

Scholarship & Innovation: An Inquiry 2018-2019

Prepared by the
IMSA Scholarship & Innovation
Committee

August 2019

Our Mission

IGNITING AND NURTURING

creative, ethical, scientific minds

THAT ADVANCE THE HUMAN CONDITION

Our Identity

A LEARNING LABORATORY

“As we look forward to our fast-changing future, where the speed of change will never be slower than it has been in the past, IMSA continues to iterate to develop self-motivated, problem solvers, who write clearly and persuasively. Not being content with our past success, our charge is to move forward in testing hypotheses, gathering evidence, deriving conclusions, and repeating this cycle again and again, which is the definition of the scientific method. This method, in essence, is the spirit and practice of inquiry, innovation, and discovery. We continue to lean into being a learning laboratory because our changing world demands it and our students deserve no less.”

Jose M. Torres, PhD, President (2014-Present),
Illinois Mathematics and Science Academy (IMSA).

Our Vision

By 2022, IMSA is a Recognized Global Leader and Catalyst in Equity and Excellence in STEM Teaching and Learning, Innovation and Entrepreneurship.

SCHOLARSHIP AND INNOVATION COMMITTEE

The IMSA Scholarship and Innovation Committee was established in August, 2019 by Dr. José Torres based on report recommendations from Research Fellow, Dr. Page as a way to deepen a culture of scholarship, research and innovation across the IMSA community. The purpose of the committee is to create and communicate a shared vision, meaning and support for scholarship and innovation at IMSA, continuing its long tradition as a leading learning laboratory.

Committee membership for 2018-2019 included representatives from across the academy: Dr. José Torres (President & Co-chair), Dr. Kelly Page (Center for Innovation & Inquiry, Co-chair), Dr. Amber Stitzel Pareja and Jean Bigger (Principals Office), Richard Palmer and Benjamin Lepak (Student Affairs and Residential Life), Dr. Nadia Miskowiec (Faculty), Dr. Richard Schultz and Lindsey Herlehy (Center for Teaching & Learning).



COMMITTEE OBJECTIVES

- To create, communicate and support a shared vision and meaning for scholarship and innovation at IMSA as a learning laboratory.
- To foster a culture of 'doing' and 'sharing' about scholarship and innovation.
- To identify key multi-year priorities to invest resources that further scholarship, innovation, and professional development at IMSA.
- To establish formal relationships with key external partners such as with universities, foundations, research centers, innovation hubs to support scholarship and innovation.
- To forge connections across the IMSA community and partners that advance teaching and learning.

HOW DO WE CONSIDER, PRACTICE & SUPPORT SCHOLARSHIP & INNOVATION?

A Community Inquiry.



HOW DO WE CONSIDER, PRACTICE & SUPPORT SCHOLARSHIP & INNOVATION?

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During 2018-2019, the committee identified three ways to explore with faculty and staff how we consider, practice and support scholarship and innovation at IMSA.

1: Secondary Research

A review of existing literature, secondary source material, video and audio content.

2: Interviews and Group Discussion

Interviews and a group discussion were conducted with faculty and staff.

3: Public Consultation and Exhibit

Two public research events were conducted over the course of a week. Individuals were encouraged to share their comments on a public board which posed the questions, “What is Scholarship?”, “What is Innovation?” and “How can we support your work in these areas?”. A lunch was also held where participants discussed the previous questions in addition to more detailed inquiries such as, “What are you currently doing?”, “What would you like to do?”, “How would you like to be recognized for your work?”, “How are you currently supported?” and “What are the obstacles?”

HOW DO WE CONSIDER, PRACTICE & SUPPORT SCHOLARSHIP & INNOVATION?

A Community Inquiry.



WHAT IS SCHOLARSHIP & INNOVATION AT IMSA?

Community Insights.

A personal and intellectual journey of knowledge and growth, generating, experiencing and sharing new knowledge.

