Hipopathy

Omoju Miller

University of California, Berkeley

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Statement of the Problem

One of the most interesting innovations that has occurred in the area of education is the rapid growth of the online education industry. In the past year, Stanford University created an online version of their introduction to Artificial Intelligence course. The demand for this class was so high, over 100,000 students enrolled in the class. Similarly in the past week, a $60 million online course collaboration between MIT and Harvard University, EdX was introduced. These two examples are but a few such innovations of its kind, in the education technology space. Online education platforms generate vast sums of student data. These data can be harnessed to help students become better learners.

At the onset of the online education revolution, most systems presented static learning materials. The approach to was the "*just-put-it-on-the-web"* kind. Materials that were designed for classroom learning were just presented in an online format. However, now we are beginning to extend our thinking about the affordances of online education systems.

Online environments give us the opportunity to create personalized education by building models of individual's goals, preferences, knowledge and culture. Where as before in traditional classroom settings, it is impossible to create a one on one teacher student interaction ratio. In online settings, we are able to do this. Furthermore, we can now start to create some technology-mediated solutions to some of the more pernicious problems in education, such as the failure of our standard education system to meet the needs of its diverse population (Lee, 2008). This problem is so in my opinion, because our current system fails to incorporate the role of culture in learning. No one has suffered more from this failure than low-income African American and Latino students. By refusing to meet the cultural needs of our students, the unintended consequence of our institutionalized intransigence is seen with the seemingly continual decline of America's academic standards when compared to her peers.

The student base of online education is a global one. In this new environment, we have to cater to an ever more diverse group of students, ranging in socioeconomic diversity, cultural diversity and age diversity. The global demographics have shifted and majority of the projected growth in the world population will be in developing countries (UN World population report, 2004). Of this growth, the youth population will account for a sizeable chunk. If this new students are the future users of our online systems, it behooves us to make it more culturally adaptive.

As great as the affordances are for online education systems, there are some glaring limitations. In a traditional classroom, the teacher performs an informal monitoring of the students. Through the daily face-to-face interaction, they are able to build a database of their students understanding. They know who will need more attention in a certain task; they can tell when the students are bored, and so on. These teachers have tacitly built a model of their classroom and can correctly predict the needs of their students. In our current online education environments, this informal monitoring is not as robust yet. In some cases, it is just not there. The emerging field of education data mining is making strides to ameliorate this problem, and it is in this arena where my education technology tool is situated (Mcgrath, 2008; Muehlenbrock, 2005; Romero & Ventura, 2007; Xu, Recker, & Hsi, 2009). Education data mining is an interdisciplinary field that includes knowledge from Computer Science, Education, Psychology,

Psychometrics and Statistics. The goal is to mine the large datasets that are generated by education systems to help educators create better learning outcomes for their students.

