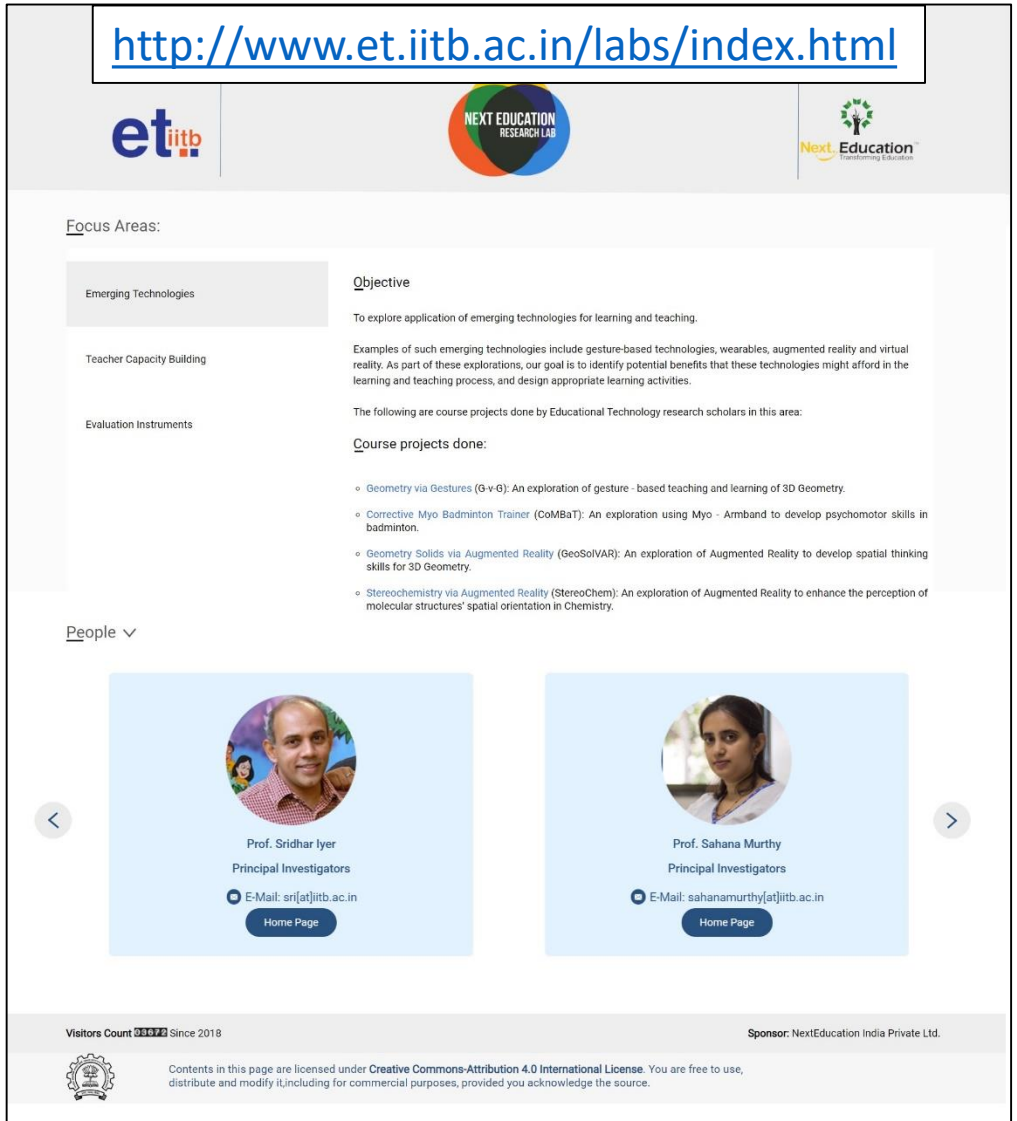
Project NextEducation Research Lab

(September, 2017- December, 2018)

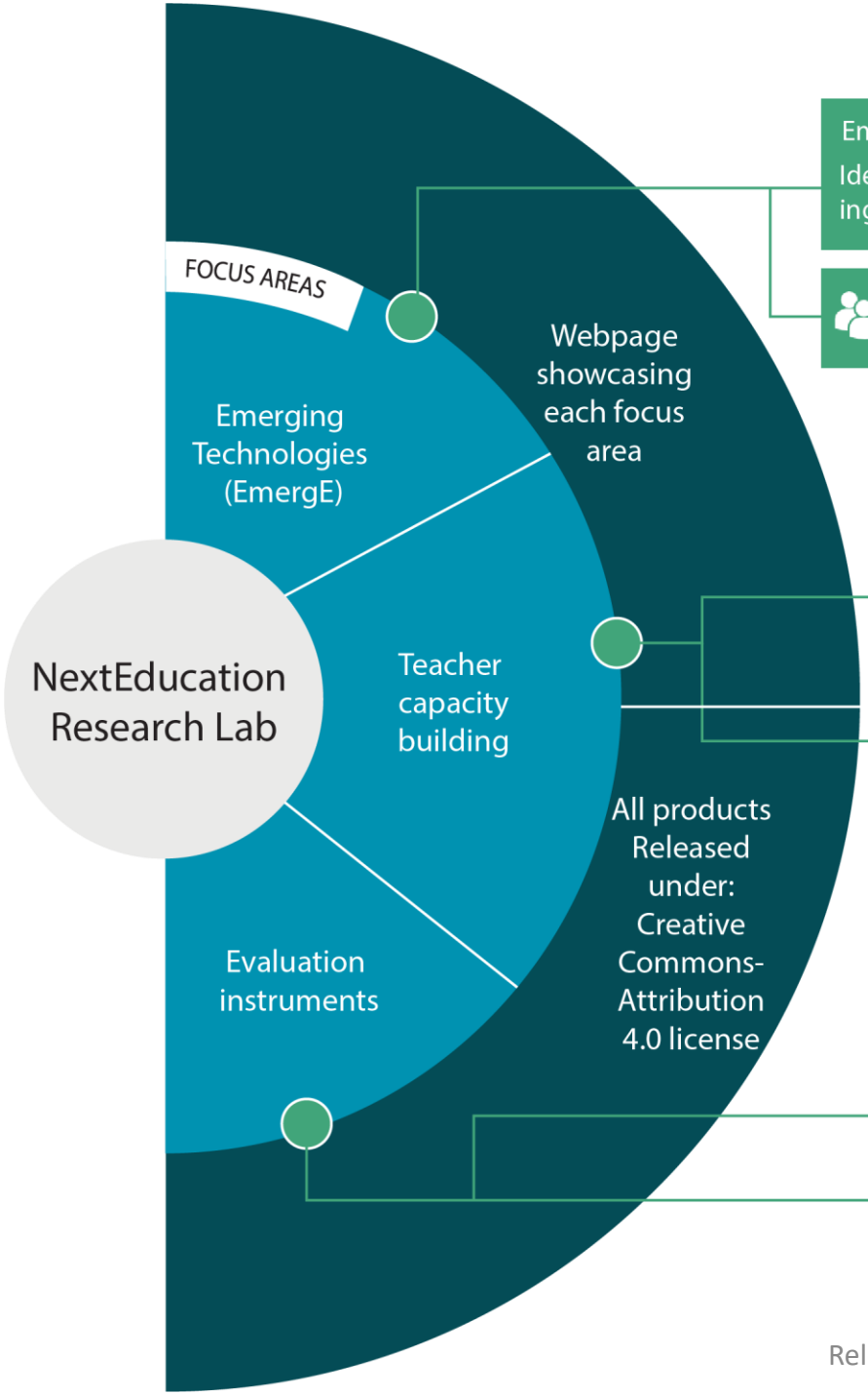


Setting Context : Other NextEducation sponsored projects in IITB

- Benchmarking : Closure Report sent on Feb. 15, 2018
- Development: LOBE_Next
- Implementation: Recommendations to improve quality of TN box content
- Human resource development: Training NextEd personnel to use LOBE_Next

- MOOC Project : ET611Tx & ET621Tx – Reports sent on Aug. 17, 2017 (1st run) & December 30, 2017(2nd run)
- Design & Development : ET611Tx & ET621Tx courses
- Implementation : ET611Tx & ET621Tx, each course ran twice on IITBombayX in 2017
- Human resource development : 2,122 teachers (ET611Tx) & 485 teachers (ET621Tx) trained

NEXTEDUCATION RESEARCH LAB : FOCUS AREAS (2017 – 2018)



EmergE Objective:

Identify potential benefits that emerging technologies might afford in the teaching-learning process and design appropriate learning activities.

