FCI 2.0 Proposal Cover Sheet

Name of cluster: Learning Sciences

Cluster leaders: Dave Edyburn <dave.edyburn@ucf.edu>, Professor, CEDHP
Charles E. Hughes <ceh@cs.ucf.edu>, Pegasus Professor, CECS

Participating units: Given that learning is at the core of all we do at UCF, we anticipate initial participation in this cluster from faculty members in CEHP, CECS, CAH, CON, COM, COS, and IST with the eventual goal of involving all of the university's colleges and research institutes. At this stage, the core planning and structural development have been completed by two colleges and two campus units who have agreed to collaborate on this faculty cluster initiative to advance transdisciplinary basic and applied research in the learning sciences, impacting education (PK-20), locally, regionally, and globally:
• College of Education and Human Performance (CEDHP)
• College of Engineering and Computer Science (CECS)
• DirectConnect to UCF
• UCF Global

Participating UCF faculty: Sean Armstrong, Malcolm B. Butler, Lisa A. Dieke, P.K. Douglas, Fei Liu, Matthew Marino, Barry Morris, Megan Nickels, Ben Noel, Guo-Jun Qi, Eleazar Vasquez, Vicky Zygouris-Coe

Potential external reviewers:

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Abstract

250-word non-technical summary (summary for the public)

Teaching and learning are at the nexus of UCF's vision and mission. Unlocking the human potential within every learner will result in harnessing intellectual capital for solving society's most challenging problems and saving billions of dollars. Concurrently, some futurists have predicted that technological advances will cause 45% of today's jobs to be replaced by robots in the near future (i.e., *Humans Need Not Apply*, https://www.youtube.com/watch?v=7Pq-S557XQU). Even under more conservative assumptions, an innovation economy poses an urgent demand for theory, research, development, and application at the nexus of the Learning Sciences (LS) and Computational Knowledge (CK). The *learning sciences* are an interdisciplinary field informed by recent scientific advances focusing on how people learn across the lifespan in formal (i.e., school), free choice (i.e., museums, self-directed), and work force (i.e., seminars, workshops) contexts and the conditions under which learning can be optimized. *Computational knowledge* is a discipline focusing on how machines learn. The point of distinction of this effort leverages current and future partnerships between educators, cognitive psychologists, computer scientists, philosophers, and designers around LS and CK. The focus of this cluster will bring international recognition to UCF as a leader in theory, research, development, and classroom practice regarding the complex and dynamic relations between thinking, decision-making, and problem solving and how computational knowledge helps people conceptualize and learn. We provide a blueprint for developing the cluster and posit that the cluster investment will produce a rate of return of 2.5 dollars for every dollar invested within five years.

250-word technical summary (summary written for the field of expertise)

As the world's knowledge is assembled and accessible in machine-readable formats (i.e., Google Books, Wikipedia, data sets), unlimited new opportunities exist for the application of computational knowledge transforming 21st century learning. Futurists argue that the riches of the 21st century economy will be built on the ability to capture, mine, and distill knowledge from massive amounts of data. Failure to recognize and respond to the changing landscape transforming 21st century learning could render existing educational institutions ineffective, obsolete, or irrelevant. A faculty cluster focusing on the intersection of Learning Sciences (LS) and Computational Knowledge (CK) would be distinguished by our shared focus on the integration of transdisciplinary knowledge regarding ways in which big data can inform machine learning algorithms to create more effective personalized learning environments for students of all ages and abilities. Specifically we seek to understand how systems (i.e., users, tools, data, analysis, visualization), interfaces (i.e., natural language, speech, vision, agents, robotics), and cognition (i.e., memory, emotion, curiosity, pattern-recognition, problem solving, decision making), interact in ways that improve student academic, behavioral, and social outcomes through personalized learning (i.e., recommendation systems, self- and guided reflection, growth curves, learning pathways, reinforcement, remediation). The cluster will extend the existing pillars of faculty excellence and bring international recognition to UCF. We provide a blueprint for developing the cluster and posit that the cluster investment will produce a rate of return of 2.5 dollars for every dollar invested within five years.

1. Context, Need, and Opportunity

The use of technology in education has a long history (Cuban, 1986) and is a fundamental component of federal priorities for transforming 21st century education (U.S. Department of Education, 2017). The casual observer can point to any number of innovations (e.g., Google search engine, Wikipedia, YouTube) impacting the way we learn, live, and work. However, the myopic focus on learning to integrate these new tools into our daily lives obscures deeper, and more profound changes that are on the horizon (Christian & Griffiths, 2016).

The ubiquitous nature of technology has created unfathomable amounts of data. For example, data can be created, stored, and shared in static formats such as text, audio, and video as well as real-time dynamic streams from sensors, web cams, GPS devices, web interactions, and interactive learning materials. Futurists argue that the riches of the 21st century economy will be built on the ability to capture, mine, and distill knowledge from massive amounts of data.

Education has historically been characterized as a process of transferring knowledge from a teacher to one or more students. Clearly teaching and learning are at the core of all that we do at UCF. However, existing instructional methods are not effective for all students as there is little adjustment to the pace of instruction for students who struggle or for students who could benefit from acceleration. It is often said that we have more data about the shipment of a priority package than we have about the academic performance of a student. Existing models of teaching and learning are at risk given the convergence of trends associated with advances in the learning sciences (how people learn) and computational knowledge (how machines learn). Failure to recognize and respond to the changing landscape that will transform 21st century learning could render existing educational institutions ineffective, obsolete, or irrelevant.

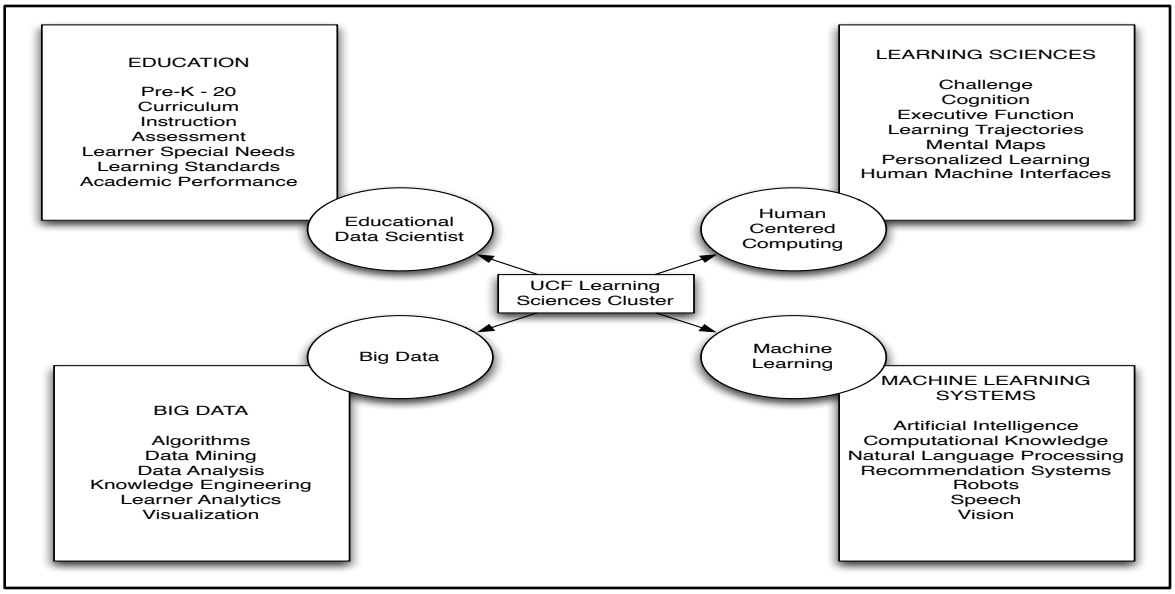
The *Learning Sciences* (LS) are an interdisciplinary field informed by recent scientific advances that focus on how people learn across the lifespan in formal (i.e., school), free choice (i.e., museums, self-directed), and work force (i.e., seminars, workshops) contexts and the conditions under which learning can be optimized. *Computational Knowledge* (CK) is a term that describes disciplines such as computer science and knowledge engineering that focus on how machines learn by discovering meaningful patterns in data. A faculty cluster focusing on research and development (R&D) at intersection of LS and CK positions UCF to be a leader in the theory and practice of using computational means, e.g., machine learning, knowledge discovery, and data analytics, to understand and support human learning. This R&D initiative is critical to the university's future by assuring that we are at the forefront of the transformation of teaching and learning during a period of disruptive technological change.