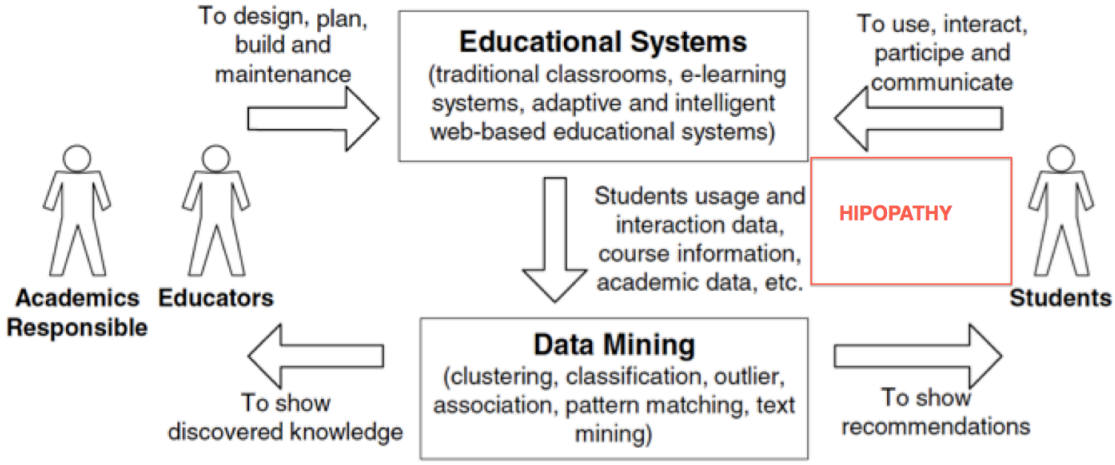

Figure 1, an improved Education Life cycle

The Hipopathy project is a tool that is designed to capture students cultural model through their analysis of hip-hop lyrics and an application of conceptual metaphor theory. In figure 1, I have envisioned the tool as being situated in the education lifecycle as an additional source of information that goes to the data mining system, whose output can be used by both the educators and their students.

Target Audience

This tool is designed for three users: the traditional classroom teacher, the student, and the education data analyst. The traditional classroom teacher can use hipopathy as a way of learning the cultural model that students have. Often times, students in urban environments are taught by teachers who may not come from that environment, because of their "outsider" status, students are not so eager to trust the teacher and allow them the opportunity to share their knowledge in an emotionally safe, secure and inclusive social environment. What is needed in many cases is a means to demonstrate empathy - a deep appreciation for another's situation and point of view. In the typical scenario of the urban classroom, the teacher can interact with this tool, to learn the cultural reasoning models of urban youth, which will start the process of empathy. This understanding will make the task of such teachers easier.

From the students' perspective, in their experience with this tool, they will be developing a skill that remains a core criteria of success, critical thinking. Critical thinking is a core skill that students should have because it prepares them with expertise for handling complex, novel and information-intensive tasks, especially in situations that demand initiative and independent thought (Cohen, Salas, & Riedel, 2002). The hipopathy tool is a means of making thinking visible and a way of developing higher order learning.

From the education data analyst perspective, the output of the hipopathy tool becomes a way to add cultural models to improve the quality of the knowledge that is

generated through the data mining process. Students' hipopathy outputs can be clustered to identify the various kinds of cultural models that their student base have.

The current version of the hipopathy tool is design for hip-hop text understanding. I made this design decision for the following reasons:

- Hip-hop is increasingly becoming a cultural universal
- It has become the ubiquitous language of youth.
- It has certain affordances in its ability to transcend social demographic boundaries.
- It has very vivid visual narratives.
- It is seen by the mainstream as something outside of the norm.

The urban student and hip-hop have a lot in common, they are both dispossessed by the main stream, they are both deeply misunderstood, they are both underestimated and they are both products of the American underbelly.

Cognitive Challenges

The cognitive challenges that hipopathy addresses are:

- The difficulty with understanding points of view in text.
- The difficulty with adopting an ideological stance that differs from ones own.
- The difficulty with extracting a coherent model of the cultural view of a writer from text.

Learning Objective

The learning objectives of hipopathy are as follows:

- I want the student users to develop the ability to see the underlying concepts that frame a discourse.
- I want the urban education teacher users to pay explicit attention to the cultural frame that urban music uses.
- I want urban education teachers to build cultural models or urban youth.

Theoretical Framework

Hipopathy is built on the theoretical framework of conceptual metaphors. Metaphor is pervasive in human language and thought and is crucial for both linguistic expression and human reasoning.

When people think of metaphors, what they often think of are literary metaphors. Literary metaphors are indeed a form of metaphor, but there is more to the story than that. This project is concerned with the use of conceptual metaphors in hip-hop lyrics, and how we can leverage the derived knowledge to support online education systems.

In the academy, they're two main views of metaphor. The first is the structural alignment view championed by Gentner. In this view, metaphors are analogies, and as such its theoretical base rest on similarity. According to structure-mapping theory of Gentner, human comparison or processing of metaphors involves a process of establishing a structural alignment between two represented situations called the source and target, and then projecting inferences from one to the other. This alignment is determined according to (a) structural consistency constraints, and (b) parallel connectivity, (Gentner, 2010; Holyoak, Gentner, & Kokinov, 2001; Holyoak & Thagard, 1989). The sentence, "A man is not necessarily intelligent because he has plenty of ideas,

any more than he is a good general because he had plenty of soldiers," (Chamfort), is an example of an analogy.

