CUYT Design Framework Model (CDFM)

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ABSTRACT

This article discusses the significance and relevance of program design research in informal environments in urban communities. Design and project based research initiated through the Center for Urban Youth and Technology (CUYT) framework has produced several Science, Technology, Engineering, Arts, and Mathematics (STEAM) projects in urban communities in New York State. Elements of our design framework model will be explored and defined. Connections between project design, action research, and intercultural research will be presented, and the process of design to implementation will be explained. CUYT interventions will be included to provide examples of how the model works in practice. The action research based project Information Technology and Cities (ITC) and the Institute for Nanoscale Technology and Youth (INTY) program demonstrate the influence of the CUYT Design Framework Model (CDFM). The current conceptual CDFM will be discussed and reviewed.

Keywords: Project Based Research, Informal Education, Instructional Technology, Resilience, Character Education, Action Research, Inter-Cultural, Intervention, and Evaluation.

1. INTRODUCTION

Science, Technology, Engineering, Arts, and Mathematics (STEAM) education have been identified as critical factors in the development of innovation, economic opportunities, and social expansion in the United States of America. We are challenged by a "Quiet Crisis" [1]: we are not preparing our youth to become 21st century leaders in the labor and university workforce. Public and private education must provide academic and scholarly pathways that support educational achievement for our youth. Nowhere is this crisis more pressing than in the inner city. The challenge of the "Quiet Crisis" includes high drop-out rates that are especially problematic. Each year, approximately 1.2 million students fail to graduate from high school; more than half are from minority groups [2]. Compared to other countries, U.S. 15-year-old students ranked 25th out of 34 in measures of reading, mathematics, and science literacy (PISA 2009) [3]. The average scores of these U.S. students on the science literacy scale ranked 17th out of 34 OECD countries [4].

The data suggests that educational program designers need to identify new, innovative and creative strategies to address these issues and reach this "new majority" of learners. The problem is how to reach the students of the 'Quiet Crisis" with cost effective program design models that support and supplement existing formal academic systems. One option is to create alternative (informal) [5] program models that provide authentic, hands-on activities to mirror or shadow educational and workforce experiences. That is the option that the Center for Urban Youth and Technology (CUYT) has taken.

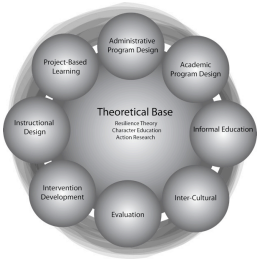
The CUYT model is adaptable, flexible, and can be implemented in any urban setting given knowledge of that community environment. The model emphasizes the development of a project based, hands-on, non-threatening, and student-centered learning environment. A driving theme is the importance of providing intercultural models that are based on and relevant to the population of participants living in the urban settings in which the programs are offered. The CUYT model can align its applications with the needs of the student population and with the needs of the academic and workforce environment in which the model is deployed. STEAM activities, intercultural [6] models, instructional design, and project-based research [7] anchor the model.

Although the CUYT model is flexible and can be used in formal and informal settings, the informal settings and programs offered in summer, after school, and on weekends have provided opportunities for greater creativity, larger collaborative activities, and immersion in 'direct connection' STEAM experiences. In recent programs students have been directly engaged in STEAM experiences taking water samples at area reservoirs, cataloging the data, and comparing the samples with other reservoirs to test water quality. They learned how to fish at these sites and tested the mercury levels in the fish as part of their water quality experience. The students learned forestry by locating a tree, up-rooting the tree, and transplanting that tree to a new location. The tree is now located at the College of Nanoscale Science and Engineering (Albany, NY).

The CUYT model addresses "cradle to the grave" or "pipe line" notions, and provides continuity in STEAM education activities for urban youth, their parents, and their teachers. The theoretical base for the model centers around the "resilient" nature of urban youth and the design of interventions that support and expand resilient attitudes and concepts. In the sections which follow, the CUYT model is explained, its theoretical basis and individual elements are discussed, and an example is given incorporating project-based design, an informal education environment, links to the local economy, and intercultural activities.

