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Designing informal learning spaces to support STEM identity development for Oromo youth in
the diaspora: A Situative perspective

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Abstract

What does it mean for East African Immigrant adolescents to see themselves in STEM? What does that look like and how can this be approached? Although there are recent studies on how to support identity development and negotiations, and on students “seeing themselves” in science, in the context of informal science learning spaces, this has not been explored with the East African Immigrant population in the United States. Students from the East African Immigrant population possess identities that face layers of marginalization that include language, race, and socio-economic status. In this conceptual paper, I identify design characteristics that I believe will support the STEM identity development of adolescents from the East African Immigrant community in Seattle. I explore research studies that take up identity, and focus in on how these studies are organizing and designing learning spaces to support STEM identity development. In addition, I examine the practices they are incorporating to support identity development. I argue that a Situative perspective to understanding identity, its relationship to contextual factors, is important to understanding my target population and their experiences when thinking about designing STEM learning context to foster STEM identity development. This perspective takes

into account the complexity of context, learning, identity development, power, and positionality- specifically, how the organization of a learning space can support or hinder motivation to engage in learning and identity negotiation. Through this research, I have come up with a set of principles of design and practices that I believe will support positive STEM identity development for my target population. I hypothesize that the following principles will support identity development; students seeing themselves in their learning spaces, connecting what students are learning to their own lives, and the practice of positive positioning and to teach resilience through dialogue. What this means is the intentional practice of valuing student participation, contributors to learning space, and as STEM learners. As well as making aware the challenges they may face in their learning and future learning experiences. These principles combined provide practices that culturally and educationally are valued to the East African Immigrant community. In this paper, I expand on these principles and their importance.

Importance of Research

Underserved high school students from the East African Immigrant population have very few opportunities to engage in STEM learning that is designed and structured to support their STEM learning and identity construction as learners in the field. Or to provide space to discuss culture and their lived experiences in connection to their learning. Jackson et al. (2016) argues that students from underrepresented minority (URM) communities lose interest and motivation in science-related fields because they do not see science careers as potentially culturally relevant careers. Hughes, Nzekwe, & Molyneaux, (2013) share that access to role models is a challenge for students who are underrepresented in STEM. Oakes (2000) shared that in addition to the lack of access to local experts in STEM fields, there is a lack of access to materials to support learning. (as cited in Barton, p. 190), raising equity concerns. African-American/Black students face a history of marginalization, disproportionate resources and funding in education compared to white students (Nasir 2012, p. 146). The importance of this research addresses equity and access concerns for my target population and one approach to designing a space to provide exposure to STEM domains in way that addresses these concerns.

The STEM field and opportunities within STEM are growing. If adolescents from the East African population lack access to these opportunities, then they are lacking access to meaningful learning experiences that will foster positive STEM identities, and potential learning trajectories. Hughes et al. (2010) share that historical views of STEM and the STEM field are viewed as white, middle class, and predominately male, and these views impact whether a student further pursues education in STEM domains (as cited in Aschbacher et al. (2010). This is challenging given that recent research shows there are increasing work opportunities in the STEM field, but

research shows that the projected amount of college graduates with STEM majors will not match the projected increase in jobs, with a deficit of 1,000,000 workers in the STEM workforce over the next decade. (Oyana et al. 2015). There is a small percentage of people of color who choose a career in STEM once they begin college, or who graduate college with their first degree in a STEM field. (US Census 2011). Census data also shows that people of color are disproportionately represented in the STEM workforce. (US Census, 2013). In addition to addressing access and equity concerns for my target population, the importance of this research stems from the demand for professionals in STEM fields and the disparities in STEM employment by race. (US Census, 2013). This also stems from my interview of East African students in the diaspora regarding their lived experiences in math and science courses, and not having access to engineering courses or programs in their high schools. STEM identity is taken up as important for my target population because of its connection to STEM persistence. (Hughes et al. (2013). Survey results from a pilot coding course for East African youth found that 75% of students in the course state that their high school does not provide a STEM career or coding course both during and/or after school. Skills in the STEM field, particularly coding, math, and knowledge of technology are important skills to have in this generation. These skills provide tools to innovate and create in the STEM field. Lack of exposure to educational resources in STEM can be interpreted as a factor that contributes to the lack of opportunity to establish a positive STEM identity, contributing to the lack of representation of students of color, more specifically Black/African-American/East African Immigrants students pursuing STEM education and careers. This conceptual paper will continue the discussion of the importance of the organization of context to support STEM identities, and will become the foundation of principles of design to support positive STEM identity for my target population.

Target Population/Community Description

The target population for this paper is the Oromo Immigrant diaspora because I am from this population and work with many middle and high school students from this population. The Oromo people are one of the many ethnic groups who reside in Ethiopia. Many also live in neighboring countries Somalia and Kenya. Oromo people are the largest ethnic group in the Horn of Africa. Most Oromo people who live in the United States arrived as refugees in the late 80's, 90's, and early 00's. Their arrival to the United States was a challenge because families did not know the language, culture, and systems (bank, loans, housing, education, etc.). As a result, many students and families from this population heavily depend on community services and school supports to navigate their new lives and their children's lives. For example, In Seattle, Seattle Parks and Recreation after-school and summer programs were opportunities for Oromo elementary and secondary students to engage in sports, field trips to museums, Pacific Science center, The Flight museum, and activities they otherwise wouldn't have access to, usually provided at no cost to the families.