2. Research Agenda

The initial phase of our work to create the Learning Sciences cluster involved a snowball nomination process of asking colleagues in the College of Education and Human Performance (CEDHP) and the College of Engineering and Computer Science (CECS) to nominate college and campus colleagues whose work would be relevant to the cluster. We gathered the names and extended invitations to join the proposal development process. Given that the work of this cluster could impact every unit on campus, we elected not to make the case for the cluster based on the

sheer number of collaborators. Therefore, we devoted our time, energy, and resources to creating an infrastructure that would subsequently support a large transdisciplinary research team. If this cluster proposal is funded, we will use all appropriate campus communication channels to invite interested faculty to participate in cluster activities and apply for investigator status.

To formulate the initial research agenda for the cluster, we solicited the individual research agendas of our collaborators and normalized the interdisciplinary language to create a technical blueprint (see Figure below). The blueprint provides a visualization of the relevant topical domains of existing faculty expertise and allowed us to determine the areas of expertise gaps that would inform our faculty search priorities.



Subsequent discussion and analysis of the technical blueprint challenged the investigators to answer the question: What makes our cluster unique relative to other learning sciences research groups around the country? We acknowledge that we would not be the first research group to study the learning sciences. However, what would make the UCF LS cluster unique is our shared focus on the integration of transdisciplinary knowledge regarding ways in which big data can inform machine learning algorithms to create more effective personalized learning environments for students of all ages and abilities. Specifically we seek to understand how systems (i.e., users, tools, data, analysis, visualization), interfaces (i.e., natural language, speech, vision, agents, robotics), and cognition (i.e., memory, emotion, curiosity, pattern-recognition, problem solving, decision making), interact in ways that improve student academic, behavioral, and social outcomes through personalized learning (i.e., recommendation systems, self- and guided reflection, growth curves, learning pathways, reinforcement, remediation).

A broad range of perspectives and research paradigms will be used to conduct basic and applied research relative to cognition; the nature of learning; physical, social, and cultural context; learning environments, instructional materials, and systems; the conditions impacting memory, thinking, reflection, problem solving and performance in novice to expert learners; the ways knowledge is represented through machine learning, artificial intelligence, and knowledge engineering; and learner analytics generating meaningful data about student performance,

accomplishment, and optimal pathways through knowledge bases and curricula that improve efficacy and reduce time.

3. Scholarly and Creative Works that can Help Address Challenging Societal Problems Facing us in the Coming Century

The literature is replete with evidence of the shortcomings of the current educational system relative to chronic achievement gaps for students of color, students living in poverty, students with disabilities, and students whose first language is not English (Ladson-Billings, 2006), stagnant levels of achievement performance (Barro & Lee, 2001), and low levels of educational attainment that have individual and societal economic consequences (Meyer & Benavot, 2013). As a result, there are numerous calls for educational reform at the state, national, and international level. UCF's investment in this cluster will be a powerful statement of the university's R&D commitment to enhance the educational and economic capacity associated with unlocking human potential.

The Learning Sciences cluster will advance transdisciplinary research, both basic and applied, impacting education (PK-20), locally, regionally, and globally. To achieve this goal, we have an established a research network consisting of local PreKindergarten – 12 school districts, UCF DirectConnect, and UCF Global. This research network will offer our researchers ready access to subjects and real-world classrooms to test their basic research work while at the same time providing an opportunity for our research network partners to be at the table to collaboratively shape the applied research agenda to solve real-world problems. We believe this synergetic partnership will enhance the quality of our research and accelerate the research-to-practice process necessary for wide-scale educational improvement.

Another important tactic for engaging our multiple stakeholders will take the form of *grand challenge contests* and *hackathons* conducted on-campus These events, while common in the technical community, are not routinely found in K-12 education or preservice teacher education. As a result, we propose that the cluster will sponsor one grand challenge contest per year and one hackathon each semester as an opportunity to engage our faculty with UCF students as well as K-12 students to collaboratively tackle grand computational knowledge problems.

4. Scholarly Output that Will have an Influence Across Multiple Disciplines

The LS cluster will document its productivity through the annual individual AESP reports required by each unit as well as an annual report produced by the cluster regarding its collective accomplishments. We proposed to monitor and report on the following metrics: (a) refereed journal article publications, (b) grant proposals (submitted, funded), (c) conference presentations and publications, (d) patents filed or awarded, (e) face-to-face and virtual training events and courses sponsored by the cluster, (f) hackathons, (g) grand challenge contests, (h) GitHub uploads of open source tools, and (i) curricular innovations relative to the learning sciences. All reports, publications, project descriptions and artifacts will be readily accessible through a cluster web portal. This site will also provide opportunities for prospective collaborators to become part of the conversation through scholarly contributions and project suggestions.

The transdisciplinary impact of our work will be evident in (a) training materials and resources as we provide primers and non-technical introductions for students and professionals who are encountering new technical information from outside their existing areas of expertise, (b) the formation of our research teams, and (c) our ability to attract high-quality students and win competitive grant competitions. Over time we expect the impact to grow beyond local impact indicators to be measured by highly cited journal articles, conference speaking/keynote invitations, and participating/directing large multi-site research grants.

5. Enhanced Capacity to Develop a Robust, Diverse, and Recurring Funding Base that is Commensurate with the Proposed Scholarly Area

The core group of investigators advancing this proposal have been extremely successful in securing extramural funding (over $24m in the past five calendar years) and therefore we have significant grant writing expertise through which to mentor the new junior faculty cluster hires and localized knowledge to assist the senior hires in navigating UCF systems.

Funding of this cluster proposal will provide a significant opportunity to scale the existing research capacity of the campus as we anticipate the new faculty members will both join existing research teams and provide leadership for new research projects. There are numerous federal, state, and foundation funding sources that are interested in the concepts of learning sciences, personalized learning, machine learning, and big data (e.g., NSF, NIH, DOD, DOE, IES, State Departments of Education, Gates Foundation). One example of the funding opportunities the cluster will pursue, NSF recently announced a collaboration with major cloud providers to accelerate research and innovation in big data and data science domain – BIGDATA (Critical Techniques, Technologies and Methodologies for Advancing Foundations and Applications of Big Data Sciences and Engineering), with an anticipated $26.5 million in funding for 2017.

Given the funding record of the core UCF investigators in this cluster, we posit that the cluster investment will produce a rate of return of 2.5 dollars for every dollar invested within five years. To ensure that the candidates for the LS cluster positions understand the expectations for seeking extramural funding, we have developed the following guidelines:

Year	Activity	Expectation
1	Capacity Building	Participate in meet-ups to meet new UCF collaborators; Define personal and collaborative research agendas; design grand challenges and hackathons; each new hire will submit at least one new grant proposal
2-3	Grant Submissions	FCI hires will demonstrate a rate of *grant proposal submissions* that reflect 5 times the amount of the cluster investment
4-5	Grant Awards	FCI hires will demonstrate a *grant award rate* that reflects 2.5 times the amount of the cluster investment

6. National and International Prominence

We propose to use traditional measures of impact as a means of benchmarking the stature of the faculty associated with the LS cluster such as journal acceptance rates, citation counts of publications, h-factor of researchers, agency funding rates, journal editorial board appointments,

and invited keynotes. However, we propose two additional tactics to accelerate innovation and stature.

The complex nature of our work requires transdisciplinary collaboration. However, the pace of change in technological fields also requires that we develop, nurture, and sustain strong collaborative relationships with industry. This is particularly true in the context of working with big data that is now measured in *Petabytes* and *Exabytes*. We cannot be successful by working in isolation. Therefore, a key component of our research will involve collaboration with researchers in the technology industry, including Amazon, Facebook, Google, IBM, Microsoft, and Wolfram Alpha. These collaborations will accelerate innovation and impact and provide invaluable career opportunities for our students.

We believe one tactic that will significantly accelerate the trajectory of the national and international prominence of this cluster is a core development principle based on the work of The Open Science Project (https://cos.io/). In particular, we intend to conduct research that is aligned with two badges: Open Data and Open Materials. Our review of prominent research centers reveals that when researchers share data and tools, their citation counts and status tend to rise exponentially in comparison with traditional research center that focus exclusively on grant-funded projects and publications.

7. Short- and Long-term Custer Objectives

The preliminary short- and long-term cluster objectives include the following:

Operational Objectives [short-term]

01. Create an organizational structure for the cluster that supports appointments such as research scientists, affiliate faculty, post-doc researchers, and collaborating partners.
O2. Develop recruiting materials for campus faculty interested in cluster affiliation appointments
O3. Develop recruiting materials for international search for the four cluster positions, including the innovative interview procedures
O4. Implement a technology infrastructure that supports exploration (i.e., digital sandboxes) and collaboration (e.g., virtual lab notebooks, proposal development, and publications).