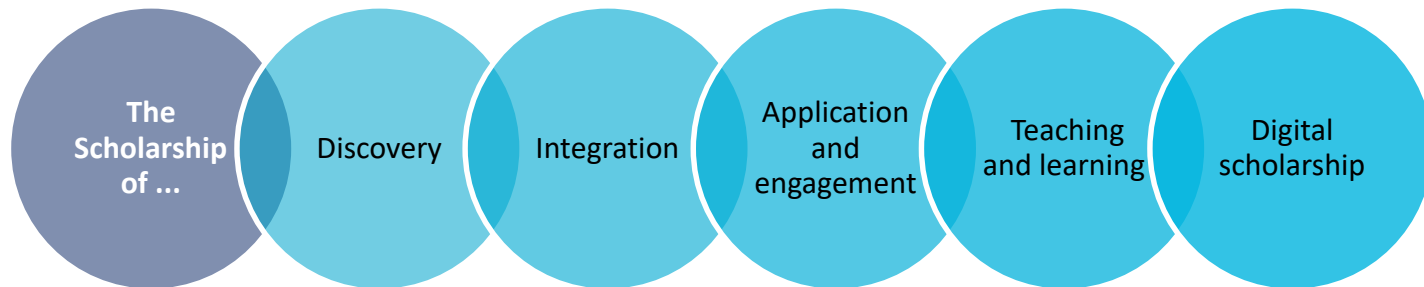
- New, groundbreaking ideas.
 - Original accomplishments.
 - It is the “pursuit of knowledge”, the act of “generating your own understanding” , “generating new knowledge” and “always learning something new.”
-
- **Scholarship** was shared as “generating and experiencing new knowledge”.
 - **Innovation** was shared as “creative” and “inquiry-driven” “shifting of norms, processes and paradigms.”

problem forward
questioning research
ideas experiential generation
creative professional conferences growth
personal participation breaking
articles **Scholarship** break
Innovation books
scholarly intellectual knowledge
teaching achievement journals
advancement
journey

WHAT ARE MODELS OF SCHOLARSHIP & INNOVATION WE COULD LEARN FROM?

Community Insights.

We need to consider scholarship and innovation in inclusive and expansive ways that reflect the realities of what it means to be a scholar and/or innovator at IMSA.



Five Types of Scholarship
(Boyer (1990); McNabb and Pawlyshyn (2014))

Dimensions and Types of Innovations

Table 2. Dimensions of an Innovation

Dimension	Description
Degree of Novelty	Whether an innovation is new to the firm, new to the market, new to the industry, or new to the world.
Type of Innovation	Whether it is a social innovation, process, digital and/or technology, product innovation, organizational or business, creative or design innovation.
Degree of Impact	Whether there has been a shift or change in the norms of behavior, thinking or application.
Speed of Impact	Whether the entity brings incremental or radical change when implemented. Incremental innovation is an improvement in an existing thing (e.g. product, process or service). Radical innovation is finding an entirely new way of doing something.

Baregheh, A., Rowley, J., & Sambrook, S. (2009). Towards a multidisciplinary definition of innovation. *Management Decision*, 47, 1323-1339. (p.1334); Drucker, P. F. (2002). *The Discipline of Innovation*, Harvard Business Review; Subramanian, A. and S.Nilakanta (1996). Organizational innovativeness: Exploring the relationship between organizational determinants of innovation, types of innovations, and measures of organizational performance. *Omega*. 24 (6). pp.631-647.