Target Audience : Teachers and students from Science, Mathematics & Physical Education

Teacher Capacity Building Objective :

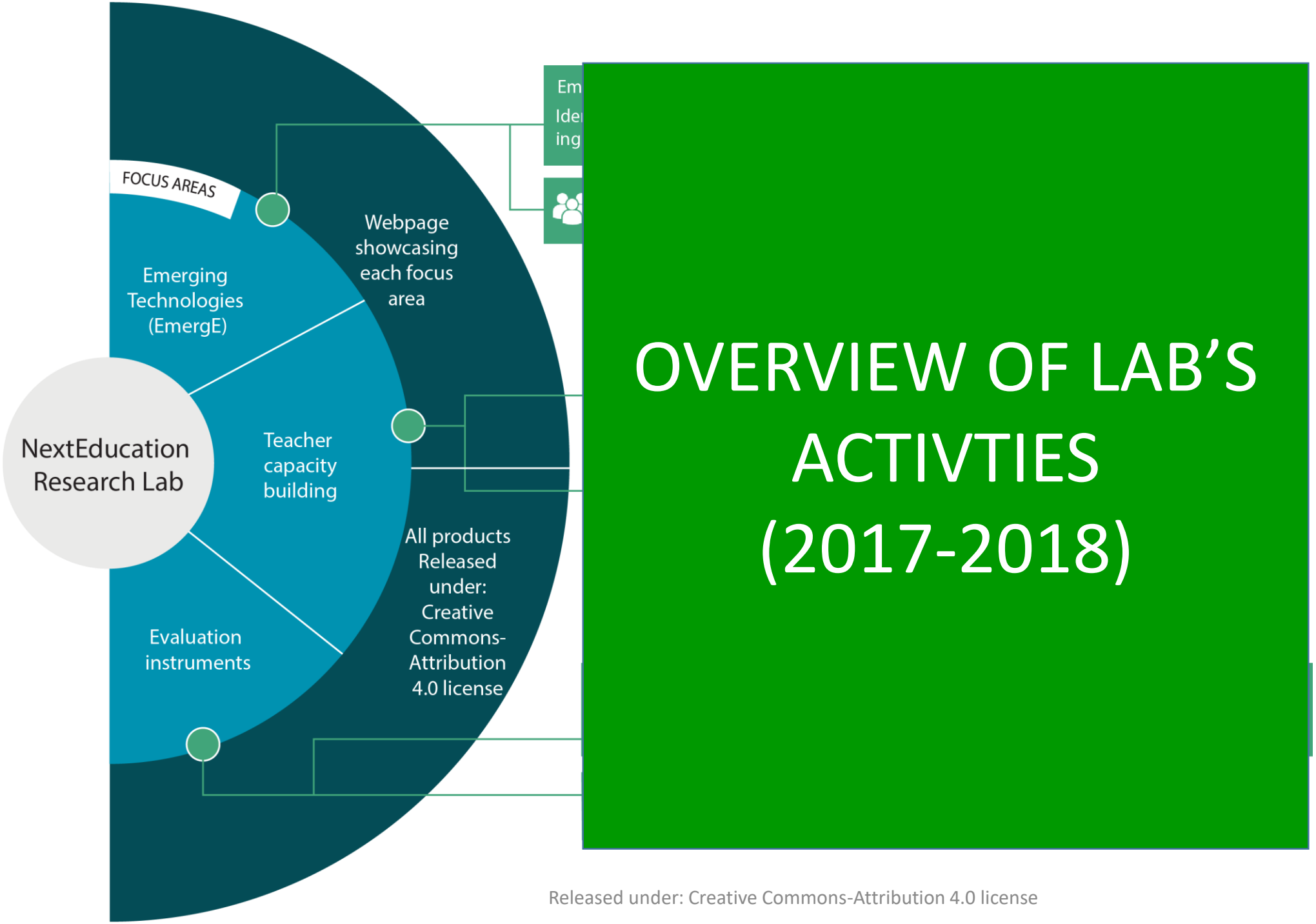
Train teachers in the pedagogy effective integration of ICT in their teaching through Massive Open Online Courses (MOOC) Courses

Target Audience : School teachers interested in teaching with ICT

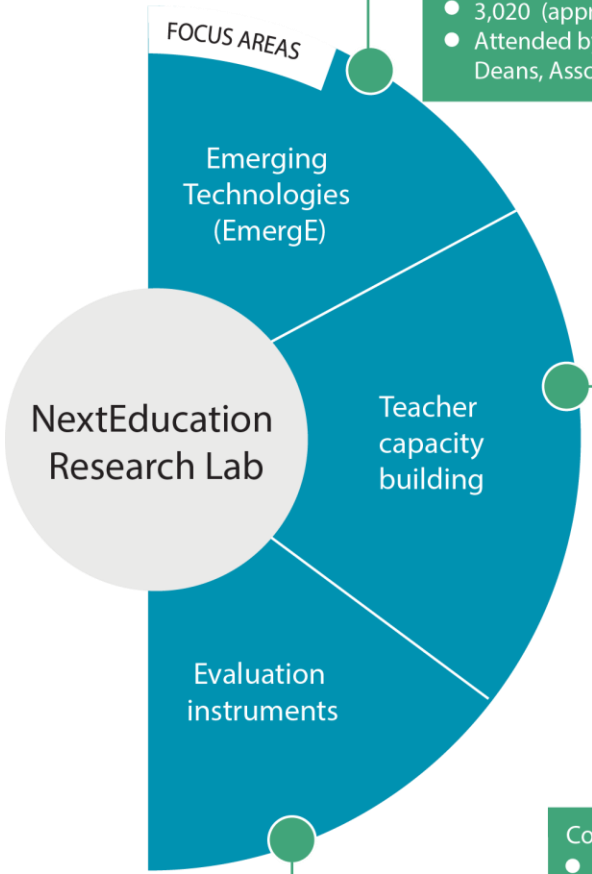
Evaluation Instruments Objective :

To evaluate quality of instructional products like multimedia teaching materials and textbooks for Science and Mathematics.

Target Audience : Learning solution creators, Principals & HODs who want to select between different learning solutions



OVERVIEW OF LAB'S ACTIVTIES (2017-2018)



Completed R&D Activities :

- 5 apps using emerging technologies like Augmented Reality, Leap Motion, Myo-armband with student-centred learning activities
- Pilot tested with students
- 6 research papers published

In progress R&D Activities :

- 4 more app using emerging technologies like Augmented Reality, Virtual Reality, 3D printer
- Learning activities & lesson plans for teachers

Outreach :

- 5 outreach events conducted
- 3,020 (approx.) people reached
- Attended by International researchers & research scholars in Educational Technology, Deans, Associate Deans, faculty & research scholars of IIT Bombay

Completed R&D Activities :

- 693 school teachers trained in 'Pedagogy for effective use of ICT in teaching'
- 171 computer science teachers trained in 'Effective teaching-learning of CS in schools' in 2018
- 2 research papers published

In progress R&D Activities :

- Data Analysis - quantitative & qualitative analysis of the level of engagement & quality of engagement
- Two more research publications planned

Outreach :

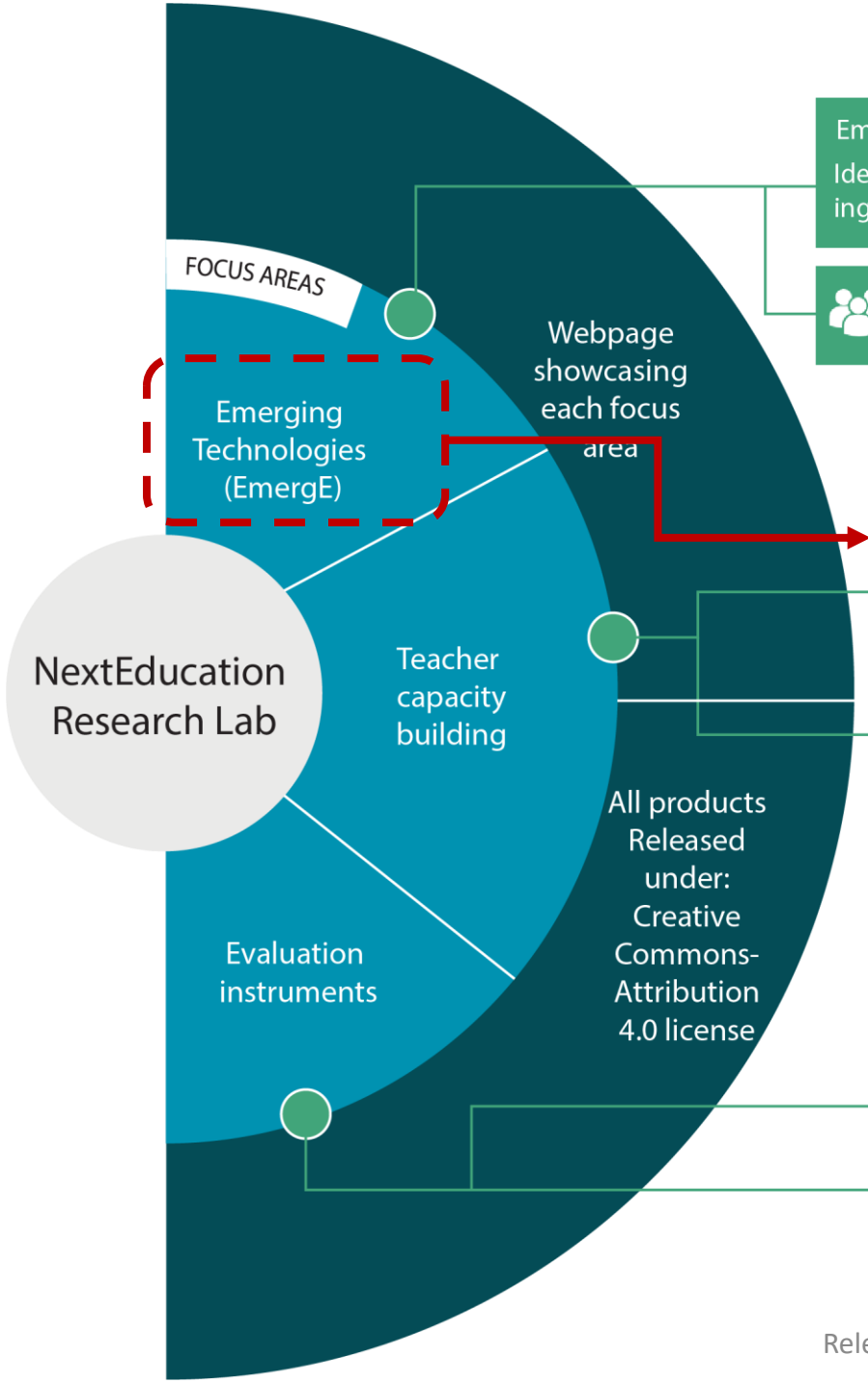
- Facebook page for ET611Tx teachers : https://bit.ly/2TZs6wl
- 548 likes and 586 followers of the page
- Facebook community of ET611Tx honor codes : https://bit.ly/2FMVjYI
- International community of teachers - 163 members from India, Tanzania, Middle East, UK
- Downloadable course handout in webpage