2. CUYT MODEL

The CUYT design model uses several elements of instructional design in the development of the format, concepts, and structure of culturally relevant STEAM instruction. The goal is to develop program intervention models that reach underserved, economically challenged youth, in grades three through twelve, of both genders, all religions, and ethnically mixed, who have an interest in learning about STEAM fields. Many students are level 1 or 2 in middle school (under the New York State evaluation system) and/or special education in high school. Although written off, these students have great educational and academic potential if the academic environment can be changed and modified. New student centered, non-threatening, informal education environments and interventions need to be created to serve this population.



Design by Dr. Joseph Bowman, Jr. and Manulito Loman, M.L.S.
Figure 1: Elements of the CUYT Model [8]

Elements of the CUYT design model (see Figure 1) include: Intervention Development, Instructional Design, Academic Program Design, Administrative Program Design, Inter-Cultural Models, Project-Based Learning, Informal Education, and Evaluation. In the model these are deployed around a theoretical base grounded in resilience theory, action research, and character

education which permeate all aspects of the model. After a discussion of the theoretical base for the CUYT model, each of its functional elements is described in the sections which follow.

3. THEORETICAL BASE

Resilience theory [9], action research [10], and character education [11] form the foundation of the CUYT design model theoretical framework. The CUYT model looks at youth from a resilient lens that promotes positive attitudes, encouragement, motivation, and embraces future opportunities. The model does not support any deficit model concepts (labels, limited economic resources, social issues, or low academic scores) that have any impact on students' ability to learn and grow. The students and parents live in and through these deficient issues daily and understand their current status. They want solutions and interventions that will empower them, and improve and address quality of life issues. The CUYT model is designed to empower students to be leaders and make contributions to their communities and society. Discipline concerns diminish as students make correct life choices, take responsibility for themselves, and become role models and youth leaders. Self-efficacy, self-reliance, motivation, and academic achievement improve as students begin to embrace the exciting challenges and opportunities that life offers them. We have anecdotal evidence (testimonies, newsletters, and articles) of these life styles changes through several program interventions that CUYT has sponsored over the years.

The visual representation of the model uses circles or spheres to demonstrate the connective nature of the design. The theoretical base binds the design together and each sphere component is linked to the others and the theoretical base. The action provides continuity of thought and practice as we plan program activities, curriculum, selection of target populations (student, teacher, or parent), and urban settings. Each of the small spheres has elements of design that support that component but each also relates back to the larger design model based on the program intervention.

Resilience Theory

The CUYT model has been rooted in the importance of resilience theory, a key concept used in our framework. Our view of resilience theory subscribes to the belief that all youth are resilient, creative, and ready to learn. By labeling or branding students, (at-risk, level 1 or 2, and/or special education) we create a stigma, bias, and negative attitude toward these students. This stigma is projected throughout our educational system and our society. These labels are accepted and believed by our students. When we stop the labeling or change the label type that we associate with our youth, their attitudes about who they are and their academic abilities will also change. We are not naïve and realize that these youth are at different levels on the social, emotional, and academic scales. The respect and passion that we demonstrate toward these youth; the nonthreatening learning environment that the design model creates; and the unique content areas of study in STEAM through nanosciences challenge and stimulate students' desire to learn.

Character Education

The integration of character education into the theoretical base of the design model addresses core issues of self-respect, team building, honesty, loyalty, bullying, and motivation. Character education provides assistance to students who reside in communities where social issues (gang violence, crime, and drugs) are prevalent.

The design model includes a character education component to address self-control, team building, anger management, life-long learning, and self-determination. This is reflected in the program plans that include invited special guest speakers for lunch, mentoring, and "Rites of Passage" activities. The "Rites of Passage" model (Macedonia Initiatives in Community Development (MICD)), utilizes the seven principles of "Kwanzaa called the Nguzo Saba". Nguzo Saba [12] requires that students define their common interests and make decisions that are in the best interest of the family and community through group discussions, handout responses, and student presentations.