Table 3. Types of Innovations

Social Innovation	The implementation of new social initiatives, norms and practices that aim to meet and advance social needs and strengthen civil society. ¹⁰
Digital & IT Innovation	The implementation of new digital tools, information technologies and/or computing languages or existing ones in new and different ways. ¹¹
Organizational & Business Innovation	The implementation of a new organisational methods in the undertaking of business practices, workplace organisation, partnerships or external relations. ¹²
Product Innovation	The development and launch of new products (goods and/or services, tangible and/or intangible), changes in design of established products, or use of new materials or components in the manufacture of established products ~ so a product that is either new, or an improved version of previous goods or services. ¹³
Process Innovation	The implementation of a new or significantly improved production or delivery methods, including significant changes in techniques, equipment and/or software. ¹⁴
Creative & Design Innovation	The implementation of new creative and critical design processes that integrate and draw from across multiple and diverse disciplines and ways of thinking to innovate ~ to define, imagine, and advance a globally just future. ¹⁵

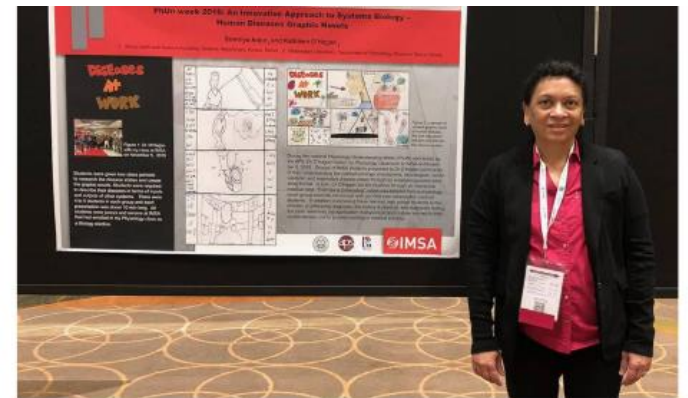
Subramanian, A. and S.Nilakanta (1996). Organizational innovativeness: Exploring the relationship between organizational determinants of innovation, types of innovations, and measures of organizational performance. *Omega*. 24 (6). pp.631-647; Howaldt, J. and Schwarz, M. (2010). Social Innovation: Concepts, research fields and international trends. *IMO international monitoring*; Damanpour, F. (2017). Organizational Innovation: A Meta-Analysis Of Effects Of Determinants and Moderators. *Academy of Management Journal*, 34 (3); RG Fichman, BL Dos Santos, and ZE Zheng (2014). Digital innovation as a fundamental and powerful concept in the information systems curriculum. *MIS quarterly*, 38 (2). 329-353; Ettlie, J. E. and Reza, E. M. (1992). Organizational Integration and Process Innovation. *Academy of Management Journal*, 35 (4). [1] Walsh, V. (1996). Design, innovation and the boundaries of the firm. 25 (4), pp. 509-529.

WHAT ARE EXAMPLES OF SCHOLARSHIP & INNOVATION AT IMSA?

Community Insights.

IMSA has been participating in scholarly and innovative activity for over 30 years, with scholarship and innovation occurring everywhere across the academy.

- Presentations, workshops, publications, creative works, inventions, technologies, new processes etc.,
- Participants mentioned many and varied examples (e.g., UN SDGs, Year of Inquiry, LiveSafe App, Bio-Pilot, New Residence Life Curriculum etc.).
- Scholarship and innovative work is occurring across across the academy “everywhere.”



Dr. Anjur Sowmya, Science Faculty.

HOW DO WE SHARE SCHOLARSHIP & INNOVATION AT IMSA?

Activity	Location	Description	Timing	Responsible
YOUTH & ADULT				
Innovation Showcase	IN2	An annual showcase and demonstrations of scholarly activity and innovations from across the IMSA community.	<input type="checkbox"/> 2nd Semester	Scholarship & Innovation Committee & IN2
ArtExpo	Library	Creative and artistic STEAM exhibits, demonstrations, projects, and collaborations by faculty, staff, students, and alumni.	Intersession	IRC
Library Gallery	Above Old Cafe	Regularly plans and hosts exhibits that recognize and stimulate creativity and innovation within the community.	Ongoing	IRC
IMSA Walk/Tour	Across Campus	Exhibits and display cases across campus displaying IMSA works	Ongoing	Various
Digital Commons	Web	Globally accessible institutional repository and digital portfolio of open-access articles, conference proceedings, teacher resources, image and audio files, as well as provides references to books and other creative works not fully accessible online.	Ongoing	IRC
YOUTH				
IMSAloquium	Across Campus	An annual public event during which student inquiry and research (SIR) and internship projects are showcased.	2nd Semester	Principles Officer, SIR & IN2
Student Leadership Exchange (SLX)	Across Campus	An annual event that provides students with an opportunity to present their leadership projects and research.	2nd Semester	Student Affairs & LEAD