In schools, having one school staff who spoke both *Affan Oromo* (Language of the Oromo people) and English assisted in the transition into the American education system. This person would explain new things like standardized testing and what it meant for their children to be English language learners were valuable resources and essential to their experience and transition. The first establishment of an Oromo community center in Seattle, WA was in the late 90's. This community center was established to provide a space for gathering for all Oromo's in the diaspora and a form of social services that assisted new coming refugees in settling into the workforce and housing. These are just some of the examples of challenges this population have

faced and are facing. Among these challenges, are the challenges of being Black in America, and a Black Immigrant in the education system. Oromo people identify as black and are identified as Black. The African-American/Black population have been historically marginalized in many ways, and have had to negotiate what Nasir (2012) would describe as racialized identity, and micro-aggressions in the education system. For example, high school students from the Oromo diaspora community usually come from low-socioeconomic backgrounds, lack access to vibrant and culturally relevant education, and lack of access to STEM learning experiences that are tailored to foster their STEM identity. Formal education does not provide space for Oromo people in the diaspora to connect their culture to their learning. Opportunities to see themselves in potential roles and their culture in practice together has not been provided to this population. As previously stated, among these disadvantages are access to meaningful learning experiences in STEM education, and experiences that represent them, their culture, and lived experiences. Students from the Oromo community have strong values and beliefs that have been passed down through oral history over generations. Among these values and beliefs are the importance of giving back to our community, being involved in our community, learning through social and community interaction (i.e., Family, elders), and upholding your identity as an Oromo.

Oromo's have a unique history before their arrival in the United States and leaving Ethiopia. This specific ethnic group faces systematic oppression and has for decades. The Oromo language was banned up until 1991 to pressure this population, the largest ethnic group in Ethiopia, to assimilate and accept this new national identity of 'Ethiopian.' In the traumatic events, that followed the persecution of Oromo people who resisted and the wars in Ethiopia, many fled Ethiopia for safety and to begin new lives in a new country. In their arrival, they made sure to

move to areas where other Oromo people were living because of their desire to be around others who they can relate to and who have similar lived experiences. For those in the Diaspora, social media and technology have been tools to connect us with other Oromo people. To bring these events that most Oromo immigrants in the United States have experienced, identity and resilience are valued to the Oromo people and those in the diaspora. Many in the diaspora have built community centers, organize events, language classes, and cultural shows to not only bring the community together but provide a space for the opportunity of dialogue and connectedness of those in the diaspora.

Those in the diaspora value experiences with members of their community, because it is in these spaces when we feel connected with those around us, and feel as though we belong. This can be said about the East African Immigrant community as a whole. Identity and relatedness are values of the Oromo people. To know who you are, where you come from, and those who are connected by kin and tribe are you in the flesh, are core values for the Oromo people.

Oromumma, is a word in *Afaan Oromo* (Language of the Oromo people) that has a stretch of meanings. These include who you are, your culture, your tribe, your lineage, your pride, and the value of your Oromo identity, your people, and historical values. Learning and education, is valued as tool of understanding language, culture, history, and law. *Oromumma* in the context of education, can mean understanding who are in connection to learning, and the importance of your presence in what you are learning. To share down skills and understanding of ways to benefit your community and your people as a whole. Many Oromo people in the diaspora are very connected to their families and people who live in Ethiopia. It is important to be present members of your community and it is looked down upon to disconnect from your people, even in

foreign land. Identity is an important concept in this conceptual paper because I attempt to conceptualize identity development in relationship with a person's social experience within a learning context. For Oromo youth in the diaspora, from the perspective of Oromo culture and its importance of valuing yourself and your community, learning through a social process include making connections to learning, and seeing its value for oneself and the larger community. Those in the diaspora value seeing themselves and learning from "one of their own." Designing learning spaces that incorporate the values of this population, teaching forms of resilience, and for students to see themselves in the roles of engineer, scientist, or mathematician provides, and exposure to their potential selves, I believe will foster positive STEM identity development. Oromo adolescent students in the diaspora will have the opportunity to begin to transform their experiences with STEM, and their STEM identity when given the opportunity to in a space that is designed to do so.

STEM informal learning spaces/rationale

Why STEM education in informal learning spaces? Over the past 20 years, reports have been published on the effectiveness of informal STEM learning spaces. In general, the reports suggest that informal learning spaces provide opportunities for expanded learning opportunities and exposure to different STEM subjects and fields. (Oyana et al. 2015). Informal learning spaces provide an opportunity for a rich and tailored learning experience. In contrast, formal learning spaces which are usually classroom-based with curriculum aligned with state standards and do not always allow space for alternative learning experiences. Gresalfi's (2009) research suggest that structured spaces position potential outcomes if structured and designed to support a specific outcome. Design-based research is an approach that has been used to increase engagement in the

STEM domains and collaborate with both formal and informal learning settings to improve specific learning outcomes. (Bell et al. 2009). My interests in STEM informal spaces are aligned with what I have discussed and give me, as a researcher, the freedom and flexibility of design and practice. These spaces could build on existing cultural practices of the Oromo people in the diaspora, who participate in informal learning spaces through gatherings and discussion.