Guest speakers would include culturally diverse representatives from businesses, state agencies, and community organizations (past representation has included leaders from Price Chopper Supermarkets, New York State Office of Technology, New York State Office of Children and Family Services, Verizon, and Environmental Justice/Education). Such representatives provide role models, mentoring, and career exploration opportunities for students and parents in design interventions.

Action Research Development

When academicians and researchers present a case for doing research in urban communities they are met with resistance. For years, researchers have entered these communities with the promise that their research will improve the quality of life or support educational equity. The researchers obtained the data, published their work, and the urban communities were left in the same undesirable conditions. To enhance the understanding and importance of research, we have incorporated action research development as a component of the theoretical base to be considered throughout the design process. An underlying consideration of action research through all components of program design is intended to teach students about research methodologies and techniques that assist in data collection, observation, interviewing, survey creation, and population selection.

An example of the expression of this theoretical base of the CUYT program design model is reflected in recent programs described here. We have worked with students to research and support their own communities and report their findings back to influential leaders including their legislative representatives, school board administrators, or other civic-minded organizations. Students are also encouraged to make recommendations about CUYT program activities and applications that are interesting and useful for their development. These research activities give the students a voice and empower them to participate in the decision making process of our programs, school district initiatives, and community concerns. As an example of action research within our programs, students in our Information Technology and Cities program, canvassed the area around a new school in an urban community to look at traffic and pedestrian patterns. After surveying traffic volume, car average speed at intersections, and interviewing pedestrians, they determined that traffic lights and speed bumps would improve safety situations around the school area. The students created a report including their findings, transcribed pedestrians' interviews, and recommended possible solutions to address their safety concerns. These concerns were sent to their local legislative officials, school board officials, and the city mayor. Within three months their recommends were implemented to improve safety conditions around the school. Students, teachers, and parents had the opportunity to interact with a participatory action research activity and see the results of their involvement.

4. INTERVENTION DEVELOPMENT

Two central themes need to be considered as this phase (intervention) evolves: (1) Knowledge of your audience, their concerns, academic background, attitude, and interest level, and (2) The working or operating environment (school, university, CBO, informal education settings, public or private education, and community) in which we will operate. The CUYT model has operated in public schools, community based organizations, churches, universities, and city community centers. We prefer university settings with significant resources (faculty, students, and facilities), but many of our most successful interventions were convened in community settings. We are embedded in urban communities and have the opportunity to interact with students, parents, and their environment. This action gains student and community trust and respect, and teaches us how to reach and serve this population.

4. ACADEMIC PROGRAM DESIGN

In this area we reverse engineer our design by asking what expectations, outcomes, assessments, and final projects would be evaluated for student success. A series of course/workshop rubrics, activities, and presentations that identify student skills levels and content knowledge are created to support the academic program design. Discovery, hands-on immersion, STEAM exploration, and cultural awareness techniques are used to create problem solving and other higher order learning skill activities with the students. We raise the academic standards and skill levels of these students to meet current educational and career challenges.

Curriculum content is developed with subject area specialists, examined, and matched to the graduation specific standards at the national and state levels. This ensures that these

interventions follow the same curriculum grade level standards that the students follow in their public school lives. Knowledge of student learning and achievement status provides us (curriculum designers, teachers, and university faculty) with a guide to students' prior learning and skills. This knowledge allows our interventions to develop a mentorship and tutor resources for students and parents.

5. ADMINISTRATIVE PROGRAM DESIGN

Operational considerations are essential elements of a total program model and ensure effective handling of program activities. Elements include: salary, schedules, space-facilities, contracts, calendars, human resources (staff, students, parents, faculty/instructors), transportation, food, securing funding, and grant writing. Program intervention sustainability is equally important to determine program resources, length of intervention, and quality of services.

Any program design model must have a strong leadership team, who are passionate about the work, willing to put in the required time for program success, and have the ability to work with a diverse range of staff, faculty, and students. Attention to detail is an important quality of the team leaders. (It is the little things that can bring things to a halt and stop the show.) Networking and the ability to create collaborative partnerships are important, as this impacts funding, establishes other program resources, and adds new content ideas to the interventions. (In this discussion interventions and activities are used in the same context to represent various aspects of our CUYT programs).