The other view of metaphor is that of conceptual metaphor, or the cognitive linguistic view as championed by Lakoff and Johnson. The conceptual view of metaphor states that a more abstract domain A is understood in terms of a more concrete domain B. In addition, this theory further claims that conceptual metaphors form the basis of human cognition. In this view, conceptual metaphors are gained through experiential learning by means of sensorimotor experience, perceptual experience, and cultural experience. This view is commonly referred to as the embodied view of metaphor (Feldman, 2006; Kovecses, 2010; Lakoff & Johnson, 1980, 1999).

If the theory of conceptual metaphors is true, then much of normal everyday thought is metaphoric. For example, in the case of the conceptual metaphor, IDEAS ARE FOOD, we use the physical domain of eating to understand the more abstract domain of ideas. This conceptual metaphor has its linguistic realization in sentences like:

(1) I can't *digest* what you are saying.
(2) Stop *force-feeding* me information.
(3) The students just *regurgitated* all the facts on the exam.

These sentences do not use the words ideas or food, but one can see that the two concepts are initiated in the understanding of the sentences. Just like the structure alignment theory, in the conceptual metaphor view, there also exist certain mappings that go from one domain to another. The major disagreement between the two views is that Lakoff and Johnson claim that the human brain, from its neuronal structures is a set of networks whose design in fact captures the existence of conceptual metaphors through the links that are created and strengthened over time. This theory poses an answer to the question of how the brain gives rise to thought and language.

Where as the Gentner view claims no such embodied basis, and regards metaphors as the by-product of analogical reasoning. The claim that conceptual metaphors may be the foundations of our neural-conceptual system may seem unfathomable or ridiculous at first; however, experiments have been carried out that confirms this hypothesis (Casasanto, 2009; Narayanan, 2011).

These ideas at first might seem foreign to educational research; however that is not the case. What these two views of metaphors are ultimately concerned with is how humans reason, and in particular how they reason about metaphors. For a while, I have been pondering the role of reasoning in learning and the role of reasoning rete large in educational research.

The simplest definition of reasoning is the process of drawing conclusions or inferences from information. In education, when we design assessments, what we are doing is creating a means for us to test what people know by designing assessment instruments that we hope help us gain access to students reasoning patterns. If a student's reasoning pattern aligns with what we believe to be normative, we conclude that the student has learned the content in which they are being assessed. Similarly, in the proposed improved education lifecycle in figure 1, the data mining knowledge extraction techniques can be viewed as formative assessments used to discover useful information to assist educators in establishing a pedagogical basis for decisions when modifying a learning environment.

Another area where metaphors have had a major role in educational research is in analogical reasoning. Analogical reasoning is a learning strategy that we use to create abstractions from multiple examples of a concept. It is this reasoning strategy that is employed when we learn categories (Kuehne, Forbus, Gentner, & Quinn, 1989). Similarly, it is also this kind of reasoning that is used to understand similes and analogies. Analogical reasoning has been used to create computer aided tutoring (Forbus & Hinrichs, 2004), to explain mathematical problem solving, and a way of understanding scientific reasoning (Gentner, Bowdle, Wolff, & Boronat, 2001).

The Hipopathy project subscribes to the conceptual metaphor theory and helps us understand the role of culture in learning. The following sentences are linguistic realizations of conceptual metaphors that are acquired as a result of cultural experiences that pertain to lived in realities of urban American youth. These metaphors speak to experiences that involve gang banging, resisting the perceived mainstream oppressive government, selling drugs and making tax free, untraceable money off of it.