Dialogue and connecting culture to learning as a practice has been done historically for this population. In what is called *Walgahee*, a gathering that is for a specific purpose and action, whether it is to raise money, inform of local news, an opportunity to share goals with members of the community and connect. Dialogue and discourse, for example, the oral passing of events, and through interactions with knowledgeable others are practices within these informal spaces that are important to this target population. This is similar to the view of learning as a cultural process that involves facilitation and guidance from others (Bell, Lewenstein, Shouse, & Feder, 2009). Informal learning spaces are less constrained and offer opportunities to incorporate valued practices, and for new identities that a traditional formal learning space do not provide my target population. (Bell et al. 2009). In these spaces, there is more freedom to focus on student understanding and more complex objectives rather than specific learning outcomes. There is the opportunity to learn beyond the classroom (Bell et al. 2009), and there are opportunities to focus on fostering how students see themselves in relation to what they are learning, and whom they imagine themselves as. These spaces would be as Holland (2005) would describe as figured worlds. Holland (2005)'s concept of figured worlds and identity-in-practice discusses how positional identities are formed and developed in these "figured worlds" or what I call, learning spaces. (p. 125). To connect this to learning in informal learning spaces, it essential to note how in these spaces, the objective of fostering and transforming STEM identity is possible through

the principles I will further expand on. Which are connecting content to culture, practice to the real world, access to knowledgeable others, and engaging in meaningful discourse that supports positive positioning and discusses resilience.

Taking up new identities can be a challenge in a new space if not intentionally fostered. It is essential to look into how children engage in learning and what influences how they participate and engage in learning. (Brickhouse, Lowery, & Schultz, 2000; Carlone, 2004). There are few conceptual frameworks regarding what meaningful learning looks like, and what learning as a cultural and social process is like for students from East African Community. Through the review of the literature, I have looked into studies that have taken up identity and have designed learning spaces to support identity development. In my search, I looked into different ways learning spaces were designed, what practices were used, that were connected with positive identity development outcomes.

Through this review of literature, I have developed design and practice principles that I hypothesize will foster positive STEM identity development for students from the Oromo population and general East African population here in the United States. To address the problem of lack of representation in STEM workforce and lack of exposure to meaningful learning experiences, we need to think about STEM identity, identity development in connection with community values. In this conceptual paper I take up identity from a Situative perspective and expand on what that means while looked into studies that take up identity, and design spaces to support STEM identity. I looked to see if there are patterns in practice and design in my review of the recent and relevant literature. Through this review, I developed core principals of

design to support positive STEM identity development for my target population and will expand on later in the paper.

Situative perspective on identity, learning, and organization of context.

For this conceptual paper, I take up the meaning of identity from a Situative perspective. This perspective is taken up because it emphasizes the relationship between the learner and context. Similar to the Oromo Culture, is the belief that people are connected to their land and the people around them and their history. This perspective looks into power, how learners are positioned, the interactions that take place, tools/materials, discourse, and the design of learning spaces. (Nolen et al. 2015). Learning as a social process positions learning as a social experience that includes people, content, tools, history, and activities. (Nasir 2012). This perspective looks into who has power, how learners are positioned as they are learning, what discourse is occurring, and relationships within a space. (Nolen et al. 2015). Identity, from a Situative perspective, is understood as socially negotiated. (Nolen et al. 2015). (ie.) Identity is understood as how people see and understand themselves in relationship to what they are learning and how others see and position them. (Nolen et al. 2015) (Holland, Lachicotte, Skinner, & Cain, 1998). Understanding identity from this perspective provides opportunity to analyze how individuals see themselves and how others have positioned them in the social world and in learning spaces. (Nolen et. al. 2015). This perspective is important to my research and to the design principles because it takes into account the complexity of learning experiences and how people take up identities provided in a learning space. One of the future goals of this design is to afford positive STEM identities for Oromo youth in a way that they can connect and relate to.

Within a social context and experience are when opportunities to take up new roles or identities are afforded. Adams, Gupta, & Cotumaccio (2014)'s research looked into the identity development and interest of young women of color as they participated in an out of school science program. This program provided exposure to many different science careers, professionals, and topics that influence their interest in science, how they viewed themselves in relationship to science, and imagine themselves in these roles. Adams et al. (2014) research is aligned with my understanding of identity development and how an individual interacts with their experiences. Young girls were positioned as competent and had access to meaningful learning opportunities to take up these new identities. To understand narratives and its connection to identity it's important to critically analyze how identity emerges within a social context. This is related to Nasir and Hand (2006), "Who one is, and who one is on the process of becoming through participation" (p. 176). This is powerful to the concept of identity because identity is not a fixed and permanent state, it is a process, it is ongoing, and is linked to social factors (ie. Positioning) that can help build or break down identities. Identities change depending on context and what is made available to reconstruct identity narratives, and is a constant process. (Anderson, Valero, & Meaney (2015). This study created a space where young girls engaged in science and were given chances to change how they engaged in science. Holland (2005)'s would describe Adams et al. (2015) research as taking place in the figured world of science learning.