Completed R&D Activities :

- 4 theory-informed evaluation instruments, downloadable from webpage
- Checklist for evaluation of school textbooks (TEC_MATHS, TEC_SCIENCE), ratified by NextEducation SMEs & product managers
- Multiple versions of LOBE created based on target audience requirements : LOBE_LITE, LOBE_PREMIUM
- Design of LOBE tool with Generator, Evaluator and Analytics modules

In progress R&D Activities :

- Development of LOBE tool
- Content Validity of LOBE premium



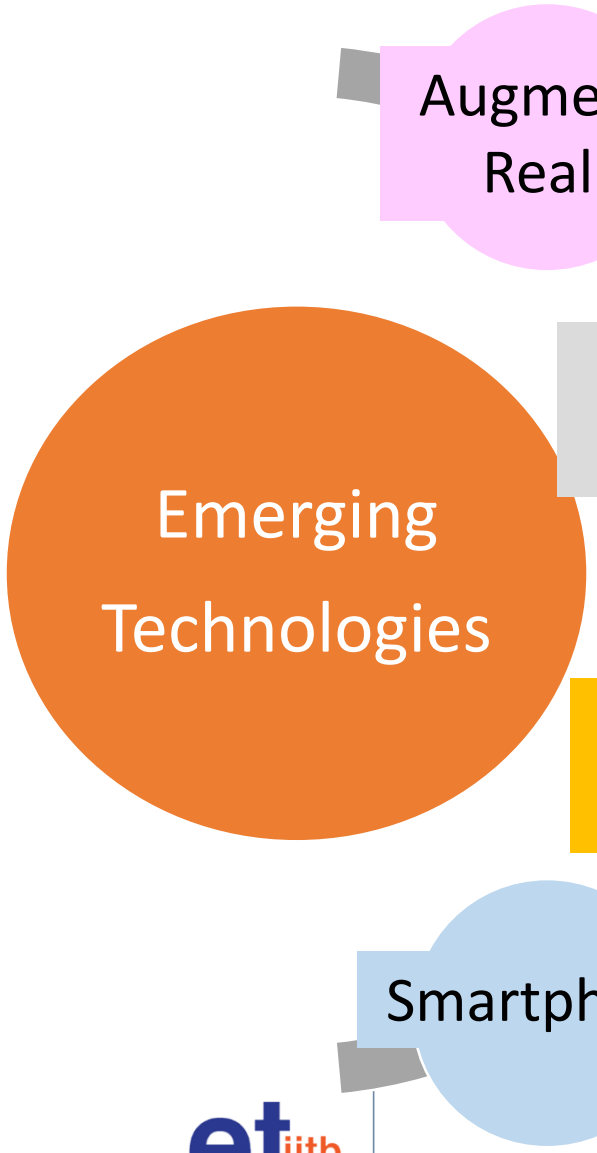
EmergE Objective:

Identify potential benefits that emerging technologies might afford in the teaching-learning process and design appropriate learning activities.

Target Audience : Teachers and students from Science, Mathematics & Physical Education

COMPLETED R&D ACTIVTY DETAILS OF EmergE (2017-2018)

Emerging Technologies (EmergE) : Completed R&D activities



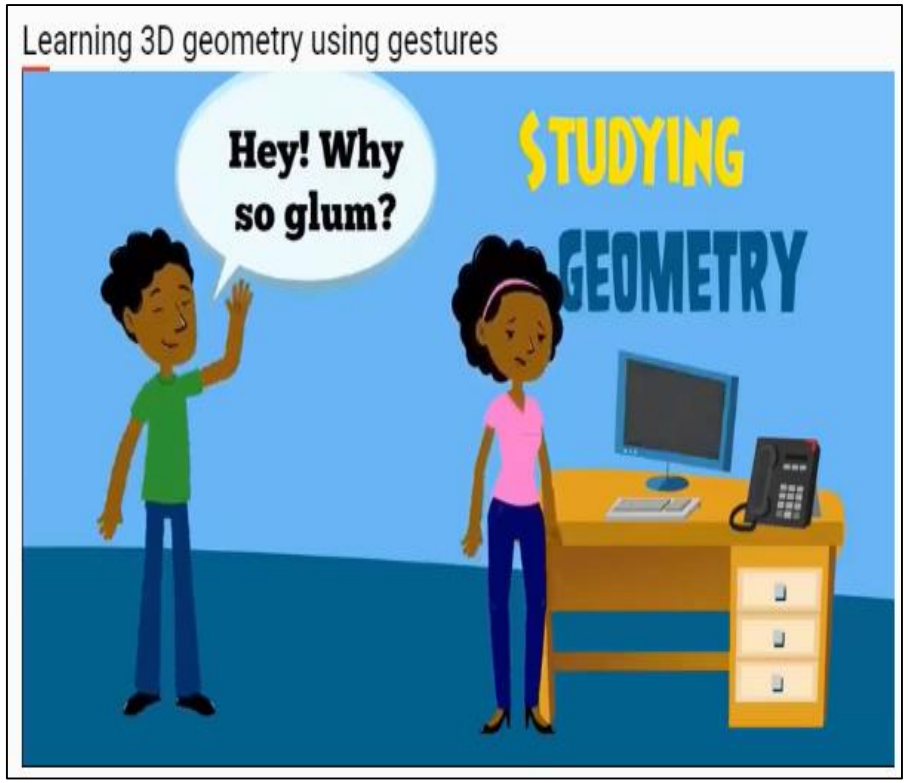
1. Geometry via AR (GeoSolvAR)
2. Stereochemistry (Stereochem)
3. Corrective Myo Badminton Trainer (CoMBaT)
4. Geometry via Gestures (G-v-G)
5. Titration ColorDarts (TCD)
(in collaboration with IISER, Kolkata)

Summary*:

- 5 apps - run/download from webpage
- Demo video in webpage
- Pilot-tested with learners
- 6 research publications
- 1 journal publication under review
- Learner-centred learning activities with feedback

*Details – Slides 9 - 13

Emerging Technologies (EmergE): G-V-G



http://www.et.iitb.ac.in/labs/GVG.html

About G-v-G :

- Web-based downloadable app for middle school geometry
- Teaching construction of 3D objects from 2D

Teacher's corner:

- User Manual to run G-v-G
- Lesson plan for teaching with G-v-G
- Run activities with G-v-G

Developer's corner :

- Code under CC-license
- Downloadable from github

Researcher's corner :

- 2 papers in international conferences on design & development of the system & user study

Emerging Technologies (EmergE): GeoSolvAR

http://www.et.iitb.ac.in/labs/geosolvar.html

About GeoSolvAR :

- Downloadable android app for middle school geometry
- Teaching spatial thinking skills for 3D geometry

Teacher's corner:

- Run learning activities with GeoSolvAR from webpage
- Downloadable paper markers