(4) I'm only *slinging* raps to your kids
RAP MUSIC IS NARCOTIC STREET TRADE

(5) If you claim gangsta, then *bang* on the system
THE SYSTEM IS A BODY + RESISTANCE IS GANG BANGING

(6) Baked a lot of *bread* and kept if off the books
MONEY IS SUSTENANCE

In the previous examples, sentence (4) deals with the conceptual metaphor RAP IS NARCOTIC STREET TRADE. In this scenario, the language of source domain deals with the concept of illicit drug trade, to reason about marketing rap. In the context of the rap lyric this was taken from, the rapper is talking about slinging rap to kids in the suburbs. Sentence (5) uses two conceptual metaphors to understand resistance. The source domain language is that of gang banging. The government aka the system, is personified. The agent that is being referred to in the sentence is instructed to "bang" on the system, i.e. gang-bang, as the sign of a true gangster in the hip-hop sense. Finally sentence (6), uses the conceptual metaphor MONEY IS SUSTENANCE, to talk about making money and keep it all. In hip-hop, this is a common metaphor where food is correlated with money. Other slangs for money include dough, and cheese. This metaphor might stem from the fact that people who live in abject poverty sometimes have to go without food. As such, the correlation between wealth and sustenance is strong.

Why Hip-Hop?

At first blush, the idea that one would conduct a critical scholarly study on Hip-Hop might seem a fool's errand or a naïve pursuit by an uninitiated member of the academy. Others might think the genre not worthy of intellectual investigation at all. Contrary to these opinions, Hip-Hop is a rather complex art form filled with staggering measures of complexity and nuance. This work is not the first attempt at a scholarly exploration of metaphors in African American discourse, others have done some similar investigations (Crossley, 2005; Lee, 1993). An undertaking of this kind can give us deeper insights into the mental view of the creators of this music, and situate cultural differences as distinct phenomenon that can serve as positive resources for learning.

The insight we gain into reasoning patterns may shed some light on the reasoning and intellectual abilities of this micro culture, and perhaps give us some new indicators in

the development of culturally mediated reasoning. One really does not know what abilities are unless one knows how they develop. Reasoning abilities are not only critical aptitudes for learning, they are also among its most important outcomes (Snow & Lohman, 1989). Since rap is known for its novel use of metaphoric language, this study affords us a means of gaining appreciation for an often-ignored form of intelligence, a new dimension of abilities, and a different perspective into the nature of creativity that we have not yet explored (Alim, 2003).

In order to understand why I have chosen hip-hop lyrics as the data corpus upon which the hipopathy tool is founded, it is of utmost importance that the cultural milieu from which rap emerged is understood. Rap and Hip-Hop culture started in the late 1970s low-income neighborhoods of the South Bronx, New York City. This was the era of "Reaganomics," where deep cuts where made to social programs in the United States (St. Pierre, 1991). At the same time, there was systemic dismantling of industrial jobs in the cities, which led to increase unemployment, which was particularly more acute in the urban areas of our nation. The 1970s also saw the beginnings of a post-civil rights malaise that was the result of the tumultuous political environment of the late 1960s. The youth of this era had lived through the assassinations of the Reverend Martin Luther King Jr, Malcolm X, President Kennedy and Robert Kennedy. In addition to these killings, there were massive race induced riots in the urban areas of America, including Watts-Los Angeles, Newark-New Jersey, Detroit-Michigan and so on. The effect of all these things was the creation of an urban core that was filled with apathy, joblessness and overall dystopia. It was this shattered environment from which Hip-Hop culture began. It is for this reasons that I believe Hip-Hop might appear rather anti-establishment and rubs us the wrong way (Neal, 2004). Hip-Hop is the culture of rap; it includes other art forms like graffiti, dancing, deejaying and so forth (Alim & Pennycook, 2007; Söderman & Folkestad, 2004).

Description of Designed Technology

The hipopathy tool is an online application built with the python web framework django. The reason why I chose django is because it is a python framework that will plug in easily into my proposed education framework from figure 1. Django framework is advantageous because it creates two views for the app, an admin view that is accessible too the knowledge engineers and a client view that is accessible to the users. Figures 2 through 4 show some screen shots from the client view of hipopathy.

Use Case

1. Student logs on to the web site;
2. They are given a little synopsis of the tool and the motivation behind it.
3. Students can choose from Jay-Z's catalogue the song that they want to begin with.
4. Once they decide on a song, they are given a verse to read and asked to come up with cultural frames they believe the author is trying to communicate to them. Students continue to do this until they reach the end of the verse.
5. At the end of the cycle, they submit their choices and are shown how closely or how far their ideas are from what the author was trying to communicate.

