

## Report 2021-5/2022 SDS Precollege Education – Part 2

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**Main Objective (all years):** Every student who goes through K-12 knows how to use systems thinking and System Dynamics tools in their daily lives.

Work being done separately by SDS Precollege members/organizations (2021 - 5/2022)

**Creative Learning Exchange:** <https://clexchange.org>

- Work continues on the development of Splash Exchange. It is very near completion and we hope that it can be released this year. Splash Exchange will only work on computers/laptops.
- An exciting and very useful new book, “Now What? A Call to Action: Environmental Systems Lessons for Upcoming Generations” by Alan Ticotsky, the co-author of The Shape of Change was published in April of this year. It is a valuable resource for pre-college teachers of grades 6-12 and uses the important ST/SD tools as part of each lesson.
- A current collaboration with undergraduate students learning System Dynamics modeling at the University of Bergen is underway to develop new SD lessons for pre-college students.

**Systems Thinking Association in Turkey:** <http://egitimdesistemdusuncesi.org/>

Numerous resources for ST/SD in pre-college education - mostly in Turkish.

They provide all their resources (training, lessons, etc.) for free to any teachers who are interested. *See details of activities at the end of this document.*

**Waters Center for Systems Thinking:** <https://waterscenterst.org/>

Numerous resources for ST in pre-college education - mostly for elementary and middle school teachers.

**Diana Fisher:** other activities related to ST/SD in pre-college education:

Activity Name	Date Completed	Time Presenting
Present ISDC Chicago, IL (Virtual) •Creating Assessment Questions for Systems Thinking Concepts •Teaching Students to Create Original Models in a 10-Week University Course (presented 2 times)	7/30/2021	Two - 1.5 hour workshops + 20 min presentation
Teach online SD course 1 for teachers •1 <sup>st</sup> Course in System Dynamics Modeling: Basic Models	8/20/2021	10 weeks (@5 hrs/week)

Teach online SD course 2 for teachers •2 <sup>nd</sup> Course in System Dynamics Modeling: More Advanced Models	8/20/2021	10 weeks (@5 hrs/week)
Present at International Encounter on Education and Systems Thinking (Virtual) (Brazil, South America) •A Potential Progression of Systems Thinking/System Dynamics Concepts for Pre-College Education	9/3/2021	20 min presentation

## 2022

Activity Name	Date Completed	Time presenting
Present (students) Workshop Nueva High School, San Mateo, CA •Build Computer Models to Expand Your Understanding of Important Problems	1/5/2022	Two - 3.5 hour workshops over 2 days
Present Systems Thinking and Sustainability in K-12 Education Conference (Virtual) (Dankook University, South Korea) •Current Status and Global Vision for Systems Thinking and System Dynamics in Pre-College Education	1/6/2022	30 min presentation
Present (virtual) Portland State University Systems Science Seminar (Portland, OR) •PreK-12 Students Have Learned to Build Systems Models to Analyze the Dynamics of Systems, Including Non-Linear Behavior	1/14/22	1 hour presentation
Present (virtual) workshop for middle and high school teachers in Turkey (various cities) •Building Systems Models to Understand Dynamics in Mathematics and Science	2/6/2022	Five 2-hr workshops over 2.5 days
Worked with Rebecca Niles, Nilay Yilmaz, and Philip Ramsey to try to get the SDS to republish the Billibonk Books.	Feb, March 2022	3 hour
Worked with Lees Stuntz, Ninad Jagdish, Anne LaVigne, Warren Farr to move development of the Splash Exchange modeling software forward.	Feb 2022	1 hour
Presented at the National Science Teaching Conference in Houston, TX • Students Build Systems Models to Study Climate Change	April 2, 2022	1 hour
Thread Co-chair for the Learning & Teaching thread for papers submitted to the ISDC	March/ April 2022	25 hours

**Benjamin Chung:** <https://system-leadership.org> South Korea

Activities in behalf of ST/SD in pre-college education in South Korea:

**SD Games go to Metaverse, Gathertown**  
**Stu**

World Climate Simulation Game with High School Students

Fishery Game with Teachers

© Evaluation results from Recommendation Index (o ~ 10)

Average	9.55
Respondents	44
Standard deviation	0.8
Variance	0.6
Median	10
Mode	10
<b>NPS</b>	<b>81.8</b>

  

Mode	10	10	10	10
<b>NPS</b>	<b>40.4</b>	<b>32.4</b>	<b>55.5</b>	<b>49.3</b>

Question: "How likely is it that you would recommend this lecture to a friend or colleague?" (0-10)

0 points: I never recommend it for sure. ~ 10 points: I highly recommend it.