Culture and Climate Objectives [on-going]

C1. Find the right mix of people; Develop teams
C2. Develop creative spaces
C3. Foster innovation through tools and toys
C4. Practice entrepreneurship and smart risk-taking
C5. Remove barriers (e.g., This Sucks wall)

Strategic Objectives [short- and long-term]

S1. Define and select the strategic grand challenges problems at the nexus of LS and CK.
S2. Develop a network of Pre-K-20 school research sites (CEDHP), two-year colleges (DirectConnect), UCF, and remote sites in the US and internationally (UCF Global).
S3. Conduct an asset inventory of the instructional content, design tools, computational resources, and learner analytic assets contributed by the cluster faculty members and affiliates.

Research Objectives [preliminary]

R1. Develop a cluster research map that illustrates layers of (a) relevant funding sources, including non-traditional sources; (b) over-arching lines of research, inquiry, and development; and (c) specific investigations that contribute to addressing grand challenges.
R2. Prepare and submit grant proposals.
R3. Develop industry partnerships.
R4. Sponsor grand challenge contests and hackathons.

8. Graduate and Undergraduate Curriculum Integration

The cluster's goal is to build a world-class team devoted to becoming a leader in theory, research, development, and classroom practice regarding the complex relations between how people learn, and the ways in which learning sciences, computational knowledge, and data analytics can be applied to thinking, decision-making, and problem solving. This approach will afford exceptional opportunities. For example, the employment opportunities for careers in disciplines associated with this cluster are strong in both the short- and long-term employment forecasts (i.e., LinkedIn postings reveal 69,800+ jobs in analytics, 9,000+ jobs in machine learning, and 5,000+ jobs in data science).

The following curriculum integration initiatives will create transdisciplinary learning opportunities for our undergraduate (U) and graduate (G) students at UCF, as well as students in DirectConnect, UCF Global, and our local K-12 area school districts.

Task	*Description*	*Outcome*
Curriculum Mapping	Review the U/G curriculum to identify existing courses relevant for study within the LS cluster.	Cluster advising menu
New Course Development	Cluster faculty will develop new interdisciplinary U/G courses, internships, and research experiences.	New state-of-the-art courses
Student Credit Hour (SCH) Generation	Given the importance of student credit hours in the new budget model, the cluster will devise ways of generating new U/G SCHs in ways that benefit units at all levels (i.e., department/ college, university).	Increase SCH in new and existing cluster courses by 50% over 5 years.

9. Proposed Recruitment Strategies and Hiring Plan

We've conceptualized the hiring request for the LS cluster to search for four individuals with the following expertise:

(1) Educational Data Scientist, Learning Sciences (Junior faculty); learning standards, performance assessment, learning analytics, data visualization
(2) Human Centered Computing, Learning Sciences (Senior faculty); cognition, learning theory, interface design, user testing, gaming, design-based research
(3) Big Data, Computational Knowledge (Junior faculty); big data, supervised and unsupervised machine learning approaches, data mining methodologies, recommendation algorithms
(4) Machine Learning, Computational Knowledge (Senior faculty); knowledge representation, decision making, complex systems, signal processing, parallel and cloud computation

We will use a multi-prong strategy to identify an exceptional pool of candidates for these positions: (a) invitations to targeted faculty using our personal networks; (b) invitations to renowned faculty serving as journal editorial board members of prominent journals (e.g., *Cognition*, *Journal of the Learning Sciences, Journal of Machine Learning Research*) (c) invitations to renowned faculty serving as officers in select professional associations; (d) invitations to members of the *National Academy of Sciences* (Section 52: Psychological and Cognitive Sciences); and (e) position announcements (e.g., *UCF Faculty Cluster Hire* web page, *Chronicle of Higher Education* ad).

Because of the fundamental requirement of these positions to engage in collaborative work and spark transdisciplinary creativity, we propose to hire all four positions at once by engaging semi-finalists in a real-time event involving a virtual meet-up where they present a "TED-type Talk" and then interactively engage with our faculty and students in a virtual "un-conference." These methods will (a) clearly demonstrate that UCF is an innovator and not a typical university and (b) require the candidates to demonstrate that they have the intellectual, interpersonal, technological, creative, and collaborative skills required for the cluster.

We propose to employ a similar strategy to bring all finalists to campus concurrently to ensure that the hiring process is not constrained by the traditional schedule conflicts when hiring faculty in a linear sequential order during a busy semester. As a result, we are ready, able, and willing to complete the hiring process within the 2017-18 academic year in order that the four new faculty members will be on-campus, ready to begin this vitally important work in August 2018.

10. Integration with the University's New Collective Impact Strategic Plan

The need for the cluster and its alignment with existing Departmental and College goals is detailed in the letters of support. The cluster will contribute significantly to each of UCF's five strategic goals. Below we summarize the alignment between the cluster objectives with tactics for achieving the goals of the strategic plan at all levels (i.e., department/ college, university):

Goal 1: Harness the Power of Scale to Transform Lives and Livelihoods		
Indicator	*Metric*	*Activity and Return on Investment*
Graduate Students	Increase Graduate Student Numbers and Quality	Given the strong employment forecasts for technical careers in the learning sciences, the cluster will develop courses and programs that will attract, retain, and graduate high quality students (approx. 4-10 students per year).
Goal 2: Attract and Cultivate Diverse Faculty, Staff, & Students Whose Collective Contributions Strengthen Us		
Indicator	*Metric*	*Return on Investment*
Endowment	Increase Named Professorships	Within 5 years the cluster will receive funding for a named professorship in LS or CK.
	Increase Endowed Chairs	Within 5 years the cluster will receive funding for an endowed chair in LS or CK.
Diverse Faculty	Achieve 25% in New Hires from Under-	The cluster hiring will meet or exceed this goal.

	represented Groups	
Goal 3: Deploy our Distinctive Assets to Solve Society's Greatest Challenges		
Indicator	*Metric*	*Return on Investment*
Meaningful Engagement	Launch a Major Community Engagement Initiative	The research network established by the cluster will represent a major accomplishment in collaboratively harnessing the Pre-K – 20 educational community to focus on personalized learning to improve the learning outcomes for all students.
Research Experience	Increase Undergraduate Research Participation by 50%	The cluster will contribute to this goal by assuring that 100% of our undergraduate and graduate students participate in research showcases.
Extramural Funding	Increase Extramural Funding	In years 2-3, FCI hires will demonstrate a rate of *grant proposal submissions* that reflect 5 times the amount of the cluster investment. In years 4 and beyond, FCI hires will demonstrate a *grant award rate* that reflects 2.5 times the amount of the cluster investment.
Goal 4: Create Partnerships that Amplify our Academic, Economic, Social, and Cultural Impact and Reputation		
Partnerships	Partnerships with Highly Regarded Organizations and Universities	See description in Section 6.
Goal 5: Innovate Academic, Operational, and Financial Models to Transform Higher Education		
Technology Innovation	Recognition for Distributed Learning Leadership	The cluster will contribute to this goal through its accomplishments in learning sciences open source tools and resources.

References

Barro, R. J., & Lee, J. W. (2001). International data on educational attainment: Updates and implications. *Oxford Economic Papers, 53*(3), 541-563.

Christian, B., & Griffiths, T. (2016). *Algorithms to live by: The computer science of human decisions*. NY: Macmillan.

Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920*. NY: Teachers College Press.

Ladson-Billings, G. (2006). From the achievement gap to the education debt: Understanding achievement in U.S. schools. *Educational Researcher, 35*(7), 3-12.

Meyer, H. D., & Benavot, A. (Eds.). (2013). *PISA, power, and policy: The emergence of global educational governance*. Oxford, United Kingdom: Symposium Books Ltd.

U.S. Department of Education. (2017). *Reimagining the role of technology in education: 2017 national education technology plan update*. Washington, DC: Author.

BIOGRAPHICAL SKETCH

Provide the following information for all the core cluster personnel. Follow this format for each person.

DO NOT EXCEED TWO PAGES PER INVESTIGATOR.

NAME: **Dr. Malcolm B. Butler** Cluster Lead: No

POSITION TITLE, DEPT, & UNIT and or COLLEGE:
Professor, College of Education and Human Performance, School of Teaching, Learning and Leadership

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date YEAR	FIELD OF STUDY
University of Florida, Gainesville, FL	Ph.D.	1995	Curriculum and Instruction, Science Education
University of Florida, Gainesville, FL	M.Ed.	1991	Curriculum and Instruction, Secondary Science Education
Southern University, Baton Rouge, Louisiana	B.S.	1989	Physics

A. Personal Statement- your value to the cluster

My research focuses on the following areas: Multicultural science education, Equity and diversity in science, Writing to learn in science, Science and underserved students, Case-based pedagogy in teacher education, and Physics teacher education. My contributions to the cluster will involve the learning sciences and technology as it pertains to student understanding, and misunderstanding of science concepts.