Two years ago, the artist Jay-Z published a book called *Decoded* in which he systematically went through a big chunk of the songs he has written and analyzed his lyrics with particular emphasis on the metaphors he was using, why he was using them and the cultural frames he was hoping to evoke in the mind of the listeners. Because this data exist, I could build a repository of the songs, chunk it into snippets and tag each snippet with the associated cultural frames given by the artist and develop this tool. The first version of this tool will be limited to the songs that Jay-Z has analyzed in his book.

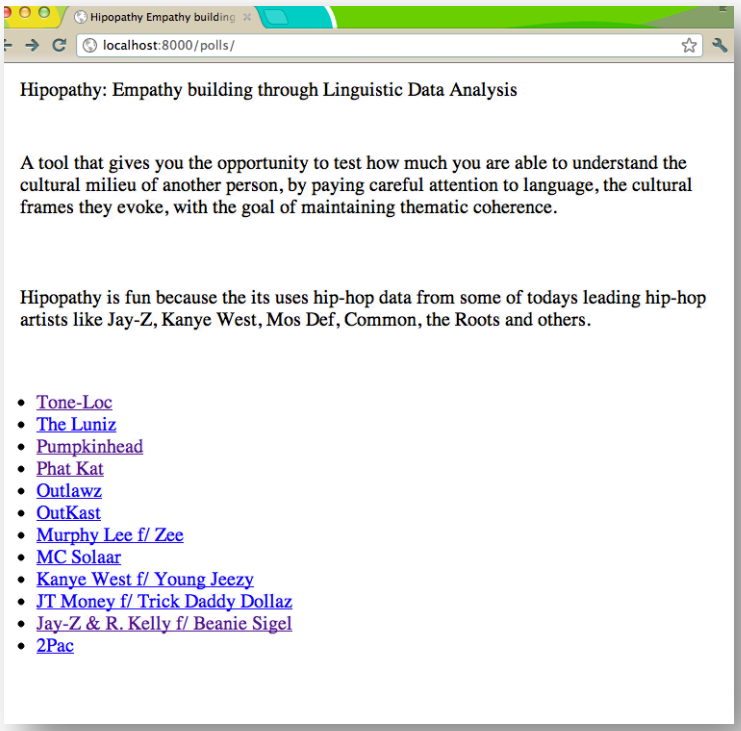

Figure 2, Hipopathy [1]

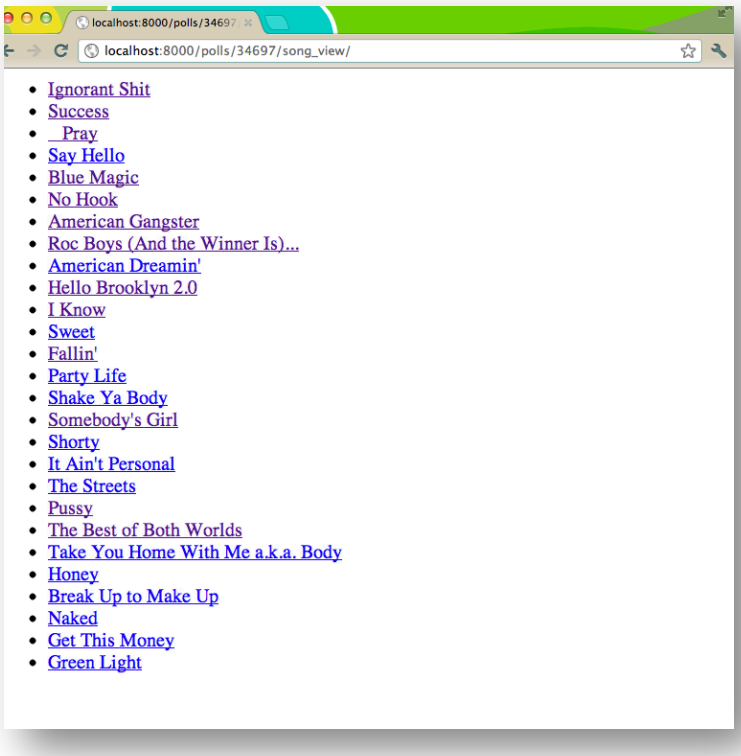

Figure 3, Hipopathy [2]

