

Ivan Sysoev

Postdoctoral Associate

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Experienced researcher focused on designing, developing, and studying learning technologies. Interested in helping to create innovative technologies that engage and empower learners.

EXPERIENCE

MIT Media Lab

Cambridge, MA

Postdoctoral Associate

2020 – present

- Designing and implementing robotic companions to support development of early literacy and creativity in children via open-ended play.
- Designing and implementing an interactive storybook to introduce preschoolers to artificial intelligence concepts.

MIT Media Lab

Cambridge, MA

Research Assistant

2014 – 2020

- Proposed a child-driven, machine-guided approach to early literacy learning, grounded in findings from learning theory and literacy learning research.
- Designed and developed two open-ended literacy apps to evaluate this approach.
- Refined the proposed designs via iterative playtesting.
- Conducted mixed-method studies utilizing Design-Based Research methodology to evaluate the approach.
- Closely collaborated with colleagues and schools to conduct the studies.

Ledas Ltd. / Bricsys Technologies Russia

Novosibirsk, Russia

Software Developer

2009 – 2012

- Researched a novel approach to modeling in CAD systems
- Developed CAD software on C++
- Participated in designing the architecture of the system

EDUCATION

Massachusetts Institute of Technology

Cambridge, MA

PhD in Media Arts and Sciences, GPA: 5.0 / 5

2014 – 2020

Georgia Institute of Technology

Atlanta, GA

Master of Science in Computer Science, GPA: 4.0 / 4

2012 – 2014

Novosibirsk State University

Novosibirsk, Russia

Master of Science in Computer Science, GPA: 4.86 / 5

2009 – 2011

Novosibirsk State University

Novosibirsk, Russia

Bachelor of Science in Computer Science, GPA: 5.0 / 5

2005 – 2009

RESEARCH PROJECTS HIGHLIGHT

A constructionist approach to early literacy

MIT Media Lab, 2015-2018

- Based on the literature on constructionism, Montessori education and emergent literacy, designed and implemented an early literacy app *SpeechBlocks*.
- Led a preschool-based pilot study with *SpeechBlocks* and participated in two home-based studies with the app led by my colleagues.
- Key findings:
 - The approach facilitates children's engagement, agency and self-efficacy;
 - Social interactions around literacy activities emerged between children;
 - There is a need for automatic scaffolding (guidance) for the approach to be scalable.
- Related publication: (3)

Child-driven, machine-guided learning

MIT Media Lab, 2017-present

- Based on results of the previous project, proposed a child-driven, machine-guided approach and implemented an app *SpeechBlocks II* to evaluate it.
- Implemented a novel information-theoretic method to align phonemes and graphemes in English words, to support the work of the scaffolding system.
- Led a school-based study with 4-5 years old participants to evaluate the approach.
- Key findings:
 - Most children were eventually able to use the system nearly autonomously, which supported their expressive play and peer learning;
 - Children with lower self-regulation and literacy skills were more likely to engage in distracted behaviors, which reduced the effectiveness of the system for them.
- Related publication: (1)

Input mechanisms for child-driven literacy learning

MIT Media Lab, 2018-2019

- Implemented input mechanisms for children to communicate their intent to *SpeechBlocks II*, to support child-driven literacy learning activities: word bank, speech recognition, text recognition, invented spelling interpretation, semantic association network (the last four were innovative).
- Evaluated the design in the *SpeechBlocks II* school-based study with 4-5 year olds.
- Key findings:
 - Word bank, speech recognition, text recognition and the association network were actively used;
 - Three roles of different input mechanisms emerged: (1) helping the child implement specific ideas, (2) helping the child to browse for ideas, and (3) being a fall-back option;
 - Invented spelling interpretation was difficult to use, and text recognition led to frequent distractions.

Phoneme-based blocks for early literacy apps

MIT Media Lab, 2018-2019

- Suggested using phoneme blocks to avoid the issue of orthographic complexity, which is known to interfere with early literacy learning.
- Determined optimal block design via iterative playtesting. Designed and implemented onomatopoeic characters to represent phonemes.
- Evaluated the design in the *SpeechBlocks II* school-based study with 4-5 year olds.
- Key findings:
 - Children generally found the characters engaging and understood their functioning;
 - There were differences in effectiveness of onomatopoeic mnemonics for different children, possibly determined by their preexisting letter-sound knowledge.
- Related publication: (2)

SELECT PUBLICATIONS

(1) **Sysoev, I.**, Gray, J. H., Fine, S., Makini, S.P. & Roy, D. (2022). Child-driven, machine-guided: Automatic scaffolding of constructionist-inspired early literacy play. *Computers & Education*.

(2) **Sysoev, I.**, Gray, J. H., Fine, S., & Roy, D. (2021). Designing building blocks for open-ended early literacy software. *International Journal of Child-Computer Interaction*.

(3) **Sysoev, I.**, Hershman, A., Fine, S., Traweek, C., & Roy, D. (2017). SpeechBlocks: A Constructionist Early Literacy App. *Proceedings of the 2017 Conference on Interaction Design and Children*

SKILLS

- Designing learning technologies for children
- Qualitative and quantitative research
- Programming languages: C++, C#, Java, JavaScript, Python, Lisp, Haskell, MATLAB
- Object-oriented design and functional programming
- Game development in Unity
- Android development
- Machine learning, AI and NLP
- Oral and written proficiency in Russian.
- Drawing and painting using traditional and digital media; digital animation

AWARDS

- Fulbright Visiting Graduate Student Scholarship 2012 – 2014
- Donald Jackson Fellowship 2013
Awarded to 3 Georgia Tech College of Computing MS students yearly
- Baker Atlas Fellowship 2009
Awarded to students and alumni of Novosibirsk State University

COMMUNITY INVOLVEMENT

MIT 2016-2019
Recycling and Gardening Chair at a graduate dorm; Sustainability Subcommittee Member

826 Boston 2016-2018
Volunteer in an afterschool program.

REFERENCES

Dr. Deb Roy: PhD advisor.
Professor of Media Arts and Sciences, MIT Media Lab.
dkroy@media.mit.edu

James Gray: research collaborator.
Research scientist at MIT Media Lab. Previously, VP of Learning Design at Sesame Workshop and Director of Learning at LeapFrog Enterprises.
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Dr. Mitchel Resnick: PhD dissertation committee member.
Lego Papert Professor of Learning Research, MIT Media Lab.
mres@media.mit.edu

Dr. Catherine Snow: PhD dissertation committee member.
Patricia Albjerg Graham Professor of Education, Harvard Graduate School of Education
catherine_snow@gse.harvard.edu

Dr. Susan Fine: research collaborator.
Assistant Clinical Instructor, Language and Literacy Program at Northeastern University
s.fine@northeastern.edu