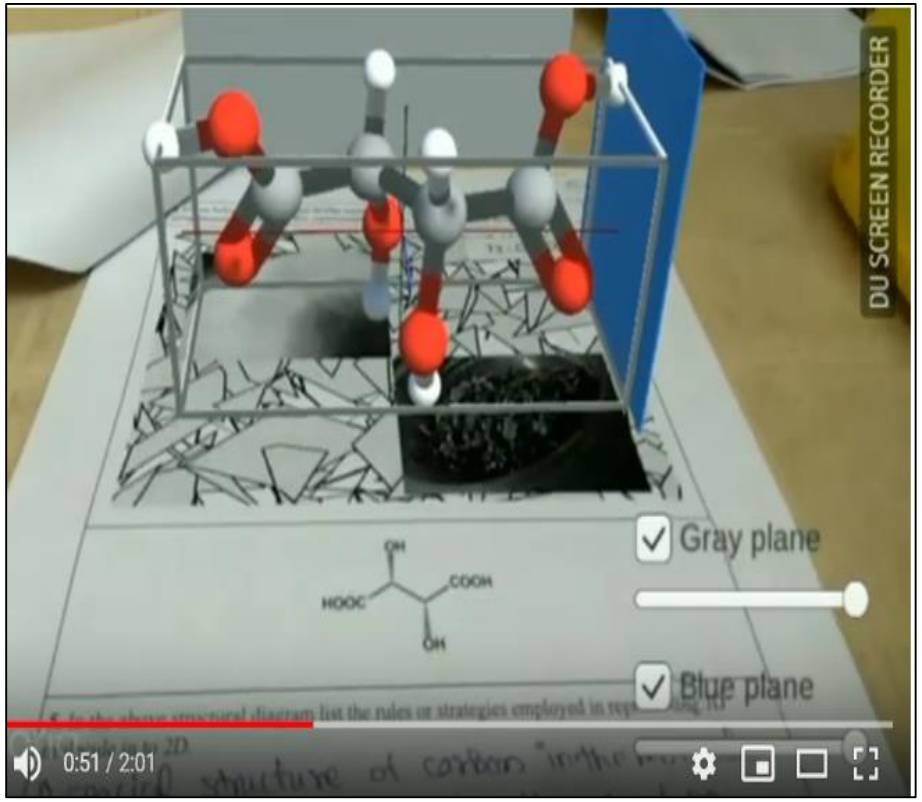
Developer's corner :

- Downloadable apk files & Blender models

Researcher's corner :

- 2 papers on the observations & results from pilot studies with school students

Emerging Technologies (EmergE): Stereochem



http://www.et.iitb.ac.in/labs/stereochem.html

About Stereochem :

- Downloadable android app for high-school chemistry
- Teaching spatial visualization of 3D molecular models

Teacher's corner:

- Learning activities to do with Stereochem
- Downloadable paper markers
- User Manual

Developer's corner :

- Downloadable apk files

Researcher's corner :

- 1 paper in international conference that includes user experience study with the app

Emerging Technologies (EmergE): CoMBaT

About CoMBaT :

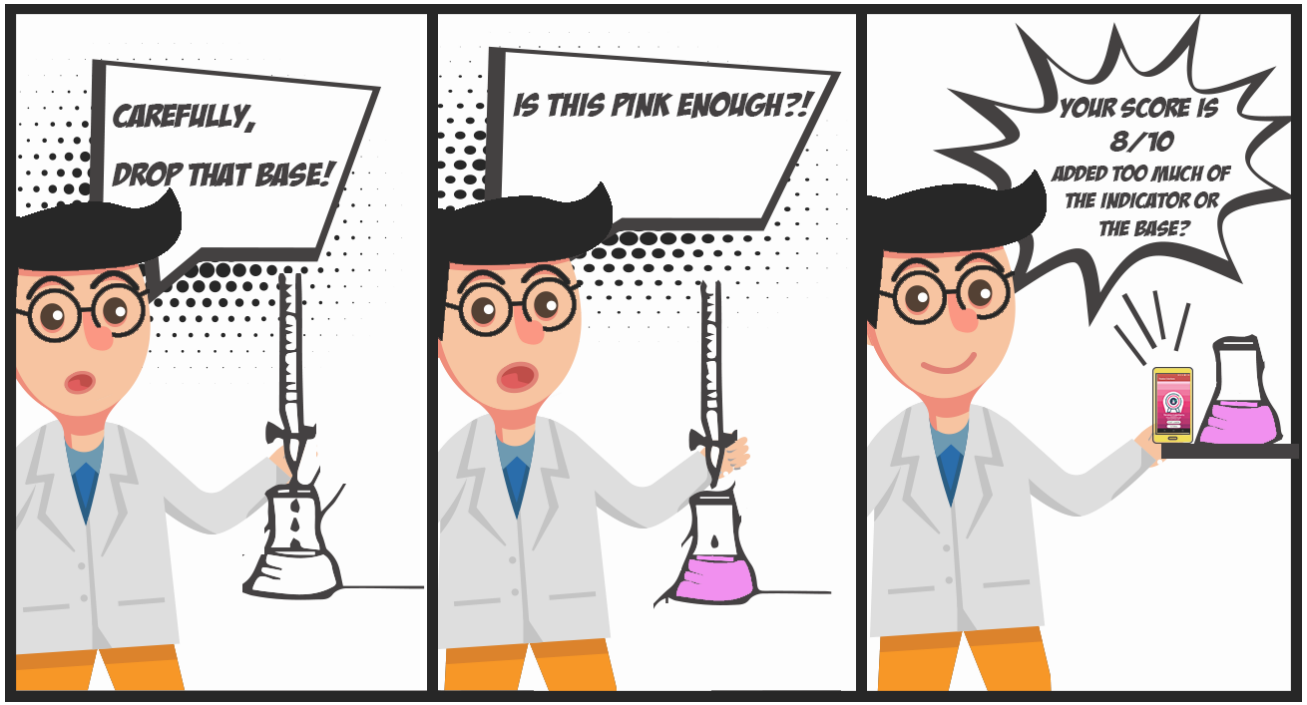
- App for badminton players to get feedback on visualizing muscular effort and swing of the arm
- Teaching psychomotor skills in badminton
- Demo video in webpage

Researcher's corner :

- 1 paper in international conference on design & development of CoMBaT
- Future research directions for other researchers

http://www.et.iitb.ac.in/labs/combat.html

Emerging Technologies (EmergE): Titration ColorDarts



http://www.et.iitb.ac.in/labs/tcd.html

About Titration ColorDarts:

- Smartphone Tutor for Phenolphthalein-based Titration Experiment
- Downloadable from the Google Play Store

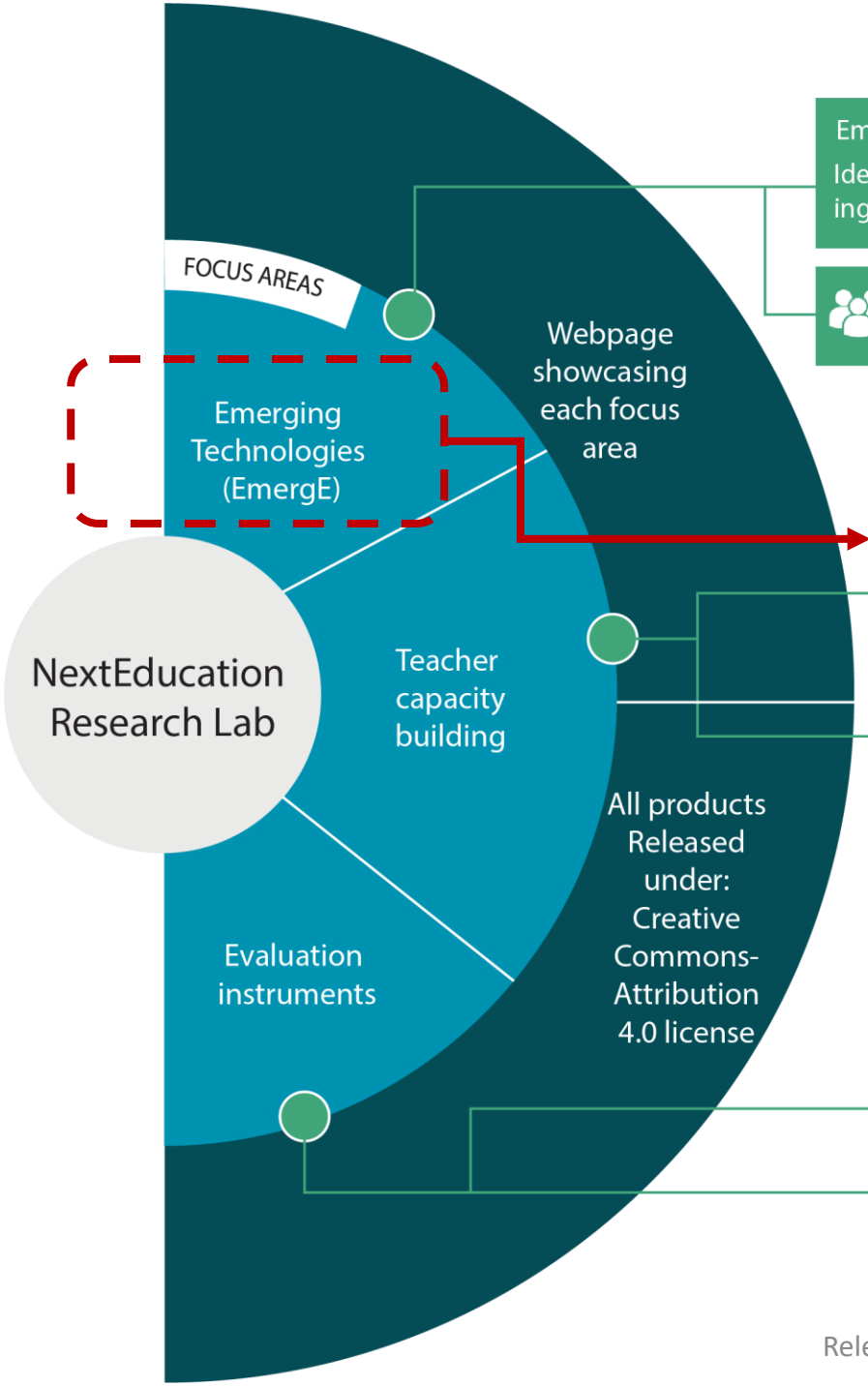
Teacher's Corner:

- Learning activities with Titration ColorDarts
- User manual

Researcher's Corner:

- Paper under revision at the Journal of Chemical Education

Project done in academic collaboration with Prof. Subhajit Bandyopadhyay, IISER Kolkata

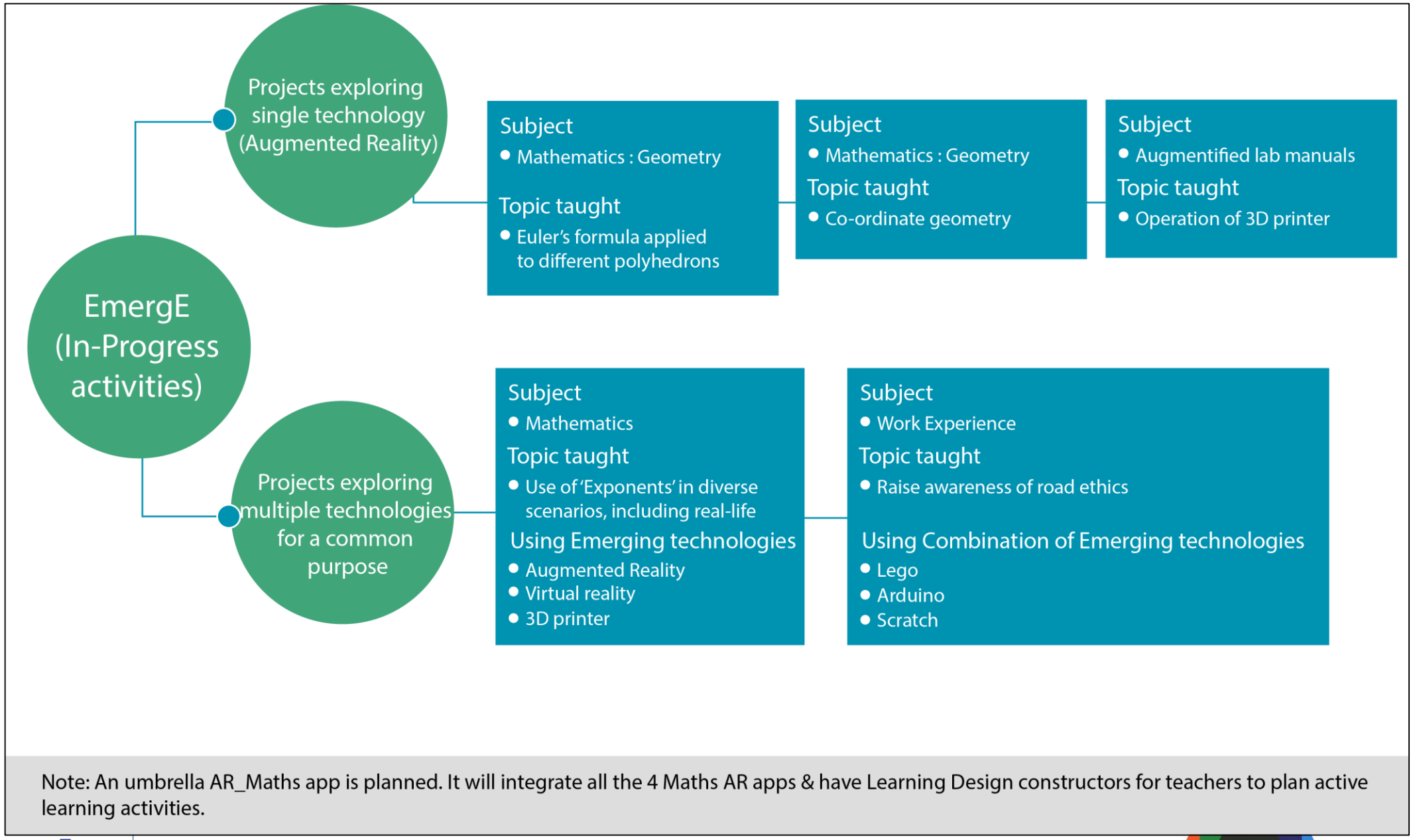


EmergE Objective:

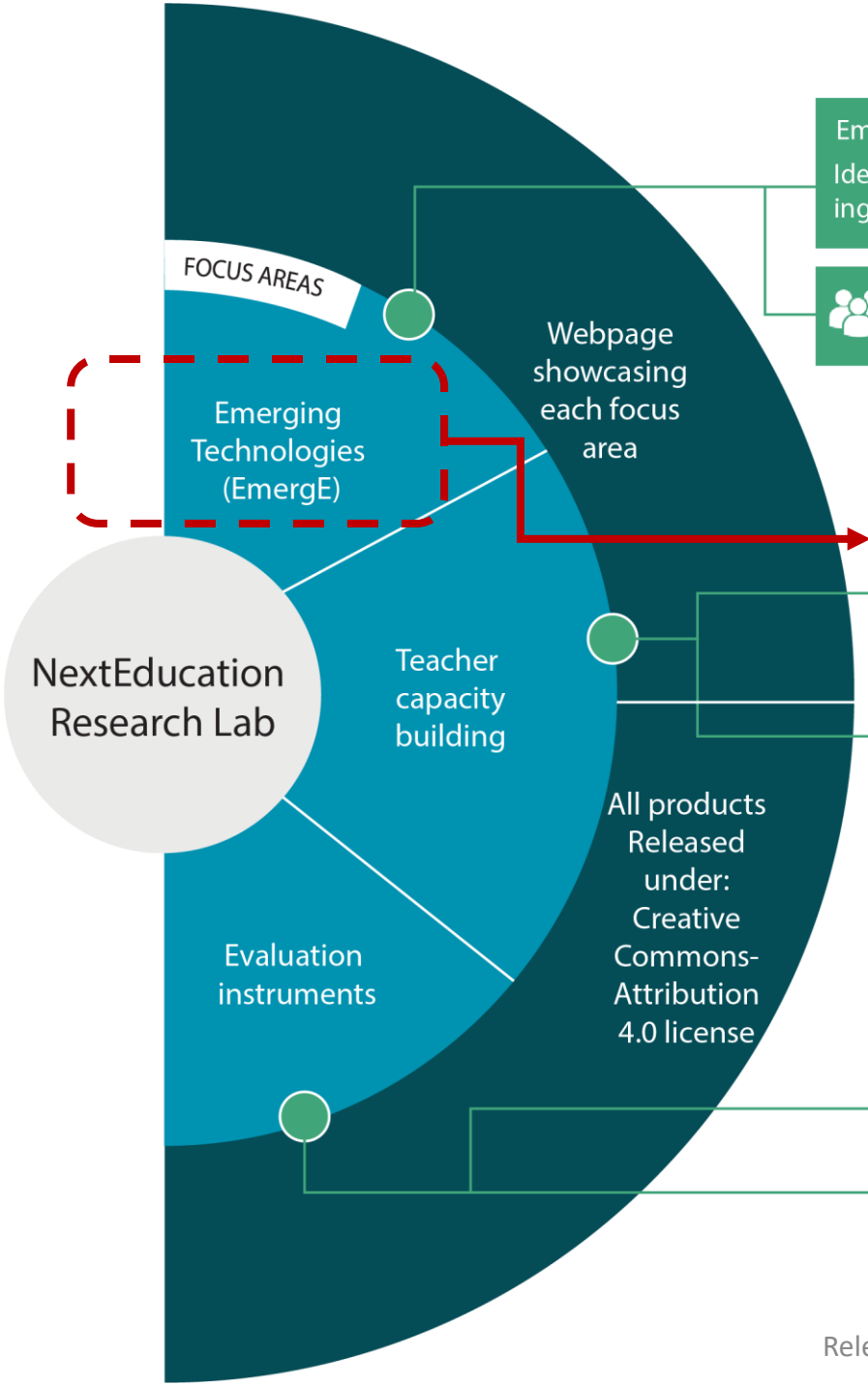
Identify potential benefits that emerging technologies might afford in the teaching-learning process and design appropriate learning activities.

Target Audience : Teachers and students from Science, Mathematics & Physical Education

IN-PROGRESS R&D ACTIVTY DETAILS OF EmergE (2017-2018)



Note: An umbrella AR_Maths app is planned. It will integrate all the 4 Maths AR apps & have Learning Design constructors for teachers to plan active learning activities.