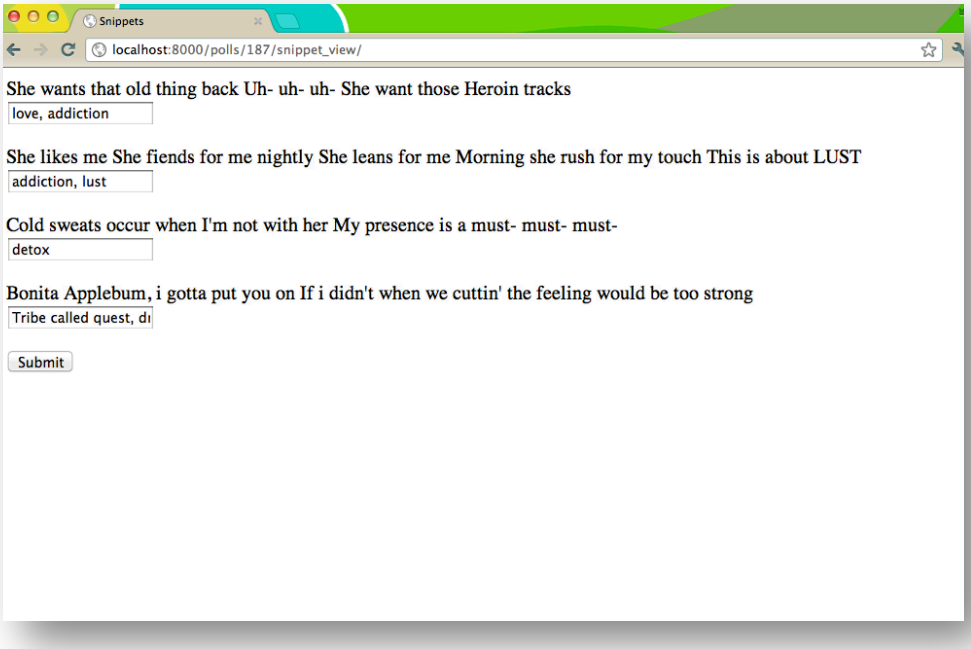

Figure 4, Hipopathy [3]

Lyrics	Artist Concept	User Concept
She wants that old thing back Uh- uh- uh- She want those Heroin tracks		Addictive music, heroin
She likes me She fiends for me nightly She leans for me Morning she rush for my touch This is about LUST	addiction, lust	Need
Cold sweats occur when I'm not with her My presence is a must- must- must-	detox	Desperation, desire
Bonita Applebum, i gotta put you on If i didn't when we cuttin' the feeling would be too strong	Tribe called quest, drug, sex	overwhelming

Figure 5, Hipopathy [4]

Design process

In the design of the technology, a data model was created to capture information. The most important data classes created are artist class, song class, snippet class, userdata class, and album class. There are several other classes, which are not listed. Figure 6 shows the relationships between the classes. Each of these classes captures information about artists, songs, album, snippets and userdata. A snippet is a unit of lyric that a user can analyze.