6. INTER-CULTURAL MODEL

The CUYT model is designed for all youth and adult learners, but clearly focused on underserved, economically disadvantaged, and academically challenged urban populations (African-American, Caribbean-American, and Hispanic). As part of our CUYT design model and to address the multicultural needs of our program population, intercultural models are included in the design model. Cultural elements of historical contributions, STEAM role models, current tools/devices in STEAM, multi-media STEAM representations (movies, shows, and theater presentations), and demonstrations of economic and community development are integrated into the CUYT design model.

Specific program activities include: Culturally Situated Design Tools that provide web-based instruction on the cultural relationship between math and students' culture; the "Black Book Project" sessions, where musicians interpret the images from the Hubble Telescope for youth; and the urban "Nano" theater, where students create skits and video productions about African, Indian, and Hispanic American scientists.

Cultural design inclusion demonstrates how various cultures have supported the rich mosaic of STEAM discoveries and opportunities in the country. It provides evidence of our participation in science and math through human history.

7. PROJECT BASED LEARNINGS (PBL)

The days and times of the "sage on the stage" has given way to "coach teaching" classroom activities that are supported with simulations and interactive learning between multiple school sites. Technology of all forms is integrated in the classroom environment. Even the classroom can be transformed into an outdoor living lab or a mobile or remote site around the country or world. This is the world our students see and we are challenged to use real world experiences to assist in the academic and instructional development of their experiences. Larmer and Mergendoller (2010) presented seven elements of PBL which are supported by the CUYT model: a need to know, a driving question, student voice and choice, 21st century skills, inquiry and innovation, feedback and revision, and a publicly presented product. Student centered learning environments, team building, and collaborative teaching are included in the CUYT design model.

9. INFORMAL AND PUBLIC EDUCATION

Early interventions of the design model were implemented in school settings, adhering to class periods, block schedules, administrative red tape, class size, staff/instructor availability, and classroom/computer lab availability. Most recent program designs have adopted the structure of an 'infused school day activity' in which one or two days and times are selected and program activities provided. This structure is best facilitated by the school administration, small school size, selection of students, small class size, and community and business participation.

After-school interventions continue in elementary and middle school environments, but we have found that attendance and completion rates can be compromised by students' external activities (Boy/Girl scouts, sports programs, and other social activities). In response, we scaled back the after school activities and increased the weekend and summer activities. Our informal education interventions have evolved into yearly weekend and summer (four to six week) programs. The CUYT model has created external partnerships with community based organizations, area businesses, school districts, state/local agencies, and universities/colleges. The model allows our program interventions to be flexible, current, and provide real world experiences for program participants.

10. INSTRUCTIONAL TECHNOLOGY DESIGN

This is an operational base for the CUYT design model and stems out of personal work in the area of instructional technology. How does one integrate technology resources in curriculum content areas to stimulate learning, discovery, and academic growth in students and parents? How do we support and challenge teachers and administrators to support and integrate technology resources (smart boards, tablet devices, smart phones, robotics, and on-line instruction) into the classroom and school activities? How do we present the case that technology is a resource that supports instruction when it is integrated in instructional activities? Needs assessments, task analyses, learning theories, cultural awareness, and technology integration are aspects of this component area. This component provides a guide or instructional model for program designers to utilize as they create instructional interventions in business and education.

11. EVALUATION

. The incorporation of evaluation into the program activities and projects is an essential step in planning activities. It also engages students directly in their learning and contributes to their skill development. Each CUYT program plan includes a project or set of tasks related to the topic that each student and team is required to complete. A formative skills and knowledge survey is administered to all students at the beginning of the intervention. This survey assists program staff in understanding reading and writing levels, knowledge of content, uses of technology, and self confidence/attitude. Small focus groups and individual interviews are conducted and all evaluation requests are voluntary. A summative survey is also administrated at the end of the program to evaluate student progress and program effectiveness.