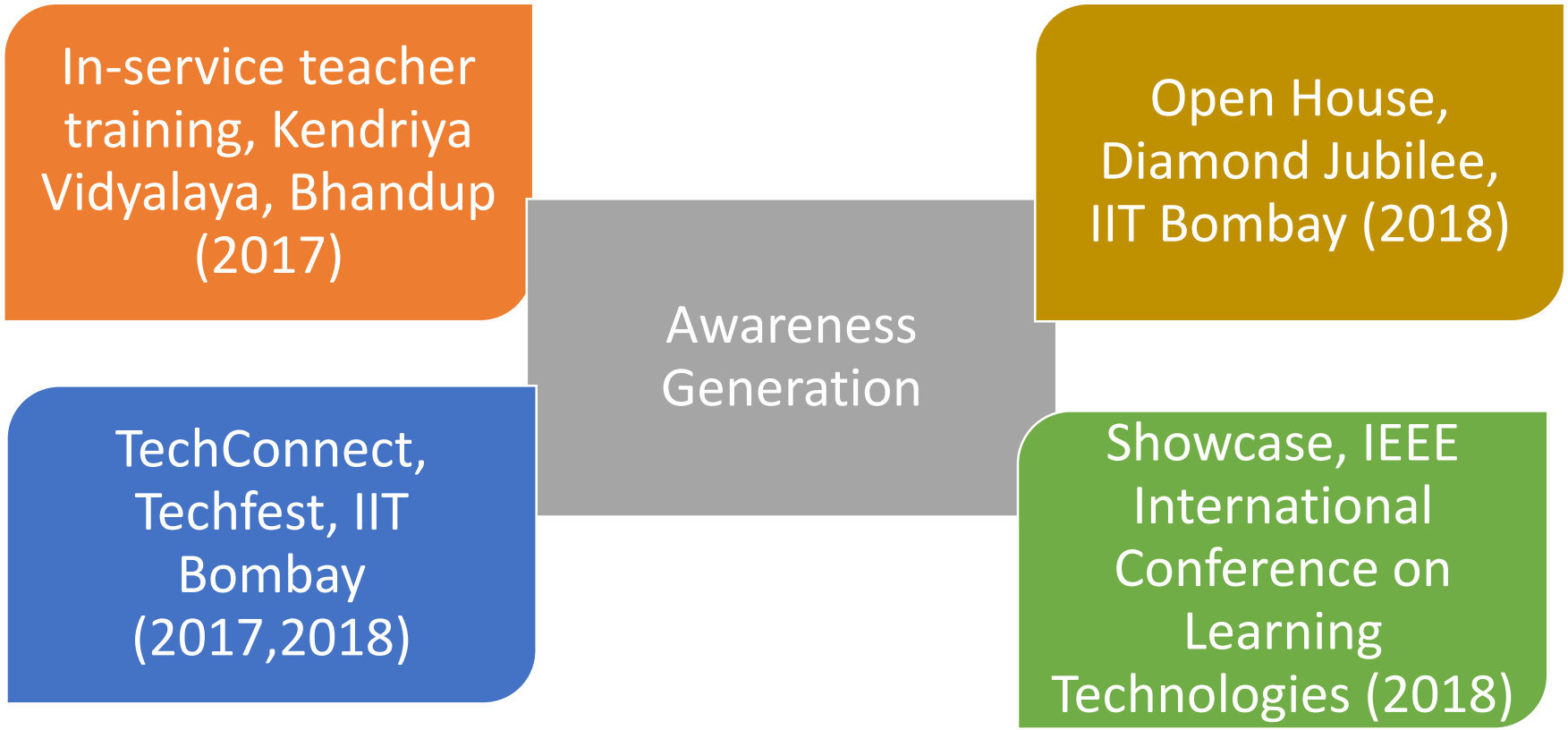
EmergE Objective:

Identify potential benefits that emerging technologies might afford in the teaching-learning process and design appropriate learning activities.

Target Audience : Teachers and students from Science, Mathematics & Physical Education

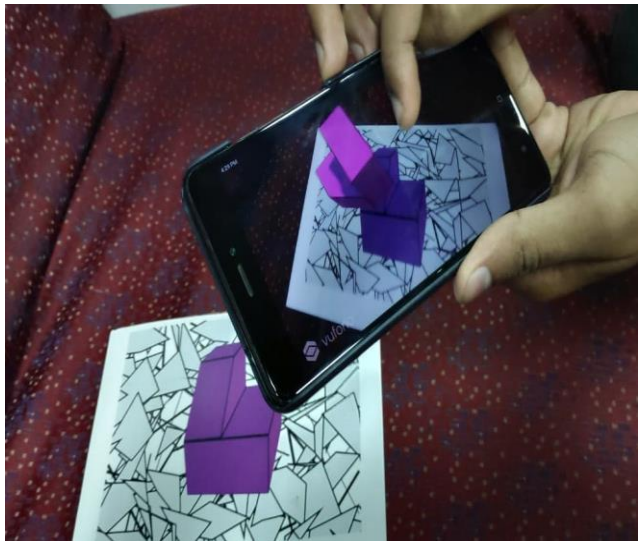
OUTREACH ACTIVTY DETAILS OF EmergE (2017-2018)