B. Contribution to Scholarship and Creative Activities

Science Curriculum Materials

1. National Geographic Society. (2010). *National Geographic Science and Literacy.* Carmel, CA: Program Authors: R. Bell, M. B. Butler, N. K. Duke, J. Lederman, D. W. Moore, & K. C. Trundle.
2. National Geographic Learning. (2015). *Exploring Science.* Independence, KY. Program Authors: R. Bell, M. B. Butler, K. C. Trundle, & J. Lederman.

Refereed Journal Articles

1. Reece A. J., Butler M. B. (In Press). Virtually the same: A comparison of STEM students' content knowledge, course performance, and motivation to learn in virtual and face-to-face introductory biology laboratories. *Journal of College Science Teaching.*
2. Parsons, E. C., Bulls, D. L., Freeman, T. B., Butler, M. B., & Atwater, M. M.(Accepted). General experiences + race + racism= Work lives of Black faculty in postsecondary science education. *Cultural Studies of Science Education.*
3. Settlage, J., Butler, M., Wenner, J., Smetana, L., & McCoach, B. (2015). Examining elementary school science achievement using organizational and leadership

perspectives: A fresh tactic for attacking achievement gap disparities. *School Science and Mathematics,* 115(8), 381-391.
4. Atwater, M. M., Butler, M. B., Freeman, T., & Parsons, E. (2013). An examination of Black science teacher educators' experiences with multicultural education, equity and social justice. *Journal of Science Teacher Education,* 24(8), 1293-1313.
5. Johnston, A., Butler, M., Mensah, F.M., & Williams, B. (2011). Playing with science: Models for engaging communities. *Children, Youth and Environments,* 21(2), 312-324.

C. Evidence of Impact & Support

Extramural Funding

1. Improving Augmented Reality Technologies for Training and Education. Principal Investigators: Joseph LaViola, Greg Welch, & Malcolm Butler ($83,333). Sponsoring Agency: Florida High Tech Corridor Council.
2. Improving Augmented Reality Technologies for Training and Education. Principal Investigators: Joseph LaViola, Greg Welch, & Malcolm Butler ($250,000). Sponsoring Agency: Lockheed Martin Cooperation.
3. The African Diaspora: Developing Black Scholars in Science Education for the 21st Century in the United States (A Symposium), Part II. Supplemental Funding ($57,515). National Science Foundation. Extended to July 2015. Co-Principal Investigator. http://african- diaspora.coe.uga.edu/
4. PhysTEC (Physics Teacher Education Coalition) Comprehensive Site. ($303,539). American Physical Society and American Association of Physics Teachers. 2013-2016. Co-Principal Investigator. http://physics.cos.ucf.edu/phystec/
5. Collaborative Research Project: School Organization and Science Achievement. ($2.9 million). National Science Foundation. July 2011-June 2016. Partner Principal Investigator. http://education.ucf.edu/sosa/
6. The African Diaspora: Developing Black Scholars in Science Education for the 21st Century in the United States (A Symposium), Part II. ($100,000). National Science Foundation. September 2012-June 2014. Co-Principal Investigator. http://african-diaspora.coe.uga.edu/

Leadership

1. National Science Foundation, Math and Science Partnership Program, Proposal Panelist
2. National Science Foundation, DRK12, Proposal Panelist
3. *Journal of Science Teacher Education*, Editorial Board Member and Reviewer
4. *International Journal of Science and Environmental Education*, Editorial Board Member
5. *Journal of Research in Science Teaching*, Reviewer

BIOGRAPHICAL SKETCH

Provide the following information for all the core cluster personnel. Follow this format for each person.

DO NOT EXCEED TWO PAGES PER INVESTIGATOR.

NAME: **Dr. Lisa Dieker** Cluster Lead: No

POSITION TITLE, DEPT, & UNIT and or COLLEGE:
Pegasus Professor and Lockheed Martin Eminent Scholar Chair, College of Education, Department of Child, Family, and Community Sciences

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date YEAR	FIELD OF STUDY
Eastern Illinois University, Charleston, IL	BS	1985	Special Education and Elementary Education
Eastern Illinois University, Charleston, IL	MS	1988	Special Education and Collaboration with General Education
University of Illinois Champaign, IL	Ph.D.	1994	Special Education and Curriculum and Instruction - mild disabilities

A. Personal Statement- your value to the cluster

My work throughout my career has been based on interdisciplinary collaboration as that is a core of my discipline, special education. My work has become much more transdisciplinary in having transcending my knowledge base in math and science as the Director of the Lockheed Martin/UCF Mathematics and Science Academy and in my work in TeachLivE. During my current sabbatical I am once again transcending my own thinking by working across numerous disciplines in learning about the use of neurophysiological tools to better understand the behaviors of master teachers. This work I hope will be at the core of my work with the learning sciences cluster to help us further think about how to help preservice and novice teachers through learning science to be more effective and to stay longer in the classroom. The current cost of teacher churn in the U.S. is estimated to be over $5 billion annually and my work with this team would be to contribute my knowledge and to learn from others across disciplines.

B. Contribution to Scholarship and Creative Activities

My strongest example is my direction of the Lockheed Martin/UCF Mathematics and Science Academy with my speciality being in the learning sciences in working with children with disabilities. I also think that my work with computer science, education and simulation to create and hold a patent for TeachLivE is another strong example. Beyond these examples at UCF I have been an editor or co-editor for three journals, I serve on over 10 editorial boards, I have presented my research across disciplines nationally and internationally and I have had significant grant funding cross my career (over $15m) with the majority being work that transcends disciplines.

C. Evidence of Impact & Support

I hold a patent that is being licensed by UCF, I have over 50 publications, 4 books, 2 DVDs and over $15M in funding. I have provided over 100 keynotes in my career at the local, state, national, and international level. I have partnered in work across all colleagues at UCF and national/internationally my work with TeachLivE has been used in teacher education, police force, resident assistants, college teaching assistants, sex education, workforce training, foundation training, leadership training, and hospitality management. I continue to be a lifelong learner and the impact of my knowledge combined with my eagerness to learn from other scholars provides the synergy to the cluster in learning sciences for a win/win/win situation for UCF.

BIOGRAPHICAL SKETCH

Provide the following information for all the core cluster personnel. Follow this format for each person.

DO NOT EXCEED TWO PAGES PER INVESTIGATOR.

NAME: **Dr. Dave Edyburn** Cluster Lead: Yes

POSITION TITLE, DEPT, & UNIT and or COLLEGE:
Professor and Associate Dean for Research, College of Education and Human Performance

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date YEAR	FIELD OF STUDY
Illinois State University, Normal, IL	BSEd	May 1979	Learning Disabilities and Behavior Disorders
Illinois State University, Normal, IL	MSEd	August 1982	Reading
University of Illinois at Urbana-Champaign, IL	Ph.D.	June 1987	Special Education

A. Personal Statement- your value to the cluster

Dave L. Edyburn, Ph.D., is a Professor and Associate Dean for Research in the College of Education and Human Performance at the University of Central Florida. His teaching and research in focus on the use of technology to enhance teaching, learning, and performance. He has authored over 150 articles and book chapters on the use of technology in special education. He is an Advisor for the National Center for Universal Design for Learning. He is the Past President of the Special Education Technology Special Interest Group (SETSIG) in the International Society for Technology in Education (ISTE) as well as a past president of the Technology and Media (TAM) Division of the Council for Exceptional Children (CEC). He is the past chair of the Online Learning and Teaching Special Interest Group (SIG-OTL) in the American Education Research Association (AERA). His contributions to this cluster will take several forms (a) administrative research support, (b) expertise in the learning science particularly in the context of literacy and the interface with technology to overcome poor academic performance, (c) expertise in managing learning technology development (i.e., project management, prototyping, user evaluation of software), and (d) expertise in research methods.

B. Contribution to Scholarship and Creative Activities

Publications

1. Hariharan, P., & Edyburn, D. (2015). Effect of text modification strategies for students with varying reading ability level. *Journal of Disability Management and Special Education*, 5(1), 24-33. ISSN: 2229-5143
2. Edyburn, D.L., & Edyburn, K.D. (2015). Design for more types: Designing text to support the access, engagement, and success of diverse learners. In D.L. Edyburn (Ed.). (2015). *Advances in Special Education Technology* - Volume 2: Accessible Instructional Design (pp. 121-159). Bingley, United Kingdom: Emerald Group Publishing. ISBN: 978-1-78560-289-4.
3. Edyburn, D.L. (2015). Recommendation engines. In J. M. Spector (Ed.), *Encyclopedia of Educational Technology* (pp. xxx-xxx). Thousand Oaks, CA: Sage Publications.

