organizations. Each of these priorities would imply different types of coordinated action, resource mobilization and collaboration models in order to be achieved.

Finally, the nature of how the work of an organization, or the network as a whole, is *evaluated* is deeply connected to the goals it has in terms of radical departures or incremental improvements. Radical departures are by definition more exploratory, and so copious formative feedback through things like user testing, program pilots, small experiments and sense-making sessions after implementations is called for.[5] Applying existing formal and summative evaluations before a given innovation is well understood might mean that it gets judges according to standards that shouldn't apply, as opposed to understood in a way that would shed light on what standards of evaluation might be applicable down the line. This could lead to the exploration of an innovation getting cut short before its real value is known.

Alternatively, the practices for evaluating and assessing incremental improvements on innovations might be more formal. Pre and post tests that help understand whether certain learning outcomes are achieved allow for more targeted iteration. External evaluators might be called for if an innovation is at stage where there are plans for scale, for example. The key takeaway here is to apply the appropriate approaches to making sense of how an innovation is playing out based on the nature of the innovation itself - radical departures from existing practice inevitably need to be evaluated differently than incremental improvements (Institute of Educational Sciences and National Science Foundation, 2013).[6]

IV - Conclusion

The conceptual frameworks and considerations presented this brief are designed to be used by Hive NYC stakeholders as a means for reflection and basis for conversation. As organizations decide what they mean when they talk about innovations, these can be used as tools that help prompt questions about problems an innovation might solve, what larger questions it answers, what value it has and what standards it might be judged by. Ultimately, these are questions that both the individual stakeholders as well as the collective Hive NYC community must continually grapple with in order to be an effective context for networked innovation.

[5] The forthcoming HRL brief "Innovation Practices and Hive NYC" discusses certain practices related to exploratory innovation and associated formative feedback processes further.

[6] For more information on how different forms of research and evaluation are keyed to different stages of development of an innovation, see the Common Guidelines for Educational Research and Development.

Appendix A – Examples of Innovations Present in Hive NYC (Winter 2014)

Considering innovation quite broadly, the following list, compiled through a combination of ethnographic observation, document analysis and review of blogs and web sites, might be considered some of the innovations, in different forms, that are present within the network and its affiliated member organizations as of January 2014.

Disciplinary-Oriented Pedagogical Approaches

- Game design (analog, geolocative, mobile and "traditional" video games)
- Maker and "DIY" learning (e.g., physical computing, robotics, 3D printing)
- Citizen Science and Inquiry-based Science Education
- Writing, Poetry and Spoken Word
- Computer programming and web design
- Youth Journalism and Documentary (film and radio)
- Advocacy and Community Organizing
- Media Literacy
- Design and Design Thinking
- Digital Literacy
- Music and Music Production

Curricula and Program Models[7]

- Collect/Construct/Change (C3) – NySci
- Kickflip – Citylore
- Technovation Challenge – Iridescent
- #ScienceFTW – American Museum of Natural History
- Webmaker curricula– Mozilla
- Neighborhood to Neighborhood - Facing History and Ourselves
- NYC Haunts – Global Kids
- Click@MoMA – Museum of Modern Art
- many many others!

Design Principles

- Interest-driven learning
- Design-based and production-centered learning
- Youth co-design of learning and organizational leadership
- Incorporation of and exposure to professionals in a field
- Youth mentoring youth and peer learning
- Sharing of creations with authentic audiences

Technologies

Developed by Hive-affiliated organizations:

- Online Platforms or Communities
  - Urban Word's "Urban Word Live" platform
  - Carnegie Hall's "Musical Exchange" community
  - Iridescent's "Curiosity Machine" community and design challenges
  - NYC Writing Project's "Youth Voices" community
- Design Tools
  - The LAMP's "Media Breaker" tool
  - Habitat Map's "Habitat Map" tool and mobile app
  - NySci's "C3" sensor device
  - Parson's "Gadgiteration" hardware platform
  - Global Action Project's "Media History Timeline"
- Combined Tools and Communities
  - Mozilla Webmaker
- Misc
  - Iridescent's "Ether" Science Video Games
  - Mozilla Open Badges Infrastructure

Commercial tools and sites that are adopted:

- Blogging tools (e.g., Wordpress, Tumblr, Blogspot)
- Social Network sites (e.g., Facebook, Twitter, Ning)
- Maker Hardware (e.g., Arduino's, 3D printers, LEGO Mindstorms)
- Game design tools (e.g., Gamestar Mechanic, Scratch, ARIS, Tailblazer)
- Augmented Reality (e.g., Layar)
- Digital Portfolio tools (e.g., Figment, Voicethread)
- Video production and hosting (e.g., Final cut pro, iMovie, Youtube, Vimeo)
- Music production and hosting (e.g., Audacity, Garageband, Soundcloud)

[7] We want to acknowledge that many of the projects listed in this category were the result of collaborations between many Hive NYC organizations, some of which were not always evident. For this reason, we list the lead partner that we were able to identify. Inclusion in this list was also based on information available to us, and we limited the list based on space considerations.

IV. References

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