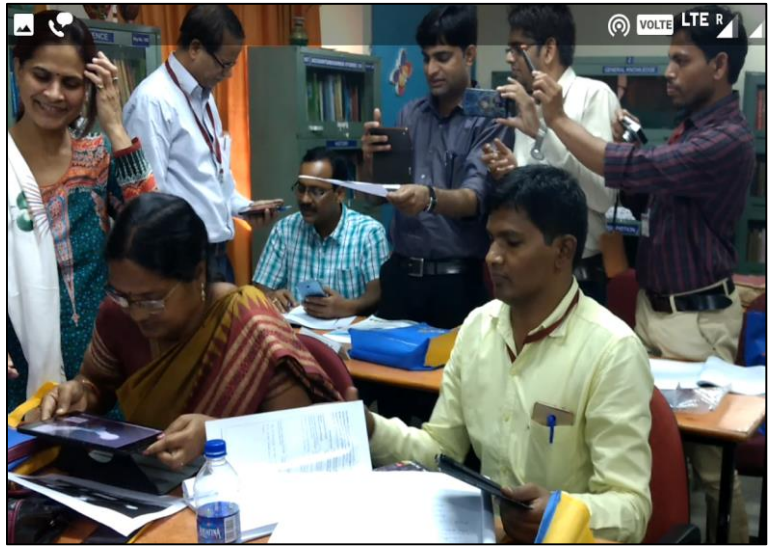
EMERGE : OUTREACH ACTIVITIES

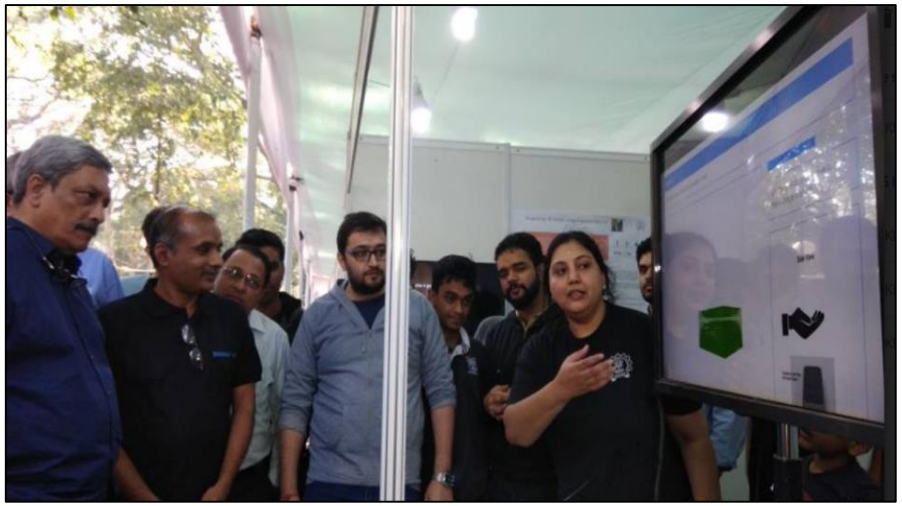


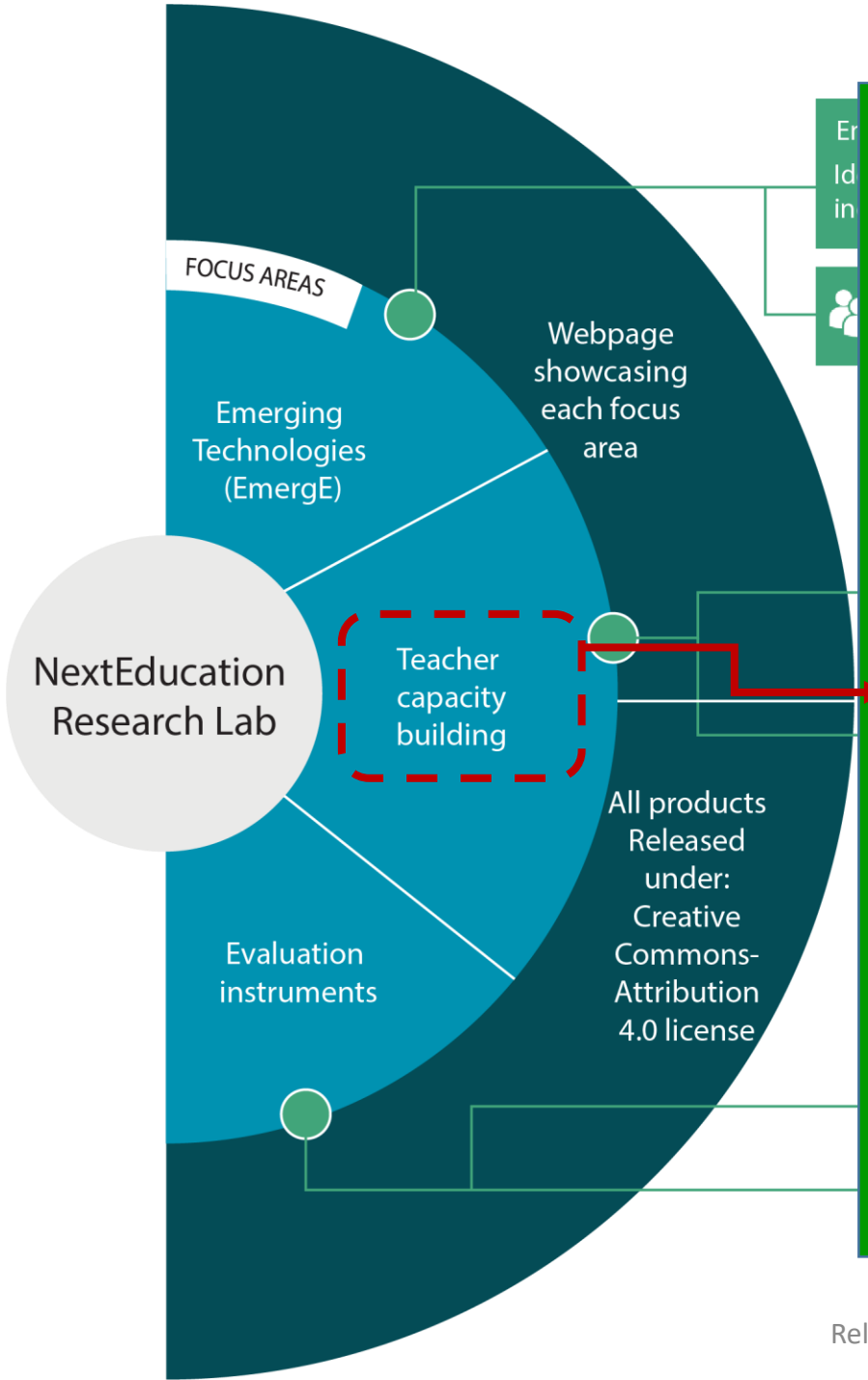
- 5 outreach events conducted
- 3,020 (approx.) people reached
- Attended by International researchers & research scholars in Educational Technology, Deans, Associate Deans, faculty & research scholars of IIT Bombay
- Refer pictures next slide

EMERGE : OUTREACH ACTIVITIES









R&D ACTIVTY DETAILS OF TEACHER CAPACITY BUILDING (Completed + In-Progress)

Teacher Capacity Building : Completed R&D activities

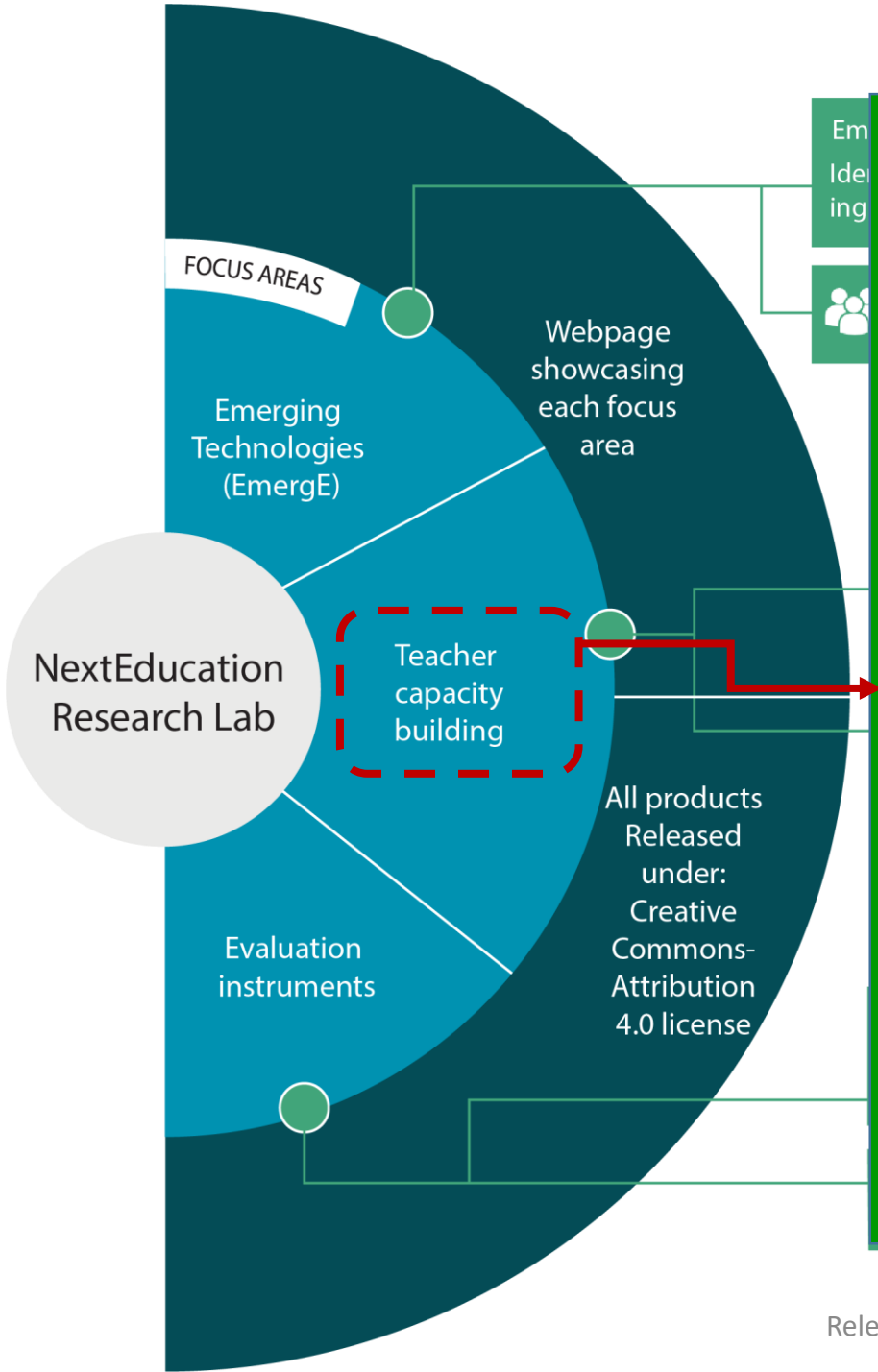
Course codes	ET611Tx The 3rd run (2018)	ET621Tx The 3rd run (2018)
Course dates	July 26 – Sept. 7, 2018	Sept. 6 - Oct. 7, 2018
Duration	4 weeks (+ 1 catch-up)	4 weeks
Registered participants	13,603	412
Honor codes (i.e. teachers trained)	693	171

- Webpage developed for each course (click hyperlinks above to access)
- Course handouts for download
- Two research publications in International Conferences on effectiveness of learner-centred pedagogy used in ET611Tx (2017) [See Publication slide – Slide 37]
- Detailed report of both courses sent on Oct. 29, 2018

Teacher Capacity Building : In-Progress R&D

- Data analysis –
  - Both quantitative & qualitative analysis of the level & quality of engagement in terms of - behavioral, affective & cognitive engagement of participants in the course

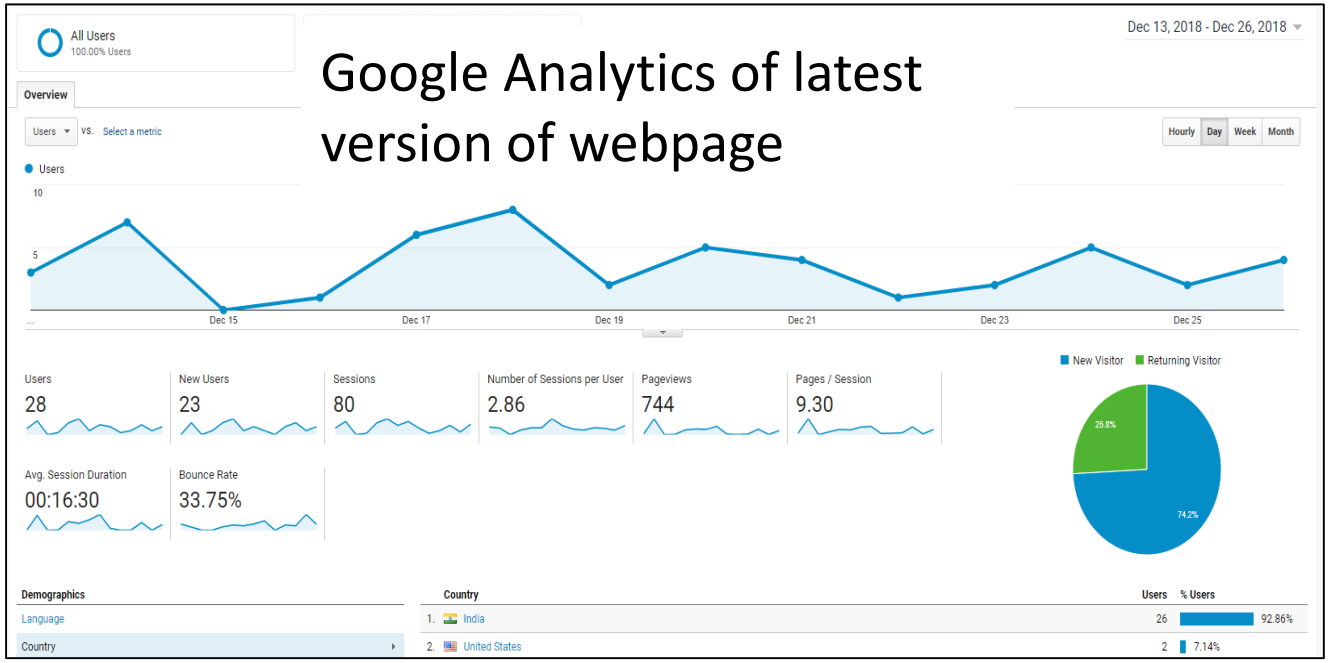
- Two research publications planned on :
  a) effectiveness of learner-centred orchestration in MOOC
  b) cross-cultural participant engagement in the course