4. Edyburn, D.L. (2014). Connecting the dots: Technology trends that could significantly alter the future of special education. In J. McLeskey, N.L. Waldron,, F. Spooner, & B. Algozzine (Eds.), *Handbook of Research and Practice for Effective Inclusive Schools* (pp. 451-463). New York: Routledge.
5. Edyburn, D.L., & Edyburn, K.D. (2012). Tools for creating accessible, tiered, and multilingual web-based curricula. *Intervention in School and Clinic*, 47(4), 199-205.
6. Edyburn, D.L. (2006). Failure is not an option: Collecting, reviewing, and acting on evidence for using technology to enhance academic performance. *Learning and Leading with Technology*. 34(1), 20-23.
7. Edyburn, D.L. (2006). Cognitive prostheses for students with mild disabilities: Is this what assistive technology looks like? *Journal of Special Education Technology*, 21(4), 62-65.
8. Edyburn, D.L. (2006). Student performance data: Extracting meaning has never been easier. *Journal of Special Education Technology*, 21(3), 52-54.
9. Edyburn, D.L. (2002). Cognitive rescaling strategies: Interventions that alter the cognitive accessibility of text. *Closing the Gap*, April/May, 1, 10-11, 21.

C. Evidence of Impact & Support

Extramural Funding

1. Basham, J., Israel, M., Edyburn, D., & Marino, M. (2010). Interactive field investigation guide: An accessible platform to provide STEM for all. A two year development grant funded by the Office of Special Education Programs, U.S. Department of Education. Two year funding: $400,000. Co-Principal Investigator and Lead Instructional Designer.
2. Smith, R.O., & Edyburn, D.L. (2008). Universal design infusion of technology and evaluation for accessible campuses of higher education. A three year model demonstration grant funded by the Office of Post-Secondary Education, U.S. Department of Education. Three year funding: $1,074,287. Co-Principal Investigator.
3. Edyburn, D.L. & Smith, R.O. (2006). Validation of student academic achievement using technology enhanced performance intervention menus. UWM Graduate School, Research Growth Initiative. Two year funding: $147,354. Principal Investigator.
4. Smith, R.O., & Edyburn, D.L. (2001). The Assistive Technology Outcome Measurement Systems (ATOMS) Project. A five year research center grant funded by the National Institute on Disability and Rehabilitation Research (NIDRR), U.S. Department of Education. Five year funding: $2,225,000. Co-Principal Investigator.

Products

1. Edyburn, K., & Edyburn, D. (2012). Text Compactor [Web-application]. Whitefish Bay, WI: Knowledge by Design, Inc. http://www.textcompactor.com
2. Edyburn, D., & Edyburn, K. (2010). Jen: The Tiered Web Page Generator [web application]. Whitefish Bay, WI: Knowledge by Design, Inc. http://www.tieredwebpages.com/

Awards

1. International Society of Technology in Education's SIGTE Award for Excellence in Teacher Education, June 2014
2. Outstanding Reviewer, Review of Educational Research, American Education Research Association, April 2005

BIOGRAPHICAL SKETCH

Provide the following information for all the core cluster personnel. Follow this format for each person.

DO NOT EXCEED TWO PAGES PER INVESTIGATOR.

NAME: **Charles E. Hughes** Cluster Lead: yes

POSITION TITLE, DEPT, & UNIT and or COLLEGE:
Professor, Department of Computer Science, College of Engineering & Computer Science

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date YEAR	FIELD OF STUDY
Northeastern University	BA	05/1966	Mathematics
Pennsylvania State University	MS	12/1968	Computer Science
Pennsylvania State University	Ph.D.	12/1970	Computer Science
National Research Council/NIST	Postdoctoral	08/1971	Computer Science

A. Personal Statement- your value to the cluster

My research career started with over four decades of research related to simulation, graphics, visualization and computational theory, much of which focused on developing and assessing environments for learning by students from pre-K to adults. Over the last decade I have focused on the development, use and evaluation of virtual environments designed to improve human-centric skills in a wide variety of disciplines. I have carried out this work in collaboration with other faculty members from Anthropology, Biology, Chemistry, Computer Science, Digital Media, Economics, Education, History, Hospitality, Medicine, Nursing, Physics, Public Health and Statistics. Applications of this research include teacher and principal education (the TeachLivE project), virtual heritage (the ChronoLeap and Caracol projects), free choice learning (predominantly STEM experiences in museums and science centers), naturalistic decision-making, cognitive and physical rehabilitation, and training for a broad range of contexts including cross-cultural interaction, debriefing skills (for trainers), de-escalation skills (predominantly for law enforcement), empathy skills, Interview skills (for interviewers and interviewees), protective strategies (for self and others), and situational awareness (military and first responders). Funding agencies for these projects have included the Bill & Melinda Gates Foundation, the Bert W. Martin Foundation, the National Science Foundation, the National Institutes of Health, the National Endowment for the Humanities, the Army PEO-STRI, the Office of Naval Research and the US Department of Veterans Affairs.

B. Contribution to Scholarship and Creative Activities

(Briefly describe your most significant contributions to scholarship and creative activities. Include appropriate indicators for your area of scholarship and external recognition.)
Recent Relevant Publications

1. Nojavanasghari, B., Baltrusaitis, T., Hughes, C. E., & Morency, L-P. (2016). EmoReact: A multimodal approach and dataset for recognizing emotional responses in children. *International Conference on Multimodal Interaction (ICMI 2016)*, Tokyo, Japan, 137-144.

2. Jung, S., & Hughes, C. E. (2016). The Effects of indirect real body cues of irrelevant parts on virtual body ownership and presence. *International Conference on Artificial Reality and Telexistence Eurographics Symposium on Virtual Environments*, 107-112
3. Hughes, C. E., Epstein, J. A., Hall, T., Ingraham, K. M., & Hughes, D. E. (2016). Enhancing protective role-playing behaviors through avatar-based scenarios. *4th International Conference on Serious Games and Applications for Health*, 1-7. (**Best paper Award)**
4. Nojavanasghari, B., Baltrusaitis, T., Hughes, C. E., & Morency, L-P. (2016). The future belongs to the curious: Towards automatic understanding and recognition of curiosity in children. *Workshop on Child Computer Interaction (WOCCI 2016)*, San Francisco, 16-22.
5. Hughes, C. E., Nagendran, A., Dieker, L., Hynes M., & Welch, G. (2015). Applications of Avatar-Mediated Interaction to Teaching, Training, Job Skills and Wellness. *Virtual Realities – Dagstuhl Seminar 2013*, Eds. G. Burnett, S. Coquillard, R VanLiere & G. Welch, Springer LNCS, 8844. 133-146.
6. Barmaki, R., & Hughes, C. E. (2015). Providing real-time feedback for student teachers in a virtual rehearsal environment. *Proceedings of 17th International Conference on Multimodal Interaction (ICMI'15)*, 531-537. (**People's Choice Grand Challenge Award).**
7. Dieker, L. A., Hynes, M. C., Hughes, C. E., Hardin, S., & Becht, K. (2015). TLE TeachLivE (TM): Using Technology to Provide Quality Professional Development in Rural Schools. *Rural Special Education Quarterly* 34(3), 11-16
8. Nagendran A, Pillat R, Kavanaugh A, Welch G, & Hughes CE. (2014). A Unified Framework for Individualized Avatar-Based Interactions. *Presence: Teleoperators and Virtual Environments*, 23(2), 109-132. **(US Patent No. 9,381,426 B1; Awarded July 5, 2016).**
9. Dieker, L. A., Rodriguez, J., Lingnugaris-Kraft, B., Hynes, M., & Hughes C. E. (2014). The Future of Simulated Environments in Teacher Education: Current Potential and Future Possibilities. *Teacher Education and Special Education*, 37(1), 21-33. **(2015 Publication Award from the Teacher Education Division of the Council for Exceptional Children)**.
10. Lindgren, R., Moshell J. M., & Hughes, C. E. (2014). Virtual environments as a tool for conceptual learning. In *Handbook of virtual environments: Design, implementation, and applications (2nd Edition)*, Eds. K. Hale & K. M. Stanney, 2014, Chapter 40, 1043-1055.

C. Evidence of Impact & Support

Office of Naval Research, *DURIP: Transportable Human-Surrogate Interaction System (THuSIS)*, $148,216 (16.7% credit=$24,752), (PIs: G. Welch, C. E. Hughes, A. Raij). 09/15/2016-09/14/2017.

National Science Foundation via University of Idaho, *Arbor: Comparative Analysis Workflows for Tree of Life*, $290,461 (100% credit=$290,461), (PI: C. E. Hughes). 5/1/2012-4/30/2017.

Bert W. Martin Foundation, *TeachLivE™ elementary classroom*, $124,000 (33% credit=$41,333), (PIs: L. Dieker, M. Hynes, C. E. Hughes). 4/1/2016-3/31/2017.

Office of Naval Research, *Human Surrogate Interaction*, (PIs: Greg Welch, C. E. Hughes). $2,312,188 (20% credit=$462,438), 3/1/2014-2/28/2017.