This program evaluation continues with the creation of a rubric for each project and the expectation that student must complete the assigned tasks for that subject area (the rubric can be created by the teachers, student, university faculty, and other content evaluation resources). When the assignment is completed, students are required to make a presentation about their work (presentations can be in any media format: e-publication, video, power point, audio recording, and/or skit). The presentations are reviewed by fellow students, who make suggestions and recommendations. The presentations then are presented to larger audiences comprised of program faculty, district instructors/administration, parents, staff, and invited guests. The rubric also provides a grading scheme of the students or teams work during the process.

The recent INTY program provides an example of how this interactive evaluation operates. One example is our robotics component where students were assigned to create a social robotics (design), program the robotic (task), and execute the commands (function). The students had to

describe the activity, make a presentation, and respond to the questions. Each student or team also had to create an article, provide visual images, and create a program youth newsletter. All elements of the robotics component were in the robotics rubric so students and teachers were able to monitor the progress of their work.

Throughout CUYT programs many of the subject area components use rubric design for the evaluation process. Students create a variety of program materials that contribute to the evaluation including: e-portfolios of their digital images, personal comments, articles, video clips, and journals. These materials are returned to the students on flash drives at the end of the program. Survey data, rubric data, focus groups, participant interviews, student e-portfolios, presentations, and video productions are compiled to generate our final program and evaluation reports as well as a final student newsletter and program video production.

12. FROM DESIGN TO IMPLEMENTATION PROCESS

The CUYT Design has evolved over twenty years to the model that is presented here, but there have been several intervention programs created to support the design model. This section (figure 2) provides a representation of the process that we utilize to move from design to program implementation. The process elements include: program goals, creating a proposal concept, partnerships, funding and sustainability, students and parents, pre-intervention and orientation workshops, staffing and program schedules, transportation and food concerns, and CUYT design process.

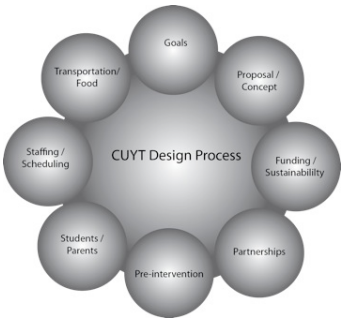


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Figure 2: Elements of the CUYT Design *Process*

Program Goals

Program developers must remember the goals the organization, institution, or agency have prioritized. Throughout the design-implementation process the larger goals of the CUYT design model need to be considered. Program goals may be compromised by the need to respond to funding issues, external directives, partnership attitudes, program audience issues, or unclear program goals.

Creating a proposal concept

We used the ideas articulated in the Design-Implementation Process to address the proposal concept: theme, audience, needs, and the CUYT design. The program theme, audience, and needs issues derive from CUYT's mission statement: "Prepare students, parents, and teachers to achieve the 21st Century skills needed to broker the interface between technology, life, employment, and develop a positive attitude toward life long learning. " [13] All of our program concepts are linked to our design model and to the mission and vision statements of the Center for Urban Youth and Technology. As program designers create their program interventions, they must identify subject area themes, listen to their audiences, and address program participants concerns.

Partnerships

A main theme in program design and implementation is collaboration and partnerships with organizations, institutions, businesses, and individuals that support the program intervention. Our program design identifies higher education institutions, k-16 (school districts, adult education, and charter schools), community-based organizations (Boys and Girls Club, Young Men's Christian Association, National Urban League, National Council of La Raza (NCLR), National Association for the Advancement of Colored People (NAACP)|, National Urban League (NUL), United Way, and local community centers), state and local agencies (Departments of Environmental Conservation, Health, Labor, Transportation, Energy, Criminal Justice, and Children and Family services), and sports programs (National Basketball Association (NBA), National Football Association (NFL), and *Amateur Athletic Union* (AAU)).

The partnership responsibilities must be clearly defined and scope of work articulated and written down. To identify partnerships, we met with education institutions from k-16 levels (elementary, secondary, adult education, and higher education) in our communities. Private institutions (colleges, charter schools, and business schools), state and local agencies, community-based organizations, churches, museums, and local businesses were contacted as partners, advisory board members, and friends of the program.