Cf) NPS (Net Promoter Score, Net Promoter Score) is calculated by subtracting the intention to not recommend (0 to 6) from the recommendation intention (10 points, 9 points) among all respondents. In this case, 7 and 8 points are considered neutral and are not reflected in the calculation. It is used worldwide as a customer satisfaction index. For reference, Apple's NPS comes out to be 47%. (Reference: <http://bit.ly/Apple-NPS>)

**Teachers' evaluation (Professional development program)**

© Evaluation results from Recommendation Index (0 ~ 10)

\	2021	~ May 2022	Total
Average	9.32	9.27	9.30
Respondents	176	143	319
Participants	212	175	387
Standard deviation	1.1	1.2	1.1
Variance	1.1	1.5	1.3
Median	10	10	10
Mode	10	10	10
<b>NPS</b>	<b>76.14</b>	<b>77.62</b>	<b>76.80</b>

Question: "How likely is it that you would recommend this lecture to a friend or colleague?" (0-10)

0 points: I never recommend it for sure. ~ 10 points: I highly recommend it.

## Public professional development for teachers



### Teachers in Korea are coming together to develop an Interdisciplinary Curriculum-based on Systems Thinking

- **First attempt in Korea** to develop cross-curriculum based on Systems Thinking
- **Online, free, omnibus style, and participatory** 17 professional development lectures for teachers
- Expected to **enhance the competitiveness of public education** based on Systems Thinking, a core future competency

Korean Chapter  
systemdynamics.org



Time 19:00~21:00, from May to June, Total 34 hours)

#### ▣ May

- 05. Thu. [Educational Philosophy]
  - Orientation
  - John Dewey's "Reflective Experience", Bruner's "Spiral Curriculum", and Systems Thinking
  - Dan Zahavi's "Phenomenology" and Systems Thinking
- 06. Fri. [Game] Text 1st, 2nd, 3rd, 6th game.
- 11. Wed. [Game] Text 4th (Bathtub game)
- 13. Fri. [Game] Text 13th & Waterlily story
- 20. Fri. [Game] Text 10th (Fishery Game)
- 24. Tue. [Game] Text 5th (Biodiversity game)
- 26. Thu. [Game] Mammoth game and expanding feedback thinking
- 27. Fri. [Game] Text 19th (Triangles game) and SPLASH!
- 31. Tue. [Group Modelling Based Project] Causality notation linking to NIE(Newspaper In Education)

#### ▣ June

- 02. Thu. [Group modeling based research] Feedback notation linking to NIE(Newspaper In Education)
- 07. Tue. [Group modeling based research] Systems Thinking Diary
- 10. Fri. [Group modeling based research] Iceberg Model
- 14. Tue. [Simulation] Prey & Predator model
- 21. Tue. [Simulation] Hamlet Modeling
- 23. Thu. [Simulation] Stock & Flow Modeling I. (Stella Usage)
- 28. Tue. [Simulation] Stock & Flow Modeling II. (Life and Calculus)
- 30. Thu. [Simulation] EN-ROADS & Energy Policy

### Meltem C. Alibeyoglu (Middle School Research & Development Administrator): Systems Thinking Association in Turkey

1. (March Meeting) D. Fisher introduced us to Alan Ticotsky's new book called "Now What? A Call to Action: Environmental Systems Lessons for Upcoming Generations". I am going to use this book in my "Education for Sustainability" lesson at MEF University as a resource.
2. (April Meeting) **Ms. Tannvi Gupta**: She is co-founder at Grok ([www.clubgrok.com](http://www.clubgrok.com)). Her company designs games for kids that help them build 21st-century (or as they like to call them, 'Any Century Skills') like problem-solving, critical thinking, system thinking, reasoning, and many more. The games are designed for kids aged 9 - 15 and we run free sessions in schools.

We met with Tannvi and her colleagues on 26<sup>th</sup> April. (Sena, Meltem, Gökşen)

3. (March Meeting) **Ms. Mahla Rashidian**: She developed Carbon Cycle simulations to be part of the Systems Thinking and Climate Change program. She developed her Master thesis about

the Carbon Cycle as part of the ecology course for 16-18 years high school students. The games have been experimented with Scena high school in Ohio and Summer school in Bergen, Norway. She also developed a handbook and facilitation guide for the games which contains the objectives and detailed learning plans. She shared the documents with us.

She joined us at our SIG prep meeting on 5<sup>th</sup> May and explained what she has done so far.