Figured Worlds

Holland (2005)'s concept of "Figured World" as practices and socially organized produced phenomena is useful in considering the design of learning spaces to represent the figured worlds

of STEM disciplines. These spaces provide opportunities to take up or even transform identities in figured worlds of STEM, and emphasizes social interactions and positioning. Similar to Kane (2016) discussion of figured worlds and the influence of peers, narratives, structures that influence the science identity development of the two African American boys in the study. Leading me to questions of how East African Immigrant students are positioned throughout their learning experiences with STEM content and how will learning in an out-of-school space look like and how can it be designed to support positive positioning and overall STEM identity development for my target population? Holland (2005)'s figured worlds is invaluable to this conceptual paper because it allows me as a researcher to see how narratives impact identity and have the potential to create a space with the intention to transform an individual's identity, and relationship with STEM learning. To build on Holland (2005)'s concept of figured worlds, I lead my discussion toward learning in informal learning spaces. Master & Meltzoff (2016)'s research found that students from high-SES backgrounds have more opportunities to "charge up their skills and motivation in STEM" through exposure and access to STEM subjects and learning experiences. Master and Meltzoff (2016) suggestion of interventions to increase STEM motivation and participation are essential to students from lower-socioeconomic backgrounds.

The Organization of Informal Learning Spaces

Nolen, Horn & Ward's (2015)'s situative perspective on motivation emphasizes the organization of contexts and what is available in those contexts, and their impact on participant motivation to engage in learning. Nolen and her colleagues take a deeper look into the learner-in-context and how the organization of context, tools and resources, and discourse impact a learner's motivation. Nasir and Hand (2006)'s practice-linked identities takes the route of understanding

identity linked to practice and the importance of belonging in a learning setting. Nasir and Hand (2012) conceptualize identity in a way that taps into how a learner views themselves and how a learning setting can support learning and identity development. Thompson (2014)'s research titled *Engaging Girls' Sociohistorical Identities in Science* examined the question, "What does it mean for ethnic minority girls, who have historically been marginalized by schools, to "see themselves" in science?" Thompson (2014) examined how high school girls from minority, ethnic backgrounds, engaged in science. It was found that giving ownership in design, opportunities for discourse to share their thoughts, exposure to professionals, opportunities to build on narratives about themselves and potential selves, and positive positioning supported participant identity development. The study took place during lunchtime, informally. The goals Thompson (2014) study aimed to examine how girls from ethnic minority backgrounds engaged in science, and the relationship between how they engage, identity, and discourse. Thompson (2014) and Hazari, Cass, and Beattie (2015) would agree that access to professionals who were willing to cross boundaries in establishing positive professional relationships with young students will support the positive identity development of Oromo students. What is interesting about this study is that science learning was not the focus, it was valued, and viewed as a byproduct. This research provided insight into the design of the learning context and what practices increase engagement and influenced how participants engaged. Positioning participants as competent learners as a way to promote learning provided opportunities to engage in both historical and personal narratives when learning and during discourse. An additional design that resonated was that the study purposefully created a learning space that was arranged in a way that allowed participants to learn science, about themselves, and relating their experiences to their learning. Findings from this study indicate that seeing science content as relevant,

participants positioned as competent, and incorporating current and historical narratives into discourse positively influenced identity development and learning. Thompson (2014) would agree with Nasir's (2011) thoughts on context, tools, materials, and people, and their influence on how students navigate and negotiate identities are important to that process. From Thompson (2014) research, I hypothesize that students seeing themselves in their learning spaces will foster positive identity development.

A second principle I have developed is access to materials that enhance learning experiences. Nasir and Cook (2009) go into depth in studying learning and the identity development within the informal learning space of track and field. Three resources were discussed to support student's identities in track and they include material resource, relational resource, and ideational resource. To expand on Nasir and Cook (2009)'s discussion of materials as a resource, it can be interpreted as the organization and physical space of a context and the tools accessible that supports a participant's relationship to practice. Relational resources can be understood as the relationship and connection a participant has to others within a context, and practice. Last, Ideational resources can be understood as how one views themselves, or sees themselves in relationship to practice and in the world. Resources were made available in a learning context and taken up during interactions. In this study, coaches positioned what was being learned, track and field, as valuable in supporting student academic success. These resources were found to support identity and learning within the context of track and field. In the context of a coding course, this can be described as a course where all adolescent participants are from the Oromo Diaspora and experts in the field reflect the participant population. Practices within this space would include those that reflect positive positioning and the discussion of how content is

connected to future academic success. Hughes et al. (2013) research findings align with students having access to experts in the field that reflect their population because in their research it was found that students having exposure to role models, having a positive view of these role models, and making personal meanings of STEM content to their own identity are critical to their STEM learning and identity development. “For underrepresented groups in these fields, the added component of role models is even more important in that these individuals need to see that there are people like them persisting in STEM.” (Hughes et al. 2013 p.1984). Connecting learning to students lives, practice, and potential future is an important practice because it does not treat learning as a context-based, but connects learning to a broader field of STEM and the world. In the context of a coding course, learning to code to build a game would not be sufficient in connecting learning to ones lives. But reframing and connecting coding to social media, tools to innovate and create, forms of communication and connection to the broader world, reframes learning and connects coding to the world.