Bill & Melinda Gates Foundation, *TeachLivE™*, $1,500,055 (33% credit=$500,028), (PIs: L. Dieker, M. Hynes, C. E. Hughes). 4/1/2012-6/30/2016.

Bert W. Martin Foundation, *TeachLivE™ Avatar Proposal for an elementary classroom and student with autism*, $65,000 (33% credit=$21,666), (PIs: L. Dieker, M. Hynes, C. E. Hughes). 4/1/2015-3/31/2016.

National Science Foundation, *Reducing Alcohol Use among College Students Using Digital Puppetry*, $257,721 (75% credit=$193,291), (PIs: C. E. Hughes, Tom Hall), joint with Weill Cornell College of Medicine. 9/1/2011-12/31/2015.

BIOGRAPHICAL SKETCH

Provide the following information for all the core cluster personnel. Follow this format for each person.

DO NOT EXCEED TWO PAGES PER INVESTIGATOR.

NAME: **Dr. Fei Liu** Cluster Lead: No

POSITION TITLE, DEPT, & UNIT and or COLLEGE:
Assistant Professor, Department of Computer Science, College of Engineering & Computer Science

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date YEAR	FIELD OF STUDY
Fudan University, Shanghai, China	BS	07/2004	Computer Science
Fudan University, Shanghai, China	MS	07/2007	Computer Science
University of Texas at Dallas, Richardson, TX	PhD	05/2011	Computer Science
Carnegie Mellon University, Pittsburgh, PA	Postdoc	06/2015	Computer Science

A. Personal Statement- your value to the cluster

I currently lead the Natural Language Processing group at the University of Central Florida. I have the research expertise, leadership, resources and collaborations necessary to contribute to UCF Faculty Cluster Initiative. My research areas are in natural language processing, machine learning, and data mining, with special emphasis on automatic summarization and social media. I have extensive experiences in both industry and academia, leading research projects at Bosch Research and Technology Center (2011-2013) and Carnegie Mellon University (2013-2015). At CMU, I was a leading contributor to a $3.75 million multi-year interdisciplinary research project (NSF CNS-1330596) in collaboration with Stanford University and Fordham University at New York. I have published over thirty peer reviewed articles in the top-tier international conferences and journals. Further, I served as an area chair for the Generation and Summarization track at the 2015 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies. I was a recipient of the Best Paper Finalist award at the 25th International World Wide Web Conference (WWW), Montreal, Canada, 2016. My research group focuses on developing innovative natural language technologies that improve human language understanding and processing.

B. Contribution to Scholarship and Creative Activities

Positions and Employment

05/2011 – 12/2012	Bosch Research and Technology Center (Palo Alto, CA), Research Scientist
01/2013 – 11/2013	Bosch Research and Technology Center (Palo Alto, CA), Senior Research Scientist
12/2013 – 06/2015	Carnegie Mellon University, Postdoctoral Fellow, School of Computer Science
08/2015 – present	University of Central Florida, Assistant Professor, Department of Computer Science, College of Engineering and Computer Science

C. Evidence of Impact & Support

1. Text summarization based on semantic graph (2015-present)

I have been leading the Natural Language Processing group at the University of Central Florida since 2015 with the mission of developing innovative natural language technologies that improve human language understanding and processing. The group conducts research in the areas of text summarization, language generation, social media analytics, natural language semantics, and machine Learning for NLP. Much of the technologies involve probabilistic models, machine learning, and deep learning as applied to large-scale text data. Automatic text summarization is a main research area of natural language processing.

a. Fei Liu, Jeffrey Flanigan, Sam Thomson, Norman Sadeh, and Noah A. Smith. Toward Abstractive Summarization Using Semantic Representations. In Proceedings of the 2015 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL), Denver, Colorado, 2015.
b. Dani Yogatama, Fei Liu, and Noah A. Smith. Extractive Summarization by Maximizing Semantic Volume. In Proceedings of the 2015 Conference on Empirical Methods on Natural Language Processing (EMNLP), Lisboa, Portugal, 2015.

2. Developing machine learning and natural language processing techniques for extracting key practices from website privacy policies (2013-present)

Website privacy policies represent a legal binding between end users and the website operator. They are verbose, too long to read, and difficult to understand. Few people attempt to read it, and those who do suffer from understanding the meaning. This project seeks to extracting key privacy practices by combining natural language processing, machine learning, and crowdsourcing techniques.

a. Shomir Wilson, Florian Schaub, Rohan Ramanath, Norman Sadeh, Fei Liu, Noah A. Smith, Frederick Liu. Crowdsourcing Annotations for Websites' Privacy Policies: Can It Really Work? In Proceedings of the 25th International World Wide Web Conference (WWW), Montreal, Canada, 2016
b. J. Reidenberg, T.D. Breaux, L.F. Cranor, B. French, A. Grannis, J.T. Graves, F. Liu, A.M. McDonald, T.B. Norton, R. Ramanath, N.C. Russell, N. Sadeh, F. Schaub. Disagreeable Privacy Policies: Mismatches between Meaning and Users' Understanding. Berkeley Law Technology Journal, Vol. 30, No. 1, 2015

4. Summarizing Speech Conversations (2007-present)

Human conversations are recorded in an unprecedented manner. Examples include telephone speech, meetings, broadcast conversations, lectures, call center dialogues, and doctor-patient conversations. This project focuses on multi-party meeting conversations using a dataset collected by ICSI Berkeley. The goal is to automatically generate a textual summary for an hour-long meeting conversation.

a. Fei Liu and Yang Liu. Towards Abstractive Speech Summarization: Exploring Unsupervised and Supervised Approaches for Spoken Utterance Compression. IEEE Transactions on Audio, Speech and Language Processing, Vol. 21, No. 7, pp. 1469-1480, March 2013.

BIOGRAPHICAL SKETCH

Provide the following information for all the core cluster personnel. Follow this format for each person.

DO NOT EXCEED TWO PAGES PER INVESTIGATOR.

NAME: **Dr. Matthew Marino** Cluster Lead: No

POSITION TITLE, DEPT, & UNIT and or COLLEGE:
Associate Professor, College of Education, Department of Child, Family, and Community Sciences

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date YEAR	FIELD OF STUDY
University of Connecticut: Storrs, CT	BS	1994	Education
Johnson State College: Johnson, VT	MAEd	1998	Education
University of Connecticut: Storrs, CT	Ph.D.	2006	Special Education

A. Personal Statement- your value to the cluster

Dr. Marino's primary research focus relates to the development, implementation, and assessment of technologies that enhance learning for students with disabilities in science, technology, engineering, and mathematics (STEM). Over the past year, with funding from the National Science Foundation, his research has expanded from k-12 to the postsecondary level. One of his currently funded projects (http://www.projectican.net/) includes graduate students in exceptional education. These students mentor undergraduate STEM majors with disabilities. Mentoring occurs on a weekly basis and utilizes web conferencing technology. Preliminary data is encouraging. The project is the first of its kind in the United States.

Dr. Marino's secondary focus is on the use of Universal Design for Learning in educational video games as a means reliably assess individuals with and without disabilities. This research builds on previously funded research from the Institute of Education Sciences. Dr. Marino was the principal investigator on a three-year $500k proposal submitted to the National Science Foundation in September to fund this research.

B. Contribution to Scholarship and Creative Activities

Israel, M., *Wang, S., & Marino, M. T. (2016). A Multilevel Analysis of Diverse Learners Playing Life Science Video Games: Interactions Between Game Content, Learning Disability Status, Reading Proficiency, and Gender. The Journal of Research on Science Teaching. 53(2), **324-345. DOI 10.1002/tea.21273**

Vasquez III, E., Nagendran, A., Welch, G. F., Marino, M. T., Hughes, D. E., *Koch, A., & *Delisio, L. (2015). Virtual learning environments for students with disabilities: A review and analysis of the empirical literature and two case studies. Rural Special Education Quarterly, 34(3), 26-32.

Hayes, M. T. & Marino, M. T. (2015). Utopia: An imaginative, critical and playful dialogue on the meaning and practice of contemporary education. E-learning and Digital Media, 12(3-4), 327-342. DOI: 10.1177/2042753015571039

Marino, M. T., Gotch, C., Israel, M., Vasquez, E. III, Basham, J. D., & *Becht, K. M. (2014). UDL in the middle school science classroom: Can video games and alternative text heighten engagement and learning for students with learning disabilities? Learning Disability Quarterly. 37, 87-99.

*Coy, K., Marino, M. T., & *Serianni, B. (2014). Using Universal Design for Learning in synchronous online instruction. Journal of Special Education Technology, 29(1), 63-74.
Marino, M. T., Israel, M., *Beecher, C. C., & Basham, J. D. (2013). Students' and teachers' perceptions of using video games to enhance science instruction. Journal of Science Education and Technology. 22, 667-680.