Partnership development creates evidence that other organizations are interested in and supportive of the program concept. These partnerships indicate that additional in-kind, lab resources, and potential funding support exists when potential funders review your program request for funding.

Funding and sustainability

Funding and sustainability are critical issues to support program design and we look at potential funding streams across federal, state, city, and foundations. We identify potential funding sources that have an interest in the research, professional development, and training aspects of our program. We invite federal, state, and local officials to program presentations and activities to see and talk with our program participants whenever they are available. Regional business community organizations (chamber of commences and workforce investment boards) and the individual business organizations are identified and contacted as sources of funding. Previously we have attended funding workshops and session with the National Science Foundation, Corporation for Public Broadcasting, local Community Foundations, and The Foundation Center to learn about funding resources and opportunities.

We have focused on the issue of sustainability and are implementing new ideas and activities to secure resources through program design elements. Entrepreneurship opportunities (program calendars, shirts, and cards), fund raising activities (coin harvests, bake, and car washes), and technology promotions (on-line fund raisers, creation of program iBooks and apps for mobile devices) are being developed to support this sustainability effort. We invest in fund raising program activities (coin harvest; program open houses; bake, candy, and clothing drives; car washes; and shirt/calendar creation) to teach entrepreneurial and sustainability skills. The need to secure funding has lead us to develop collaborative partnerships in our existing areas of interest in science, technology, engineering, arts, and math.

Students and parents

Students and parents are critical to this process because you have to understand the needs and desires of your program audience. Academic levels, reading levels, free and reduced lunch, personal attitudes, and parental status must be identified during the design and implementation process. Awareness of our end user population helps us fine tune the program intervention to address their needs. This focus allows us to add program personal, adjust program content material, and identify other resources that can improve the design.

The next areas relate to program activities and are essential elements to bring students, parents, district teachers/administrators, and university faculty and their students together.

Pre-intervention and orientation workshops

Pre-intervention and orientation activities are essential during this process. We meet with students and parents in urban community settings to establish a bond of trust and respect between

ourselves. We attend community activities (Parent forums, meetings, and association meetings) to introduce ourselves to them and provide an opportunity to let them see or commitment to their concerns. Our goal is to be visible and supportive of community concerns. This interaction is an important step in developing a strong community presence.

Orientation and pre-workshop activities are designed for all participants to provide them with an opportunity to interact, talk about interests, learn about program content, and address any potential issues that may arise. One or two meetings/workshops are held to help gage student academic skill levels in writing, speaking, presentation, and in content areas of math, science, and English. Short one-hour workshop sessions with students allow us to determine subject area interests (nanoscience) and workshop resources (lab kits). These workshop sessions provide an opportunity for faculty to work with the populations of high school students. Many college faculties have not worked with these students and have developed preconceived attitudes and notions (disruptive behavior) about them. These sessions allow the students to have a college experience while still in high school to stimulate their desire to go to college.

Staffing and program schedule

Staffing and program scheduling are essential elements of the design to implementation process and are discussed in the early stages of the process. The program intervention time of year is critical to the success of the activities. We have chosen to host primarily summer and weekend session program activities based on student, faculty, and university space availability. Faculty, student, and teacher availability must be determined and matched to classroom, lab, and university resources. Insurance and support staffs are included in this area because they are critical points to address. Who is liable if a student or teacher has an accident during program activities and what is your responsibility to address this issue? What is your support staff quality and experience working with this population of students? Do they have residency and social skills experience? Are they in the national finger print database? Do you need to be that radical?

Because the nature of our program work (nanoscience) is critical and sensitive - the lab resource time is shared with researchers and the business community - our program schedule reflects available lab times, field trips, and access to program sites on a daily program basis. The program schedule determines staff and faculty needs, activity locations, and security and transportation needs.

Transportation and food concerns

Transportation and food concerns are critical elements of planning that must be addressed in the design process. Whether students are traveling within your community, your city, or from a distant location, transportation arrangements must be provided at all times. The primary goal in this discussion area is student safety and fact that you are responsible for the welfare of the students. In our programming we have to address travel to the university, around the university sites, and any field trip that we include in the program schedule.