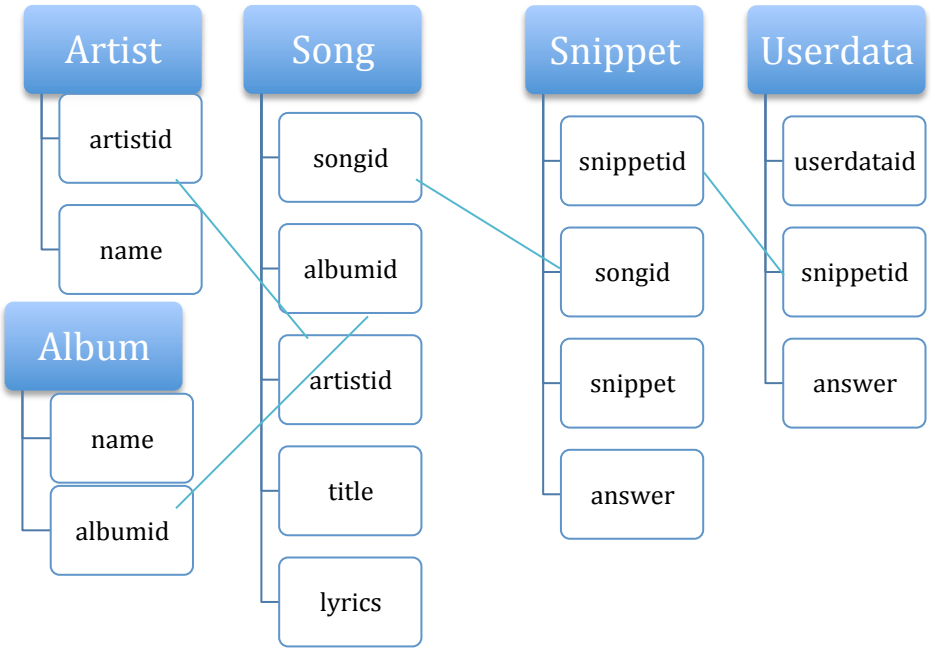

Figure 6, Hipopathy Abbreviated Data Model

Assessment and Pilot Study

A pilot study was done with one user, who is an Asian American female, age 25. I gave the user an overall sense of the projects and asked them to use the tool paying

careful attention to the language and any ideas that it evoked in their mind. The user was left to use the tool for a period of 20 minutes. After this, they were asked to recounts the thoughts that ran through their mind as the read each snippet. This data was written down. I was unable to finish building the visualization that I had proposed in the initial project; instead I gave the user a printed copy of their inputs versus that of the artist input.

The first thing evident was the fact that the user retelling of the ideas that came through their mind was different from what they actually put down. For some reason, the user started self-censoring. Upon further conversations with her, she reflected that she was not clear about what to do, she did not know if she could use the same words twice, and she could not decide between put down the emotion that was evoked versus the image that was evoked.

Future Direction

If I had ample time and resources I would redesign the tool by:

- By heavily scaffolding the idea of a conceptual frame to the students.
- By explicitly stating and restating the goal of the lesson.
- I would create a video that talks about the projects and shows an animated demo of the tool.
- I would implement a computation engine to create a better version of the results that would display them in an appropriate visualization.
- I would build a visualization of all concepts in the system.
- I would add a feature that lets people highlight words that suggest the concepts that are evoked.
- Keep a record of old work, so users can see their progression over time.
- Finally I would add more songs.

Based on this project, I am beginning to realize that culture plays a role in shaping our reasoning as is evidenced in our everyday language. It is my hypothesis that the neglect of the role of culture in cognition is one of the fundamental reasons why the mainstream education system, which is designed as a one size fits all system, is incapable of adequately educating students who come from diverse cultures. However, with the increasing adoption of online education institutions, we can now move forward with the creation of custom learning modules that are adapted to the ways in which our students reason and learn.

Using urban hip-hop as a sub-culture in the United States, I am beginning to understand how cultural factors can produce different conceptual metaphors. Since culture plays a role in developing the conceptual metaphors that we have, it is incumbent on us to exploring avenues in which these kinds of reasoning can be integrated into urban learning environments. We need more scholarship in this area to understand how we can leverage what we are discovering about culture, reasoning and cognition to gain larger impact in the education of urban and global youth. One of the main reasons why I am interested in this area, is the fact that hip-hop culture has found global mass adoption, because of its far reaching nature, I am persuaded that there is something to the way in which knowledge is organized in hip-hop that leads to its mass appeal.

In conclusion, I hope that an investigation of conceptual metaphors in hip-hop can begin to gives us a different view into the nature of linguistic intelligence. Furthermore, I

hope this research helps us to discover new designs of online education technologies that will do a better job of supporting the diversity of student reasoning.

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