## **Systems Thinking Association in Turkey: Detailed activities.**

### **• May 2022**

- *“Systems Thinking in Education” textbook:* A textbook having basic system thinking concepts and system dynamics tools with examples from in class implementations is written by Systems Thinking Association members and published with support of UNDP. A [pdf version](#) is also published and freely available in association’s website. An interactive [epub version](#) is under development. Published books are planned to be sent to academicians of Faculties of Education who is or may be interested in systems thinking in education.
- *“EsdX201 Environmental Education with Systems Thinking and World Climate Game online course:* An online course is developed by the teachers who applied the “EsdX201 Environmental Education with Systems Thinking and World Climate Game” program in Darüşşafaka Schools in first half-year of 2021-2022 academic year.

### **• April 2022**

- Project application about implementing systems thinking approach to environmental education to The Scientific and Technological Research Council of Turkey (TÜBİTAK) is accepted. During the project which will start on Fall of 2022, a graduate level systems thinking course will be developed, implemented, assessed, reviewed.

### **• March 2022**

- *“Systems Thinking Education” university course:* The course is being given K-12 preservice teachers (students from various departments of faculty of education) as part of an elective course in Balıkesir University, a public university in Balıkesir, Turkey. It is a 40-hour elective course lasting 14 weeks. 45 students of varying fields and work experiences are enrolled and graduated. This is the first graduate course about systems thinking in education given to students of an education faculty in Turkey. Weekly review meetings are being held with the course instructor along with sharing of recordings and documentation of previous courses to support effectiveness and efficiency of the course.
- *Pre-college education SIG webinars:* Six presentations are made in two webinars (December 2021, March 2022) giving implementation examples and suggesting an infusion strategy for infusing systems thinking into K-12 education.
- *Application for an Erasmus+ project:* A project (KA220-SCH Cooperation partnerships in school education), deploying the infusion method on

international scale is developed and application is submitted. Results will be announced in September 2022.

- **February 2022**

- *Building System Models to Understand Dynamics in Mathematics and Science workshop*: A 3 day workshop is organized and facilitated by Diana Fisher is held. 15 people, all but 3 were teachers or academicians from faculties of education, participated in the workshop.

- **January 2022**

- *Turkish Translation of "Thinking in Systems"*: "Thinking in Systems" written by Donella Meadows is translated into Turkish by members of the association and published and distributed by a publishing house (Pegem Academy Publication) working on reference books and textbooks widely used in the field of educational sciences
- *"Systems Thinking Education" online course*: The course is given K-12 teachers as part of Learning Sciences Master's Degree Program of MEF University in Istanbul, Turkey. It is a 40-hour elective course lasting 14 weeks. 9 teachers of varying fields and work experiences are enrolled and graduated.
- *Systems Thinking in Education - School Manager Workshop*: A workshop is organized for the managers of a private school chain (Bahcesehir Koleji is a private school chain with 143 campuses having 20,000 teachers and 170,000 students in Turkey).
- *The South Korean ST/SD in Education conference*: Systems Thinking in Education Implementations in Turkey for primary and middle school levels are presented in the conference.

- **December 2021**

- *"Environmental Education with Systems Thinking and World Climate Game"*: An educational programme, which applied systems thinking methodology on climate change and environmental education whilst also using the simulation game "World Climate" as a tool, was implemented for the first time in Turkey from September to December 2021 with the participation of eighth grade students as an after-school programme at Darüşşafaka Secondary School.
- *Support from UNDP*: Responsible Party Agreement (RPA) was signed with between UNDP Accelerator Lab Turkey and System Thinking Association in Turkey. The project is funded for 4 expected results: a guide for educators, online course, mobile application, updated version of climate literacy course

- **October 2021**

- *Systems Thinking in Education Training*: An online workshop is organized but attendance was low (10 teachers) and no implementation request was received from teachers after the training. This is a frequently encountered

situation for post-pandemic online workshops but a different approach is under consideration.

- **August 2021**

- *Systems Thinking in Education Yearbook*: An online publication having papers from Bulletins of System Thinking in Education in Turkey is started. The [web site of the publication](#) is based on Open Journal System is a free software for the management of academic journals. By this way, papers (that we think) having academic value will be browsed and indexed by Gogole Scholar.

- **May 2021**

- *SDS Pre-College SIG Leadership team*: Six members of the Systems Thinking Association in Turkey joined System Dynamics Society Pre-College Special Interest Group Leadership team.
- Sections are written in two textbooks explaining systems thinking approach in education is written (“Teacher as a Systems Thinker [Sistem Düşünürü olarak Öğretmen]” in “New Generation Teacher [Yeni Nesil Öğretmen]” and “STEM education from the Systems Thinking Perspective [Sistem Düşüncesi Perspektifinde STEM Eğitimi]” in “STEM Activity Examples and Teacher Experiences [STEM Etkinlik Örnekleri ve Öğretmen Deneyimleri]”)

- **March 2021**

- The project "*Changing Language of Education with Systems Thinking - System Dynamics models in Science and Math Lessons*" prepared based on work done in Darüşşafaka Middle School is selected by The Sustainable Development Goals Accelerator Lab under the United Nations Development Programme Turkey Office within the context of Social Innovation Support Program as one of the 10 projects to be supported. With UNDP support we are planning to collaborate with two institutions: first Faculties of Educations, next Ministry of National Education.