Food is not a concern in our programming because we insist on three healthy meals each day for students and program participants. We also include at least two healthy snacks during the day. The meals or snacks will change based upon the program intervention that is created (after school, weekend, or summer), but it essential to plan to provide quality meals (many students are in free and reduced lunch programs).

CUYT design process

The CUYT design model is a base for our program intervention concepts and we have scaffolded (built up) our design process with the elements presented in this section. This section defined the difference between the CUYT design model and process elements that are necessary to develop the design into a program intervention that can be implemented to impact students, teachers, and faculty. This section demonstrates the importance of the integration of the design model and process (how to make it happen) in the evolution of program interventions.

The Institute for Nanoscale Technology and Youth (INTY) is a recent program intervention that was created to address the youth issues of workforce development in the high-technology fields of and multi-media design and nanoscience.

13. INSTITUTE FOR NANOSCALE TECHNOLOGY AND YOUTH (INTY)

An example of the CUYT model in practice is the Institute for Nanoscale Technology and Youth (INTY). This intervention focused on thirty high school and adult education students who were considered "Special Education," on track for dropping out from area schools, economically disadvantaged, and representative of the Afro-American and Hispanic populations in the New York State Capital District. Our goals were to introduce these students to career opportunities in information technology, nanoscale sciences, and multi-media design. Students met in a series of workshops sessions that explained program goals, session activities, the potential benefits of this intervention, program expectations, student outcomes, and criteria for selection in the six-week summer program (students could not be enrolled in district summer school classes).

INTY is a creative collaboration in program design. Our partners, the College of Nanoscale Science and Engineering (CNSE), provided the Nanoscience training sessions (three weeks). Workshops sessions included: radio-frequency controlled aircraft, clean room safety, fuel cell and solar power transportation, nanobusiness development, nanochip fabrication (working with and processing Si wafers), and nanobioscience biopolymers (making bio-fluidic devices).

The Center for Urban Youth and Technology (CUYT) provided one week of character education and multi-media sessions (e-publishing, video production, culturally situated design tools (graphics), radio production, and robotics), and the University Center for Academic and Workforce Development (UCAWD) provided Microsoft IT Academy Word training and certification (two weeks). The Summer Youth Employment Programs from the New York cities of Albany, Schenectady, and Troy provided salaries for students to make it possible for them to participate. Students were required to make presentations about their program experiences to university faculty, district administrators, teachers, parents, and fellow students. They produced a program newsletter and a program video production. In these hands-on activities, students created articles, photos, powerpoint presentations, and rap poetry for the newsletter. Scripts, program formats, production crew selection (camera person. audio, lighting, and video editor) had to be determined by students to complete the video production. Please visit our website for additional information, video clips, and INTY the newsletter. [14]

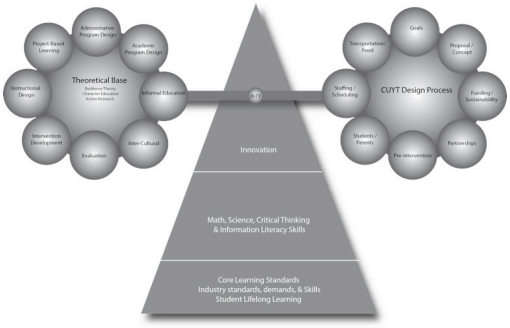

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Figure 3: CUYT Framework Design Model

This (figure 3) is the CUYT Framework Design Model. The integration of the CUYT Design and Process Modules has created several program projects and interventions for students, teachers, and parents, in urban communities. We have displayed the framework to provide a visual representation and explanation for this discussion.

14. REFLECTIVE PROCESS

As part of our reflective process, other design models were identified and reviewed. The CUYT model was compared with the *Research Methods for Community Change: A Project-Based Approach*, by Randy Stoecker [15]. Stoecker's project-based approach (diagnosis, prescription, implementation, and evaluation) (PBA) was similar to our model, population, and communities. PBA enhanced our research and evaluation methodology and we included surveys, writing samples, student presentations, focus groups, and interviews for the CUYT model and to measure student achievement. We are creating a program evaluation report and an analysis of participant attitudes and achievement in the STEAM fields of study.