In thinking of designing learning spaces, (Rosebery, Warren, Ballenger, & Ogonowski, 2005) would suggest that educators may support learning through drawing on students understanding of concepts outside of school and in their daily practices. Nasir and Hand (2006)’s research found that distributed nature of problem-solving, access to experts as a part of their practice were part of the design of out-of-school settings that increased engagement in learning. Features of informal learning spaces that increase learning and engagement have been found to be linked to as what Nasir and Hand (2006) states, “Engagement, then, has to do with students’ feelings of competence and mastery in a social context, as well as their sense that the context will offer relationships that support and value their unique selves.” (p. 147). This study sheds light on the

importance of access to opportunities for incorporating aspects of themselves and culture into their activity (Nasir and Hand 2006), and *access to the domain*, which for this paper, I interpret as access to forms of knowledge and skills in a field (i.e. STEM, coding).

Positive positioning as a practice

Positioning and belonging are reoccurring designs and practices that offer participants in an activity the opportunity to engage in learning in a way that values who they are and what they bring to the classroom. To further explain, an individual may be more engaged in practice when they feel as though they belong and have a feeling of closeness in those learning spaces. To draw on data from the learning experiences of students from black communities, it is important to note how positioning from either a teacher or students impacts how students participate in their learning, and negotiate their identities within a learning space (Wortham 2004). Kane (2016) research on personal narratives in science education can be viewed as an extension of Wortham (2004)'s, discussion of narratives and how teachers and peers, and narratives constructed and imposed on students impacts a student narrative of themselves in connection to science. To expand on how identity is made sense of from a Sociocultural Perspective, Nasir (2012)'s book *Racialized Identities* discusses the connection between learning and identity and the importance of not only providing a quality education, but also supporting positive academic and racialized identities and being aware of what racialized identities mean. Support of a positive STEM identity is critical for the target population because research shows that this population is unlikely to pursue STEM degrees (US census 2013). To take up identity as a construct and as means of opening doors to positive learning experiences and exposure to the STEM field is important because it not only provides an experience, it provide an experience to new learning

and career trajectories for my target population. It provides opportunities for the STEM field to take heterogeneous approaches to their work by diversifying their workforce, and the ideas of their workforce. As previously stated, Jackson et al. (2016) argues students loose interest in STEM because future careers in STEM are not viewed as relevant, and can be interpreted as they do not feel as though they belong. Jackson et al. (2016) findings suggests that students who entered college with the belief that science will benefit their communities, developed a strong science identity. Jackson et al. (2016)'s findings also demonstrate that underrepresented minority students became more interested in science careers once they understood that contributing and helping others can be done through such careers. It is addressed and argued that science education should find ways for students to authentically identify with STEM domains to sustain participation, and retention. In thinking about culture, learning and identity development, this article directly addresses culture and the importance of students seeing themselves in science. This is related to the Self Determination Theory which shares that within a learning context, motivation to engage is more likely to increase in the presence of relatedness in a space, and feelings of belonging, and secure relationships. (Ryan and Deci, 2000). Feelings of belonging and the presence of relatedness is important to my target population because of the historical events of being "othered" in their home land of Ethiopia. The Oromo youth in the Diaspora have experiences and grew up listening to the stories of discrimination, marginalization, and persecution of their relatives, and larger ethnic group. To be Oromo and to openly identify as Oromo is an act of resilience and declaration of who you are. To be in a space where people understand that struggle and experience is important to the culture. A sense of community of not only identifying with one another, but understanding one another experiences as member of not only the Oromo Diaspora community, but member of international Oromo community is

valuable when thinking of who we are designing for. I'd like to draw upon the idea of relatedness and what that means in the context of designing learning spaces for my target population. I have conceptualized relatedness as meaningful relationships, relating and connecting with others within a space, and feeling as though you belong; a sense of being at home. Hughes et al. (2013) propose a solution to improve student STEM identity in their research on middle school girls who participated in informal science learning. Hughes and colleagues proposed that, "One proposed solution is to improve students' STEM identity—their ability to see themselves as the kind of people who could be legitimate participants in STEM through their interest, abilities, race, gender, and culture (as stated in Brickhouse et al. 2000; Carlone and Johnson 2007; Ong et al. 2011; Polman and Miller 2010). I agree with this proposed solution because it aligns with Stevenson & Clegg (2011)'s concept of possible selves and aligns with my belief that seeing someone like me in a role begins to reshape my beliefs of what I am capable of. To provide the opportunities to imagine themselves in these roles and as people who can participate and contribute to the STEM field is a valuable experience to my target population because there aren't many opportunities afforded to them in a way that they can relate, connect, and identify with the people and content they are learning. Hughes et al. (2013) would agree with Ryan and Deci (2000) and the importance of relatedness in a learning space because of its value of relatedness and connection to learning and others. Ryan and Deci (2000) SDT suggests that relatedness, the need to feel belonging and connectedness with others, is centrally important for internalization. From the perspective of SDT, learning spaces that provide opportunities for autonomy and competence, and the aspects I attend to more in this paper, relatedness, is critical for researchers and educators who wish to increase motivation to engage in learning, and how participants view themselves in a learning space. This view is taken up because of its value to the social experience and afforded opportunities within a space that not only foster motivation, but tap into a learner's engagement in activities, learning, and identity