- **Ongoing activities:**

- *System dynamics in Darüşşafaka Secondary School*: An [adaptation plan](#) of systems thinking approach to science education programme of Ministry of Education in Turkey was done and related lesson plans are developed and implemented according to the availability of teachers.
- *Systems Thinking in Education - Activity Book for Preschool and Primary School*: ....An activity book containing sample activities and lesson plans for preschools and primary schools level as a complementary resource to the “Systems Thinking in Education” textbook is being prepared. Like the textbook, activity book will also be print published with the support of UNDP and online published on the internet site of the association.
- *Systems Thinking Storybook Preperation Workgroup*: After 12 meetings and a presentation in ISDC2021 the workgroup’s activities had came to a stall. It is planned to start working with by June 2022 with an improved structure.

- *Systems Thinking Association mobile application*: A mobile application is being developed with the support of UNDP. The main purpose of the application is to directly communicate with people interested in systems thinking and avoiding spam filters of email servers as, in time, emails from association is treated like spam as a result of bulk mailing.
- *Educational resources*: As of end of May, there are 260 lesson/activity plans were designed, implemented (updated if needed) and published in Systems Thinking in Education web site. (Resource development starts with the request of an implementer teacher. By this way, consistence with Turkish education system is assured)
- *Systems Thinking in Education Support Program (school visits)*: School visits to support teachers' ST implementations are suspended because of the pandemic and has not started yet. Virtual meetings are held as part of the support program.
- *System Dynamics Society Pre-College Education Special Interest Group Leadership Team*: The team discussed and adopted SIG's objectives, tasks and key results.
- *Collaboration with Teachers Academy Foundation*: A meeting is arranged to discuss possible utilization of systems thinking online learning programme in foundation's portal. By this way it will be easier to reach teachers especially in public schools. Teachers Academy Foundation (ÖRAV - Öğretmen Akademisi Vakfı) is the leading NGO in Turkey focusing on the personal and professional development of teachers. Since its establishment, the foundation has reached more than 170.000 teachers and principals across Turkey. The foundation continuously adds new training programs to its training pool. Attendance to the training programs is free of charge.
- *"Systems Thinking in Education" course*: A 40-hour elective course lasting two weeks, K-12 teachers as part of **Learning Sciences Master's Degree Program** of MEF University in Istanbul, Turkey is scheduled to be given in August 2022. This will be the 4th course given to students (inservice teachers) of the MA program in this university.
- *Systems Thinking in Education Strategy Planning Workshop*: ...
  - A workshop is being planned for discussing short, middle and long term objectives of the association basing on mission of infusing of systems thinking approach into K-12 education curriculum.
  - Detailed content of the workshop has not been developed yet but; review of **current strategy plan**, trainings and experience sharing sessions and a group model building activity leading to a simple stock-flow model is planned to be included.
- **January 2021**
  - *Translation of En-ROADS Climate Solutions Simulator to Turkish*: Turkish translations of En-ROADS is finished and included in the **simulator**.
  - *Stella Online Workshop*: A very basic introduction to system dynamics modeling with Stella Online is developed and delivered to members of the association (mostly school teachers). Purpose of the workshop is to clarify



and build system concepts like stock, flow, causal relation on a solid ground rather than teaching how to model.

- *Collaboration with Teachers Academy Foundation:* An online training is organized as an introduction of systems thinking in education to K-12 teachers in association with Teachers Academy Foundation. Öğretmen Akademisi Vakfı (ÖRAV - Teachers Academy Foundation) is the first and only NGO in Turkey focusing on the personal and professional development of teachers. Since its establishment, the foundation has reached more than 170.000 teachers and principals across Turkey. The foundation continuously adds new training programs to its training pool. Attendance to the training programs is free of charge.)
- *Systems Thinking Storybook Preparation Workgroup:* A workgroup, an initiative of a member of the association who is a children storybook writer and editor in a publishing house is established with the purpose of preparing (translating or writing) storybooks giving emphasis on systems thinking concepts. The workgroup developed scale to assess the level of being a systems thinking storybook. First set of material is planned to be published and distributed by the beginning of first term of 2021-2022 school year.