Basham, J. D., Smith, S. J., Greer, D. L., & Marino, M. T. (2013). The scaled arrival of K-12 online education: Emerging realities and implications for the future of education. Journal of Education. 193(2), 51-60.

Israel, M., Marino, M., Basham, J., & *Spivak, W. (2013). 5th graders as app designers: How diverse learners conceptualize educational apps. Journal of Research on Technology in Education, 46(1), 53-80.

Marino, M. T., Basham, J. D., & *Beecher, C. C. (2011). Using video games as an alternative science assessment for students with disabilities and at-risk learners. Science Scope, 34(5), 36-41.

Marino, M. T. (2010). Defining a technology research agenda for elementary and secondary students with learning and other high incidence disabilities in inclusive science classrooms. Journal of Special Education Technology 25(1), 1-28.

C. Evidence of Impact & Support

Matthew Marino, Ph.D., is an associate professor of Exceptional Education at the University of Central Florida and a former secondary special education, science, and technology teacher. His research, which has been supported in part by IES, OSEP, and NSF, focuses on the design and implementation of technology-enhanced STEM curricular materials for use in inclusive science classrooms. He is currently examining how Universal Design for Learning can increase the accessibility of educational videogames, iPad and other tablet apps, mobile devices, and online courses.

He was a featured STEM research scientist by the Family Center on Technology and Disability and invited presenter at the CEC national conference each year since 2009. Dr. Marino was a member of the design team for the national award-winning STEM videogame "You Make Me Sick!" and award winning technology-enhanced science curriculum "Alien Rescue". He has conducted large-scale intervention research in 14 states with over 2000 students during the past decade. He is on the editorial review board for a number of special education and science education journals. Dr. Marino is a technical reviewer for the National Science Foundation and a member of the leadership team for the Universal Design for Learning Implementation and Research Network.

BIOGRAPHICAL SKETCH

Provide the following information for all the core cluster personnel. Follow this format for each person.

DO NOT EXCEED TWO PAGES PER INVESTIGATOR.

NAME: **Guo-Jun Qi** Cluster Lead: No

POSITION TITLE, DEPT, & UNIT and or COLLEGE:
Assistant Professor, Department of Computer Science, College of Engineering & Computer Science

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date YEAR	FIELD OF STUDY
University of Science and Technology of China	BE	07/2006	Automation
University of Science and Technology of China	ME	07/2009	Automation
University of Illinois at Urbana-Champaign	Ph.D.	07/2014	Electrical and Computer Engineering

A. Personal Statement- your value to the cluster

I am an assistant professor in the Department of Computer Science at the University of Central Florida. My research interests include knowledge discovery, analysis and aggregation of big data deluging from a variety of modalities and sources in order to build smart and reliable information and decision-making systems. I strive to apply my research to solve the practical problems through high quality data processing and analysis in healthcare, sensor and social networks, financial systems and so forth. I was a one-time recipient of Microsoft Fellowship, and twice IBM Fellowships.

I have published over 70 papers in a wide range of venues, such as Proceedings of IEEE, IEEE T PAMI, IEEE T KDE, IEEE T Image Processing, ACM SIGKDD, WWW, ICML, ACM MM, CVPR, ICDM, SDM and ICDE. Among them are the best paper of ICDM 2014 Best Student Paper, "the best ICDE 2013 paper" by IEEE Transactions on Knowledge and Data Engineering, as well as ACM Multimedia 2007. My publications have been cited 3000+ times and my current h-index is 24 (Google Scholar).

B. Contribution to Scholarship and Creative Activities

Recent Relevant Publications

1. Guo-Jun Qi, Wei Liu, Charu Aggarwal, and Thomas Huang. Joint Intermodal and Intramodal Label Transfers for Extremely Rare or Unseen Classes, to appear in *IEEE Transactions on Pattern Analysis and Machine Intelligence* (T-PAMI), June 2016.
2. Kai Li§, Guo-Jun Qi*, Jun Ye, Kien Hua. Linear Subspace Ranking Hashing for Cross-modal Retrieval, to appear in *IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI)*, September 2016.
3. Jinhui Tang, Xiangbo Shu§, Guo-Jun Qi, Zechao Li, Meng Wang, Shuicheng Yan, and Ramesh Jain. Tri-clustered Tensor Completion for Social-Aware Tag Refinement, to appear in *IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI)*, September 2016.

4. Jun Ye§, Hao Hu§, Guo-Jun Qi*, Kien Hua. A Temporal Order Modeling Approach to Human Action Recognition from Multimodal Sensor Data, to appear in *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, December 2016.
5. Guo-Jun Qi, Charu Aggarwal, and Thomas Huang. Breaking the Barrier to Transferring Link Information across Networks, in *IEEE Transactions on Knowledge and Data Engineering (IEEE T KDE)*, March 26, 2014. ("Best of ICDE 2013 Paper" by IEEE Transactions on KDE)
6. Jinhui Tang, Guo-Jun Qi, Liyan Zhang, Changsheng Xu. Cross-Space Affinity Learning with Its Application to Movie Recommendation, in *IEEE Transactions on Knowledge and Data Engineering (IEEE T KDE)*, Volume 25, Number 7, pp. 1510-1519, July 2013.
7. Guo-Jun Qi, Min-Hsuan Tsai, Shen-Fu Tsai, Liangliang Cao, Thomas Huang. *Web-Scale Multimedia Information Networks, in Proceedings of the IEEE*, Volume 100, Issue 9, 2012.
8. Guo-Jun Qi, Charu Aggarwal, Qi Tian, Heng Ji, Thomas Huang. Exploring Context and Content Links in Social Media: A Latent Space Method, in *IEEE Transactions on Pattern Analysis and Machine Intelligence (IEEE T PAMI)*, Volume 34, Issue 5, May 2012.
9. Guo-Jun Qi, Xian-Sheng Hua, Yong Rui, Jinhui Tang, Hong-Jiang Zhang. Two-Dimensional Multi-Label Active Learning with An Efficient Online Adaption Model for Image Classification, in *IEEE Transactions on Pattern Analysis and Machine Intelligence (IEEE T PAMI)*, Volume 31, no. 10, 2009.
10. Guo-Jun Qi, Xian-Sheng Hua, Yong Rui, Jinhui Tang, Tao Mei, Meng Wang and Hong-Jiang Zhang. Correlative Multi-Label Video Annotation with Temporal Kernels, in *ACM Transactions on Multimedia Computing, Communications, and Applications (ACM TOMCCAP)*, Volume 5, Issue 1, 2009.

C. Evidence of Impact & Support

1. Best Paper Runner-up The 23rd ACM International Conference on Multimedia (SIGMM) 10/2015
2. Best Student Paper (mentoring the student recipient)IEEE International Conference on Data Mining (ICDM) 12/2014
3. "Best ICDE 2013 Paper" by IEEE Transactions on Knowledge and Data Engineering 2013
4. IBM Fellowship, IBM Corporation 2011-2013
5. Zhu Li Yue Hua Scholarship, Chinese Academy of Science 06/2009
6. Best Paper Award, The 15th ACM International Conference on Multimedia (SIGMM) 09/2007
7. Microsoft Fellowship, Microsoft Corporation, 10/2007
8. Co-PI, "REU: Research Experiences on Internet of Things", $415,160, with Dr. Damla Turgut (PI), 05/2016

BIOGRAPHICAL SKETCH

Provide the following information for all the core cluster personnel. Follow this format for each person.

DO NOT EXCEED TWO PAGES PER INVESTIGATOR.

NAME: **Dr. Eleazar Vasquez III** Cluster Lead: No

POSITION TITLE, DEPT, & UNIT and or COLLEGE:
Associate Professor, College of Education, Department of Child, Family, and Community Sciences

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date YEAR	FIELD OF STUDY
Stephen F. Austin State University, Nacogdoches, TX	BS	2000	Education
Stephen F. Austin State University, Nacogdoches, TX	MA	2003	School and Behavioral Psychology
Utah State University, Logan, UT	Ph.D.	2008	Disability Disciplines

A. Personal Statement- your value to the cluster

My activities focus on three areas: 1) Developing future teachers and leaders in education at the undergraduate, graduate and doctoral levels in special education, 2) investigating instructional strategies that promote equal access and justice for persons from cultural and linguistic diverse populations with disabilities, and 3) utilizing emerging technologies to improve and enhance methods of instruction for both academic and behavioral outcomes. However I have also been working on STEM education through NSF funded programs award numbers (1612009, 1420198; 1505202; and 1519717), and become very involved in curriculum and faculty governance. In these roles (I-STEM fellow) I have begun developing STEM education initiatives for Child, Family, and Community Sciences and the College of Education.