through relatedness. Kane (2016) discussion of “Authoring the Self” (p. 112) is important because in building resilience in my target population because authoring yourself in the figured world of STEM domains allows Oromo adolescents to imagine themselves in the role of engineer. That in itself is a narrative of resilience for Oromo youth. Gresalfi (2009) research in mathematics classrooms discuss the practice of discourse and collaborating with others present opportunities to engage deeply in learning. It is essential to understand that learning and learning spaces afford different resources, opportunities to take part in learning. (Nolen, 2007a; Nolen, Ward, et al., 2011; Wenger, 1998). Nolen et al. (2015) situative perspective is related Hazari, Cass & Beattie (2015) research, specifically how contextual and social factors that increased students motivation to learning. Hazari and colleagues shared that opportunities for students to share their perspective in relation to the content being learned, and activities that were relevant to students and their lives. (p. 748).

Feelings of Belonging

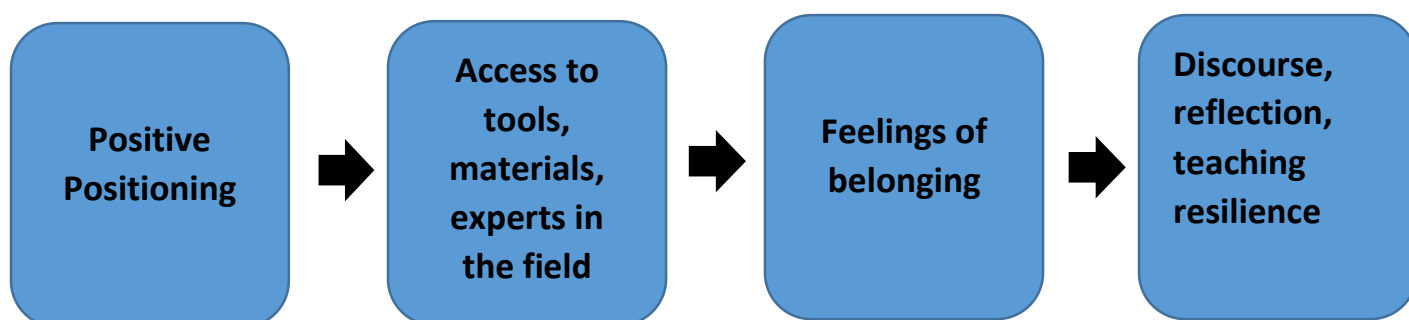
Belonging in a space is important and has been discussed by many theorists. (Nolen) (e.g., Furrer & Skinner, 2003; Martin & Dowson, 2009). “individuals are “engaged” relative to social practices and positions” (Nolen et al. p. 244). A Situative perspective is valuable in understanding forms of participation, motivation to learn is connected to identity and how people negotiate their identities, power, and how they are positioned, influence how they engage in learning, and even their motivation to engage. How populations of people are positioned in the social world can have severe impacts on their view of themselves and how they engage in learning. (Nolen et al. 2015). To be in a space that is designed to support and foster positive STEM identity through resources and tailored practices would provide an alternative experience,

Nolen et al. (2015) would describe, offering ways “into” central identities in a community of practice. (Nolen, 2007a; Nolen, Ward, et al., 2011; Wenger, 1998).

Proposal for Coding Course

This research and review of the literature have led me to propose a coding course, using a DBR approach, with the objective of fostering positive identity construction. In this Coding course, I will include design and practices such as positive positioning, experts in the field who are from the community, and opportunities for discourse and reflection on culture and resilience. The Sociocultural lenses of understanding identity, identity development, viewing the *learner-in-context*, and the importance of tools, materials, and people, and their influence on how students navigate and negotiate identities has guided my hypothesis. I hypothesize that a coding course, with the use of the proposed principals, using a designed-based research approach, will foster positive identity construction for Oromo youth in the diaspora. My proposal for the design principles of STEM education for my target population includes representation of those facilitating learning and talking about their educational experience and work experience, teaching resilience, access to tools and hands-on experiences, connecting with professionals in the field, and exposure to field activities. In the following sections, I explain and expand on these principles and propose a conjecture map to portray these principles as mediating processes in facilitating a STEM identity.