Digital Commons

Digital Commons is IMSA's institutional repository and digital portfolio.

The goal of the online repository is to share the intellectual output of IMSA and to increase visibility and impact through worldwide access.

Digital Commons@IMSA reflects the scholarly, innovative, and pedagogical culture of the Illinois Mathematics and Science Academy. The goal of this online repository is to share the intellectual output of IMSA and to increase visibility and impact through worldwide access.

This full-text, multimedia database links to open-access articles, conference proceedings, teacher resources, image and audio files, as well as provides references to books and other creative works not fully accessible online.

Background

The implementation of DigitalCommons began in 2010 as an Action Step of the IMSA Strategic Plan: 2007-2012. Strategy 4 of that plan stated, ***“We will generate scholarship that demonstrates the effectiveness of our practices and transfers knowledge produced by our work.”***

In 2015, IMSA 2022 and Priority Outcomes were instituted with IMSA’s DigitalCommons supporting STEM Teaching and Learning Outcomes, ***“strengthening identity as a learning laboratory”*** for publishing our insights and tracking our thought-leadership contributions.

Our repository provides the vehicle for doing so. It is produced and hosted by bepress, Berkeley Electronic Press (BEPress). Their customer base is over 500 institutions worldwide, including Loyola University, Purdue University, DePaul University, Northwestern University, Carnegie Mellon University, Cornell University and Yale University. ***IMSA is their only high school .***

Scope & Content

Over the past 8.5 years, DigitalCommons has grown to over 5,278 items.

The scope has evolved to include:

- ❖ **Academic Scholarship:** *peer-reviewed articles, conference papers/presentations, books and book chapters, short stories, dissertations, juried exhibitions*
- ❖ **Teacher and curricular resources:** *lesson plans, classroom resources and activities, teaching units, seminars, courses, training videos, podcasts*
- ❖ **Student Publications & Research:** *peer-reviewed articles, conference papers/presentations, poetry, juried art exhibitions*
- ❖ **Student Distinguished Work:** *math competitions, Metro History Fair projects, art competitions*
- ❖ **Examples of Student Work:** *video projects, posters, papers, graphic novels, reports, photographs*
- ❖ **Independent Study:** *final reports, papers, posters*
- ❖ **IMSA-hosted Conferences:** *Professional Learning Day, NOAA, IMSAloquium, Student Leadership Exchange (SLX), International Student Science Fair (ISSF)*
- ❖ **Digitized collections from IMSA's Archives:** *Alumni Dissertations, Oral Histories, Course Catalogs, Intersession Catalogs, 360 Annual Reports, IMSAloquium abstract booklets, IMSA Founder series*
- ❖ **Facilities:** *renderings, blueprints, and photographs from innovative construction projects that have been funded by the Capital Development Board and through grants*

Interesting Facts

- ❖ IMSA has never had a copyright or fair use challenge.

- ❖ 100% of academic teams are sharing their scholarship.

Most teams are also sharing teaching units, select lesson plans, courses, distinguished student work, examples of student work.