15. CONCLUSION

The CUYT design framework model was developed to guide the creation of programs which provide information and access to STEAM resources in urban communities. Many students. teachers, and parents in these communities are not exposed to the rapidly growing high tech, nanoscience and information technology fields of today and the future (including bio-technical, alternative/renewable energy, nanoscience, e-transportation, robotic, radio frequency aircraft, high speed broadband/wireless). Our design framework is flexible and built to be utilized across elementary, middle, high school, and adult student populations. We have focused our interventions on STEAM fields to address the country's aging work force and the under-utilization of our underserved populations, and to increase the pool of innovative ideas into our society. The CUYT design framework model is bridging educational achievement with work force needs and economic development opportunities to demonstrate the effectiveness of this type of design framework.

16. REFERENCES

[1] S.A. Jackson**,** The Quiet Crisis: Falling Short in Producing American Scientific and Technical Talent. **Building Engineering and Science Talent (BEST), 2005.**

[2] Alliance for Excellent Education, High School Dropouts in America: Fact Sheet. **1201 Connecticut Avenue, NW, Suite 901, Washington, DC 20036, 2009. www.all4ed.org**

[3] H.L. Fleischman, P.J. Hopstock, M.P. Pelczar and B.E. Shelley**,** Highlights From PISA 2009: Performance of U.S. 15- Year-Old Students in Reading, Mathematics, and Science Literacy in an International Context, **(NCES 2011-004). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office, 2010, p. 18.**

[4] H.L. Fleischman, P.J. Hopstock, M.P. Pelczar and B.E. Shelley, Highlights From PISA 2009: Performance of U.S. 15- Year-Old Students in Reading, Mathematics, and Science Literacy in an International Context, **(NCES 2011-004). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office, 2010, p. 24.**

[5] M. K. Smith, M. E. Doyle› and T. Jeffs. Editors: **Encyclopedia of informal education** www.infed.org. YMCA George Williams College, 199 Freemasons Road, Canning Town, London E16 3PY (e) info@infed.org;

[6] P. Young, **Instructional Design Frameworks and Intercultural Models**. IGI Global Hershey, PA,2009, (p. XIV).

[7] J. Larmer and J. Mergendoller, "Essentials for Project-Based Learning. Some "projects" border on busywork. Others involve meaningful inquiry that engages students' minds**",** **Educational Leadership,** Vol. 68, No. 1, 2010, p. 2.

[8] Bowman, J. (2011). Program design of STEAM education initiatives in urban communities. In N. Callaos, M. Savoie, M. Siddi1ue, and C. D. Zion (Eds.) **IIIS Proceedings of International Conference on Design and Modeling in Science, Education, and Technology** (pp, 257-262). Winter Gardens, Fl

[9] C. Rak & L. Patterson, "Promoting Resilience in At-Risk Children", **Journal of Counseling &Development: JCD, 744, 1996, pp. 368-373.**

[10] Center for Collaborative Action Research. http://cadres.pepperdine.edu/ccar/define.html

[11] C. C. Haynes and O. Thomas. Character Education Finding Common Ground: A Guide to Religious Liberty in Public Schools.(p. 150). **The Freedom Forum Washington,** D.C., http://www.freedomforum.org/templates/document.asp?documentID=13087

[12] M.Karenga**.** *Kwanzaa: A Celebration of Family, Community and Culture*, 2008**, Los Angeles: University of Sankore Press.** (www.sankorepress.com) http://www.officialkwanzaawebsite.org/NguzoSaba.shtml

[13] Center for Urban Youth and Technology Mission Statement http://www.cuytf.com/menu/mission.html

[14] Institute of Nanoscale Technology and Youth Website. http://www.cuytf.com/inty.php

[15] Randy Stoecker, **Research Methods for Community Change: A Project- Based Approach, Sage Publications, 2005.**