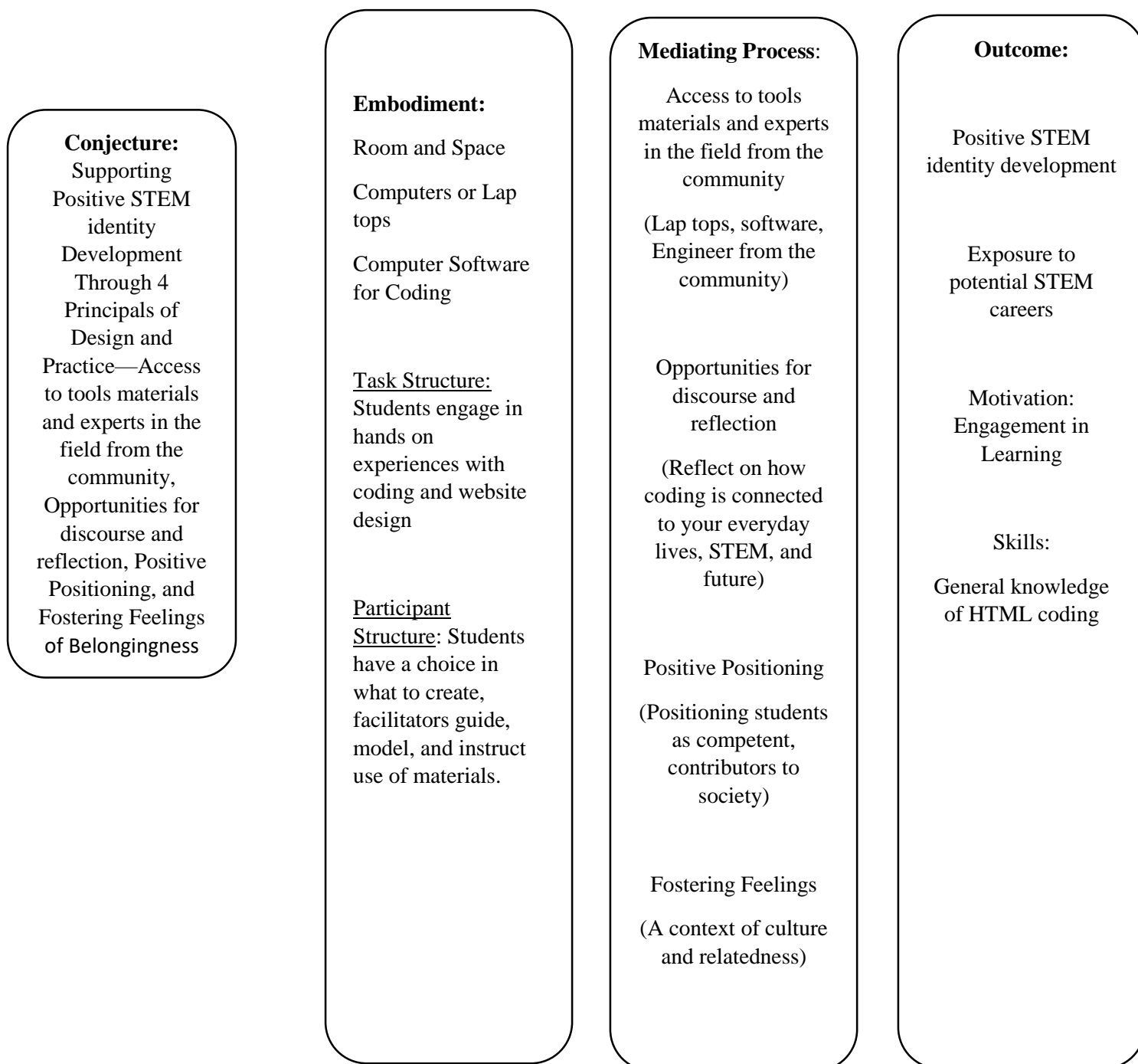
Design and Practice Principles



Conjecture Map for proposed Coding Course

I will conceptualize these design and practices through my intention of developing a Coding course with these core principals of design.

Conjecture Map: STEM, Learning, and Identity Development for Oromo Adolescents



Positive Positioning

What would positive positioning look like in the East African/Oromo Immigrant community? I conceptualize positive positioning as positioning the participants as competent and providing opportunities to imagine themselves in the role of an engineer. In practice, that is valuing what ideas adolescents bring, explicitly stating things like, “This is a career you can be in” or “This is how you could use coding in your life” and connecting experts in the field through opportunities of learning from them, networking, and hearing about their experiences and relating that to the experiences that the adolescents are going through. These practices of positive positioning provide opportunities for East African Adolescents to not only see themselves in these roles, but an expanded learning opportunity that are intentionally designed to support how they position themselves in connection to learning how to code. Learning will be relevant and connected to their lives and experiences in using social media and web application. Positive positioning is a practice that will place these participants as able learners through a rich tailored experience that I hypothesize will increase interest in a STEM career and positive exposure to the field.