- ❖ Top faculty/staff contributors:

Sowmya Anjur, Adrienne Coleman, Lee Eysturid, Adam Kotlarczyk, Mary Myers, Sarah O’leary-Driscoll, Liz Martinez, and Jose Torres

- ❖ Highest number of downloads for a faculty/staff submission:

30,644: *Creating a "Mock Essay" to Teach MLA Format* by Erin Micklo

- ❖ Highest number of downloads for a faculty/staff scholarship submission:

3,126: *Assessing Differences in Students' Experiences in Traditional versus Scientific Teaching-Based Biology Course*, authored by Sarah O’leary-Driscoll and Sue Styers and published by the NCSSSMST Journal, Spring 2010

- ❖ Most recent contribution:

Using Forensics to Introduce IR Spectroscopy & Molecular Modeling, presented in July at ChemEd 2019 by Joe Golab

- ❖ Most recent success story:

Hostos Community College (part of CUNY) recently discovered Lindsey Herlehy’s STEM activities in DigitalCommons and has asked IMSA for permission to publish them in an OER textbook.

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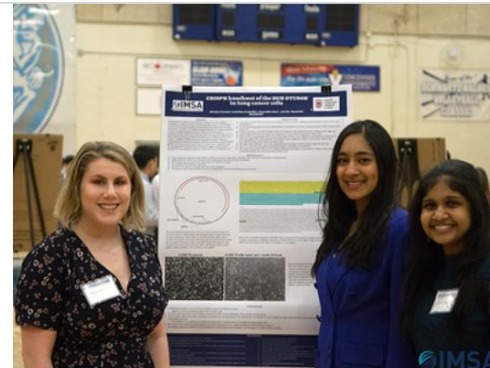
SelectedWorks

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CRISPR knockout of the DUB OTUD6B in lung cancer cells

Miriam Franks '19, Nayonika Roy '19, and Suhitha Irukulla '19 present their SIR research, conducted through Loyola Medical Center with Advisor, Dr. Maurizio Bocchetta, at IMSAloquium 2019.

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Browse Research, Scholarship and Creative Work

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DigitalCommons@IMSA reflects the scholarly, innovative, and pedagogical culture of the Illinois Mathematics and Science Academy. The goal of this online repository is to share the intellectual output of IMSA and to increase visibility and impact through worldwide access.

This full-text, multimedia database links to open-access articles, conference proceedings, teacher resources, image and audio files, as well as provides references to books and other creative works not fully accessible online.

DigitalCommons@IMSA furthers IMSA's mission "to ignite and nurture creative, ethical scientific minds that advance the human condition, through a system distinguished by profound questions, collaborative relationships, personalized experiential learning, global networking, generative use of technology and pioneering outreach."

DigitalCommons Demo

HOW DO WE CELEBRATE SCHOLARSHIP & INNOVATION AT IMSA?

Community Insights.

IMSA has a number of awards used to honor and celebrate scholarship and innovations at IMSA, and their creators.

- **Leon Lederman Award** - The formal annual recognition of faculty and staff scholarship.
- **Scott Swanson Fund for Transformative Student Learning and Innovation** - This fund supports the purchase, creation and use of leading-edge and emerging technologies for transformative student learning and innovation at IMSA.

Lederman Scholarship Award

The Lederman Scholarship Award, named in honor of Dr. Leon Lederman, recognizes individuals who engage in scholarship that demonstrably advances the work and reputation of the Illinois Mathematics and Science Academy, which includes faculty and staff who have an in-field publication or acceptance for publication of a book, refereed article, submission of tapes, slides or photographs from a juried artistic performance or exhibit, or presentation at a conference.