B. Contribution to Scholarship and Creative Activities

1. Prior to my doctoral studies, I was a school psychologist for 3 years at Georgetown Independent School District in Texas. In addition, I was a middle school resource math teacher for an additional 2 years. The time spent teaching and working as a school psychologist allowed me to gain an insight into the study of Exceptional Education. As a teacher and school psychologist I experienced the struggles related to students with disabilities especially those from cultural and linguistically diverse backgrounds with autism. My focus in use of technology to enhance academic skills, and classroom management in the public school setting so that students with autism gain access to high quality instruction. My graduate work focused on the use of online platforms to instruct students with disabilities at a distance in rural and urban locations.

1. Rock, M., L., Spooner, F., Nagro, S., Vasquez, E., Dunn, C., Leko, M., Luckner, J., *Donehower, C., *Jones, J. L. (2016). Transforming teacher development in the digital

age: Policy drivers, implications, and recommendations. *Teacher Education and Special Education* (Invited Special Issue) 39 (2): 98-120.
2. Straub, C., & Vasquez, E. (2015). Online instruction in writing. *Journal of Special Education Technology*
3. Vasquez, E., & Straub, C. (2015). Online instruction in writing for students with learning disabilities: A review of the literature. *Reading and Writing Quarterly*.
4. Dieker, L. A., Kennedy, M. J., Smith, S., Vasquez III, E., Rock, M., & Thomas, C. N. (2014). Use of technology in the preparation of pre-service teachers (Document No. IC-11_. Retrieved from the University of Florida, Collaboration for Effective Educator, Development, Accountability, and Reform Center website: http://ceedar.education.ufl.edu/tools/innovation-configurations/
5. Vasquez, E., & Serianni, B. (2012). Research and Practice in Distance Education for K-12 students. *Rural Special Education Quarterly*, 31(4), 33-42.
6. Vasquez, E. & Slocum, T. (2012). The evaluation of synchronous online tutoring for students at risk of reading failure. *Exceptional Children*, 78 (2), 221-235.
7. Vasquez, E., Forbush, D., E., Mason, L, Lockwood, A., & Gleed, L. (2011). Delivery and evaluation of synchronous online reading tutoring to students at-risk of reading failure: implications for rural students. *Rural Special Education Quarterly*, 30(3), 16-26.

2. Upon transitioning to the University of Central Florida, I began studying the impact of teacher preparation in the area of Autism and Severe or Profound disabilities. This are of study has yielded 4.5 million in funding from the department of education and over 160 graduate students completing their MA in exceptional education and certificate in Autism Spectrum Disorders. We have infused technology as a mechanism to impact the way in which teachers are prepared for students in K-12 settings.

1. Israel, M., Vasquez, E., Donehower, C. (2016). Using the UDL framework to enhance education technology-supported learning in reading and writing for all students. *Journal of Intervention School and Clinic* (Invited Special Issue)
2. McKinney, T., & Vasquez, E. (2014). There's a bug in your ear! Using technology to increase the accuracy of DTT implementation. *Education and Training in Autism and Developmental Disabilities*.
3. Davis, R. L., Ninness, C., Rumph, R., McCuller, G., Stahl, K., Ward, T., & Vasquez, E. (2008). Functional assessment of self-initiated maladaptive behaviors: A case study. *Behavior and Social Issues*, 17, 66-85.
4. Vasquez, E., Rodriguez, J., Powell, S., Hunt., J., McKinney, T., Straub, C., Walker, Z., & Vince-Garland, K. (2014). Using E-Cove to increase the efficiency of pre-service teacher observations. *Ed Technology Ideas*.
5. Marino, M. T., Gotch, C. M., Israel, M., Vasquez, E., Basham, J. D., & Becht, K. (2014). UDL in the middle school science classroom: Can video games and alternative text heighten engagement and learning for students with learning disabilities? *Journal of Learning Disabilities Quarterly*,.
6. Garland, D., Vince-Garland, K., & Vasquez, E. (2013). Management of classroom behaviors: Perceived readiness of education interns. *Journal On The Scholarship of Teaching and Learning*, 13(2), 133-147.

3. Most recently I have been working on STEM education through NSF funded programs (iCAN), and become very involved in curriculum and faculty governance. In these roles (I-STEM fellow) I have begun developing STEM education initiatives for the College of Education and Department of Child, Family, and Community Sciences.

1. Vasquez, E., Welch, G., Marino, M, Hughes, D., *Koch, A., Delisio, L., (2015). Virtual learning environments for students with disabilities: A review and analysis of the empirical literature and two case studies. *Rural Special Education Quarterly* (Invited Special Issue).

2. Marino, M. T., Becht, K., Vasquez, E., Gallup, J., Basham, J. & Gallegos, B. (2014). Enhancing secondary science content accessibility with video games. *TEACHING Exceptional Children.*

3. Vasquez, E., * Straub, C., Nagendran, A., Marino, M., Schaffer, K., Koch, A., Delisio, L., & Russel, M. (2014). A comparison of simulated and traditional environments on the social responses for children with autism. Proceedings TeachLive Conference.

4. Walker, Z., Vasquez, E., Wienke, W. (2016). The impact of simulated interviews for individuals with intellectual disability. *Journal of Educational Technology & Society* (Invited special issue)19, 1, 76-88.

C. Evidence of Impact & Support

Vasquez is Associate Professor for the Department of Child, Family, and Community Sciences Exceptional Education Program, iSTEM Fellow, and Affiliate Faculty of Lockheed Martin UCF Academy. His current research focuses on the evaluation of academic and behavioral outcomes for students with autism utilizing technology to enhance instruction. Dr. Vasquez was recipient of the inaugural Reach for the Stars Award (2014) and has been recognized as a Teaching Academy and iSTEM Fellow at the University of Central Florida. Recently his research has expanded from K-12 schools to postsecondary institutions and other venues to prepare students who are traditionally marginalized, such as those with executive functioning disorder, for careers in STEM related fields. Dr. Vasquez research has been supported in part by $8 million dollars from the National Science Foundation and Department of Education, Office of Special Education Programs. Nationally Dr. Vasquez serves as the Teacher Education Division of the Council for Exceptional Children Technology Chair, Treasurer for the Universal Design for Learning Implementation and Research Network, and Technology Chair for the American Council for Rural Special Education.

BIOGRAPHICAL SKETCH

Provide the following information for all the core cluster personnel. Follow this format for each person.

DO NOT EXCEED TWO PAGES PER INVESTIGATOR.

NAME: **Dr. Vicki Zygouris-Coe** Cluster Lead: No

POSITION TITLE, DEPT, & UNIT and or COLLEGE:
Professor, College of Education and Human Performance, School of Department of Teaching and Learning

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date YEAR	FIELD OF STUDY
University of London, London, England	D. Ed.	September 1983	Educational Psychology
University of London, London	MSEd.	September 1984	Educational Psychology
University of Florida, Gainesville, Florida	Ph.D.	December 1997	Reading Education and Research Design

A. Personal Statement- your value to the cluster

My unique contribution may lie in the following: (a) I have a vested professional interest in the science of learning; (b) my scholarship includes teacher knowledge and learning in various environments (online, collaborative, etc.), disciplinary literacy (which is highly relevant and specialized in grades 6-12 and beyond), and digital literacies; (c) cross-disciplinary activities include: instructional framework for literacy in the content areas with a variety of content teachers; disciplinary literacy course for STEM teachers; grant-writing with engineering professor on a STEM mentoring program of high school students by UCF STEM fellows; grant-writing on reading and learning using mobile devices with two other researchers from Auburn/SUNY Cortland; grant-writing with writing & rhetoric faculty on discipline-specific argumentation; several collaborative and cross-disciplinary projects (articles, presentations, etc.).

B. Contribution to Scholarship and Creative Activities

The development of Florida's first large scale and fully online professional development in reading for teachers. Served over 50,000.00 teachers, supported state policy and other literacy initiatives, resulted in collaborations with all state and private universities, all 67 school districts, and 8 community/state colleges. My contributions in disciplinary literacy and in online learning.

1. Archabbault, L., Diamond, D., Coffey, M., Foures-Aalbu, D., Richards, J., Zygouris-Coe, V., Brown, R., & Cavanaugh, C. (2010). An exploration of at-risk learners and online education: A research brief. International Association for K- 12 Online Learning (iNACOL).
2. Zygouris-Coe, V. (2009). Reading development in first language. In A. E. Brice and R. G. Brice, (Eds.). Language development in monolingual and bilingual acquisition. (pp. 222-264). Columbus, OH: Pearson Merrill Prentice Hall.

C. Evidence of Impact & Support

Record of external funding (1999-present: over $7million; 2 current grant proposals pending in the amount of $1,448,564.00).

Partnerships--ongoing collaborative research and other professional partnerships.

Leadership in national and international professional organizations.