Access to tool/materials that expand learning and experts in the field

Access to tools and materials is another core principle of design to foster positive STEM identity development for Oromo youth. Access to tools and materials to expand experiences is critical to providing opportunities to engage in a meaningful learning experience that is connected to the broader field of STEM. In the coding course discussed, this would be access to computers, coding software, projectors, and internet. Experts in the field would be those who hold current positions in the STEM field and whom are capable of guiding and facilitating learning. In the proposed coding course, HTML coding would be taught to create a usable web application or

game, and the experts would be current or future software engineers. The experts would not just be any expert in the field. For this study, it is important that the experts are from the community, and are East African first or second generation immigrants. I find this principle important because this allows the adolescents to imagine themselves in the role of engineer because both expert and participants come from similar backgrounds and face the similar challenges. Having access to tools and experts from the population is something the Oromo diaspora community would describe as supporting their identity and creating a sense of feeling at home.

Feeling of belongingness

Feelings of belongingness as a core principle of design to support positive STEM identity extends on what recent literature finds as supporting learning, and giving the chance to identify with other participants in the room, the experts in the field, and to connect learning to culture and experiences is a design and practice that will immediately bring about feelings of connectedness and belonging for those from the East African communities. In the context of the coding course that I am proposing, this will be a course provided to Oromo/Ethiopian adolescents. All of the participants will be from the population, experts will be from this population, cultural practices, the Oromo language, and history will be tied into the learning experience. This is valuable to the Oromo community and broader East African community because it extends learning beyond context and connects to history and indigenous thoughts and practice from the Oromo people of staying connected.

Opportunities for discourse and reflection, resilience/Connection to life and culture

Opportunities of discourse and reflection are practices I conceptualize as critical because it creates opportunities to discuss what coding means, and how it is connected to their lives and their potential futures. Dialogue among youth and experts is a practice I hypothesize will allow for conversation about learning experiences, learning pathways, challenges, and current experiences as a STEM professionals. I conceptualize that in this experience, participant's connection to coding and the broader field of STEM will increase in a positive way.

Opportunities for experts in the field who reflect the target population share what they do, their experiences, and how they were “just like” these participants are important and valuable to a learning experience because it exposes this population to relatable experiences, and potential future experiences. To discuss and even teach resilience can be presented in the form of member of the community talking about their learning experiences, trajectories, barriers, and challenges of the past and present. This practice is important because it allows for the Oromo students to listen to real life narratives of resilience in the face of so many challenges, and be exposed to these narratives and practices of resilience in education and in the STEM field. The act of resilience is common to Oromo people in the diaspora because of its connection to their history and current state. I hypothesize teaching resilience through dialogue and reflection of experts and adolescents to connect in their lived experiences, and potential lived experiences in education and the workforce will begin to transform their thinking about themselves in relation to STEM domains and future careers. Opportunities for dialogue and reflection open doors to new figured worlds of STEM that extend learning content to learning content in connection to who an individual is in relation to the social world. (ie. Black in STEM, Female in STEM).

Hypothesis

My hypothesis is that this coding course, using the design principles described will positively impact student STEM identity and how they imagine themselves. The model displayed represents how these principles will mediate STEM identity development. My objective is to gain insight in to how to contribute to the design of learning context and learning experiences for disadvantaged students as they are experiencing learning, along with tapping into the learners lived experiences, and how this has impacted how they see themselves in relation to STEM learning. I hypothesize that a coding course, using as DBR approach, that include the core principals of positive positioning, feelings of belonging, access to experts and tools, and provide opportunities for reflection, resilience, and discourse, will support the positive STEM identity construction, as well as motivation to engage in Coding (STEM) for the Oromo (East African immigrant) adolescent population. I believe these principles and approach to understanding learning and identity development from a Situative perspective can be adopted and other East African communities (Somali, Eritrean, Kenyan, other Ethnic groups in Ethiopia) because of this value of culture, learning, and identity and STEM.

Conclusion

How do I think this program will address this problem? This program will begin to provide learning experiences in STEM domains that include mediating processes to foster positive STEM identity development. This conceptual paper will be the basis of future research that will take place in the East African community in WA. I conclude that this paper has taken the perspective of a Situative Motivation understanding of identity and how a learning context can be organized to support positive STEM identity development for adolescents from the East African

community. In this paper I have conducted a literature review of relevant research that have taken up identity and examined how learning spaces were designed and the practices that supported identity development. Through my literature review, I found that there has been little research conducted in the East African Immigrant community, around learning experiences and identity development in STEM education. Through my research I have developed core principles I believe will foster identity development in STEM education. These include positive positioning, feelings of belonging, access to experts and tools, and provide opportunities for reflection and discourse on resilience and content, will support the positive STEM identity construction, as well as motivation to engage in STEM learning for the East African immigrant adolescent population. Through these principles of design and practice, students will be exposed to learning in a unique way that could plant a seed or thought that they are capable, and can imagine their future selves in STEM.

Future Research Questions: The following are future research question that could be explored with the East African Immigrant Diaspora.

How do East African Immigrant high school students from underserved communities negotiate and construct science identities while engaging in a coding course designed and taught by professionals from their community?

How can a Situating Motivation and Design-based research approach to learning cultivate positive STEM learning identities for underserved high school students from the East African communities?

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