- ❖ Angela Ahrendt, Ph.D.
- ❖ Sowmya Anjur, Ph.D.
- ❖ Lawrence "Bud" Bergie
- ❖ Jeong Choe-Hwang, Ph.D.
- ❖ Adrienne Coleman, Ph.D.
- ❖ Michael Dean
- ❖ Dave DeVol, Ph.D.
- ❖ Peter Dong, Ph.D.
- ❖ Lee Eysturliid, Ph.D.
- ❖ Jim Gerry
- ❖ Dan Gleason, Ph.D.
- ❖ Carl Heine, Ph.D.
- ❖ Diane Hinterlong
- ❖ John Kane
- ❖ Sanza Kazadi, Ph.D.
- ❖ Leah Kind, Ph.D.
- ❖ Adam Kotlarczyk, Ph.D.
- ❖ Kitty Lam, Ph.D.
- ❖ Branson Lawrence
- ❖ Vince Matsko
- ❖ Britta McKenna
- ❖ Barb Miller, Ph.D.
- ❖ Sarah O'Leary-Driscoll
- ❖ Noah Prince, Ph.D.
- ❖ Purva Rushi, Ph.D.
- ❖ Judy Scheppler, Ph.D.
- ❖ Megan Schrementi, Ph.D.
- ❖ Eric Smith, Ph.D.
- ❖ John Stark
- ❖ Laurie Sutherland
- ❖ José Torres, Ph.D.
- ❖ Tracy Townsend
- ❖ April Verser
- ❖ Yinshun Wang

IMSA INNOVATION SHOWCASE 2019

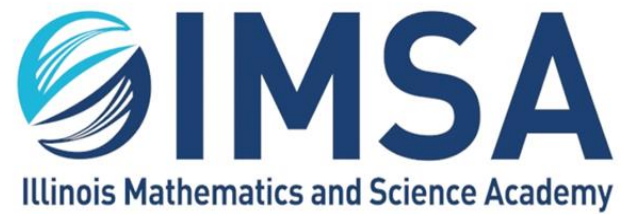
Turning Ideas into Impact

On April 29, 2019 the first IMSA Innovation Showcase was hosted in the Steve and Jamie Chen Center for Innovation & Inquiry. The event was a public showcase and demo of innovations, scholarly and entrepreneurial activity developed and shared by youth, faculty and staff from across the IMSA community.



IMSA Innovation Showcase Keynote and Q&A with Betsy Ziegler, CEO of 1871 and IMSA TALENT CEO, Aliah Shaira De Guzman ('19)

Over 25 works were showcased to over 130 attendees, and a keynote address and Q&A with the CEO of 1871, Betsy Ziegler.



Community Discussion

How can we best encourage, support
and create space for scholarship &
innovation at IMSA?

HOW CAN WE SUPPORT AND ENCOURAGE SCHOLARSHIP & INNOVATION AT IMSA?

Community Insights.

We need to be intentional as to how we support, create time and space for scholarship and innovation.

- Opportunities, space support, and mentorship.
- Intentional dissemination at and outside IMSA.
- Opportunities to present/share.
- Creation of time and space in the work day.
- Develop some standards of sharing (e.g., Digital Commons, IMSA Website).



Hannah Anderson, Doctoral Candidate and Institutional Research Associate.

HOW CAN WE CREATE SPACE TO FOSTER SCHOLARSHIP & INNOVATION AT IMSA?

Community Insights.

To create space requires aide in the areas of training, time, recognition and resources.

- Protect professional work time.
- Provide more and different incentive-based rewards.
- Make involvement optional.
- Ensure transparency, equity and inclusivity.
- Improved expense reimbursement.



Mr. Matthew McCutcheon, Mathematics Faculty

SCHOLARSHIP & INNOVATION INQUIRY

Summary Insights 2018-2019

- *Scholarship and innovation is a personal and an intellectual journey of knowledge and growth, generating, experiencing and sharing new knowledge.*
- *Scholarship and innovation is happening everywhere across the academy.*
- *We need to define scholarship and innovation in inclusive and expansive ways that reflect the realities of what it means to be a scholar and/or an innovator.*
- *We need to be intentional as to how we support, create time and space for it.*
- *To create space requires aide in training, time, recognition and resources.*

Individual Reflection

How do YOU consider, practice and need support for your scholarship and innovation at IMSA?

(Return to IN2 by 4:30pm Today)

Our Future

IGNITING AND NURTURING

creative, ethical, scientific minds

THAT ADVANCE THE HUMAN CONDITION