OUTREACH ACTIVTY DETAILS OF TEACHER CAPACITY BUILDING (2017 – 2018)

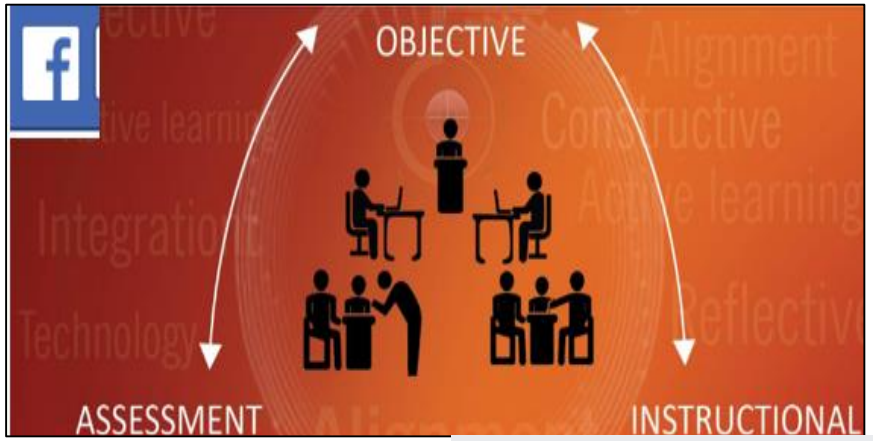
OUTREACH ACTIVITIES

- NextEducation Research Lab webpage : http://www.et.iitb.ac.in/labs/index.html



Google Analytics of latest version of webpage

- Facebook page for ET611Tx course : https://bit.ly/2TZs6wl



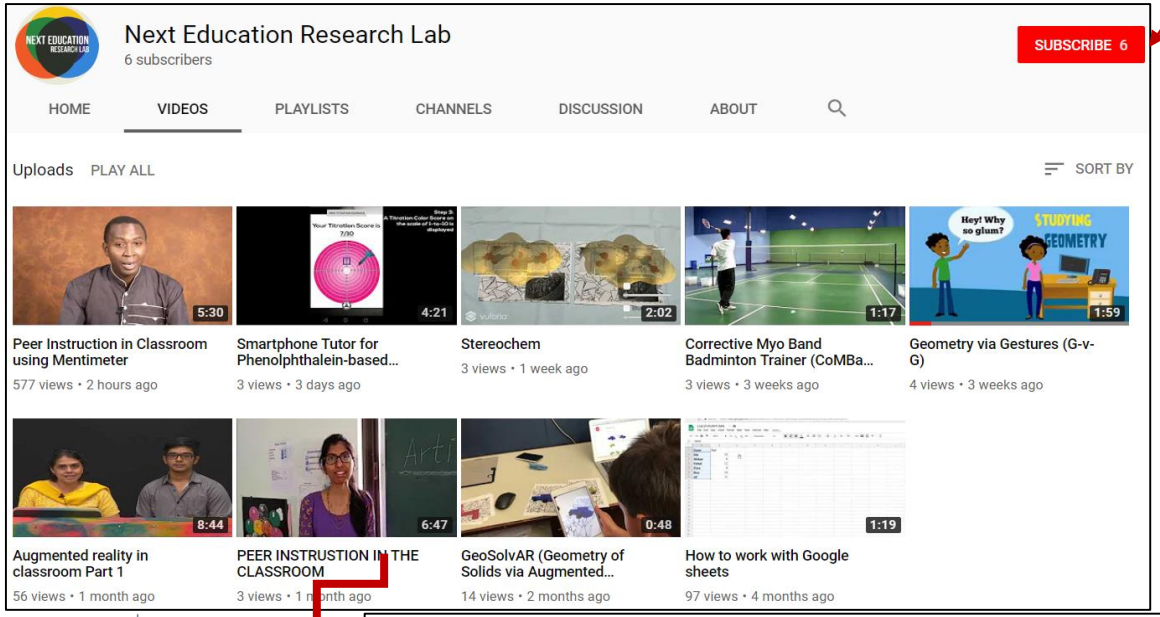
548 Total Likes

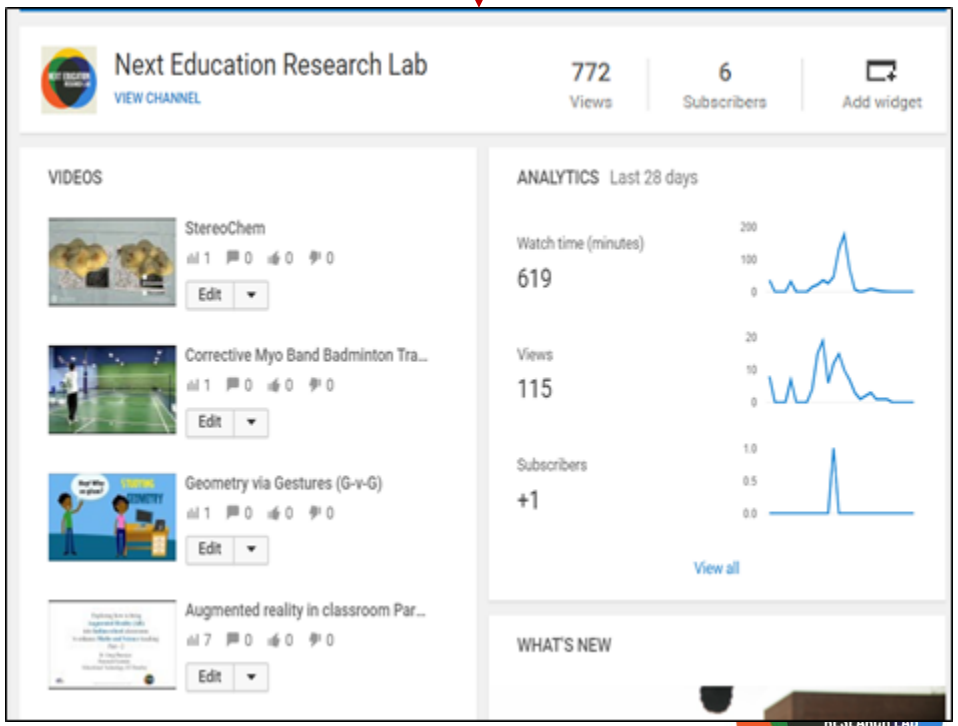
586 Total Follows

OUTREACH ACTIVITIES [CONTD.]

- Facebook community of ET611Tx honor code teachers: https://bit.ly/2FMVjYI
- 163 members from India, Tanzania, Middle East, UK

- Youtube Channel of NextEducation Research Lab started : https://bit.ly/2UNVAhv





Video of Gyankriti school, Indore on applying ET611 learnings

SUSTAINING OUR TEACHER COMMUNITY : IN INDIA

- Sustaining the community of teachers:

Innovations by teachers (voice chart), (voizometer)

Chitra Kapoor Rola Good morning ET611Tx team , here is the picture of Voizometer that has been used in class to control the noise level . Arrow shows the level as green signifies peaceful class, yellow- little noisy and red- very noisy class. This is placed near the switch board as the class become noisy I mark the arrow to red and switch off the fans & light . Children immediately understand why is that happen , what teacher is expecting and how to bring the level back to green .

Field implementation of Active Learning by teachers

- Teacher Testimonials

I am teaching Biology to the Higher Secondary Classes since last 17 years….. When I was teaching, the whole class was always calm and cool. I used to ask few questions to the students and also clear the doubts of the students. Students were satisfied with my teaching and also appreciated me many times. I was getting job satisfaction. In fact this was not the real story

When I joined the course and completed the Module-2 i.e. Active Learning and Classroom Strategies, I found myself awakened from the dark night and said that "I have to work hard for students till the next 17 years". Past 17 years my teaching was Teacher Centric, which was wrongly appreciated by my students. For the last 17 years students were listening to me, now for the next 17 years I have to listen to the students. Now on wards my each class will be noisy and found to be engaged. atul1975

Sarada Spr reviewed ET611Tx — 5★
August 24 at 12:14 PM ·

Lots of information and hands on training on ICT and the various Google apps and tools which could be used for enhancing as well as getting the desired learning in students. Also, the various educational techniques to be used by teachers to ensure 100% student attention in a classroom setting is something which I loved and I tried two of those techniques and the results were outstanding. I am thankful for Teach next and IITBombayx for providing me with the training.

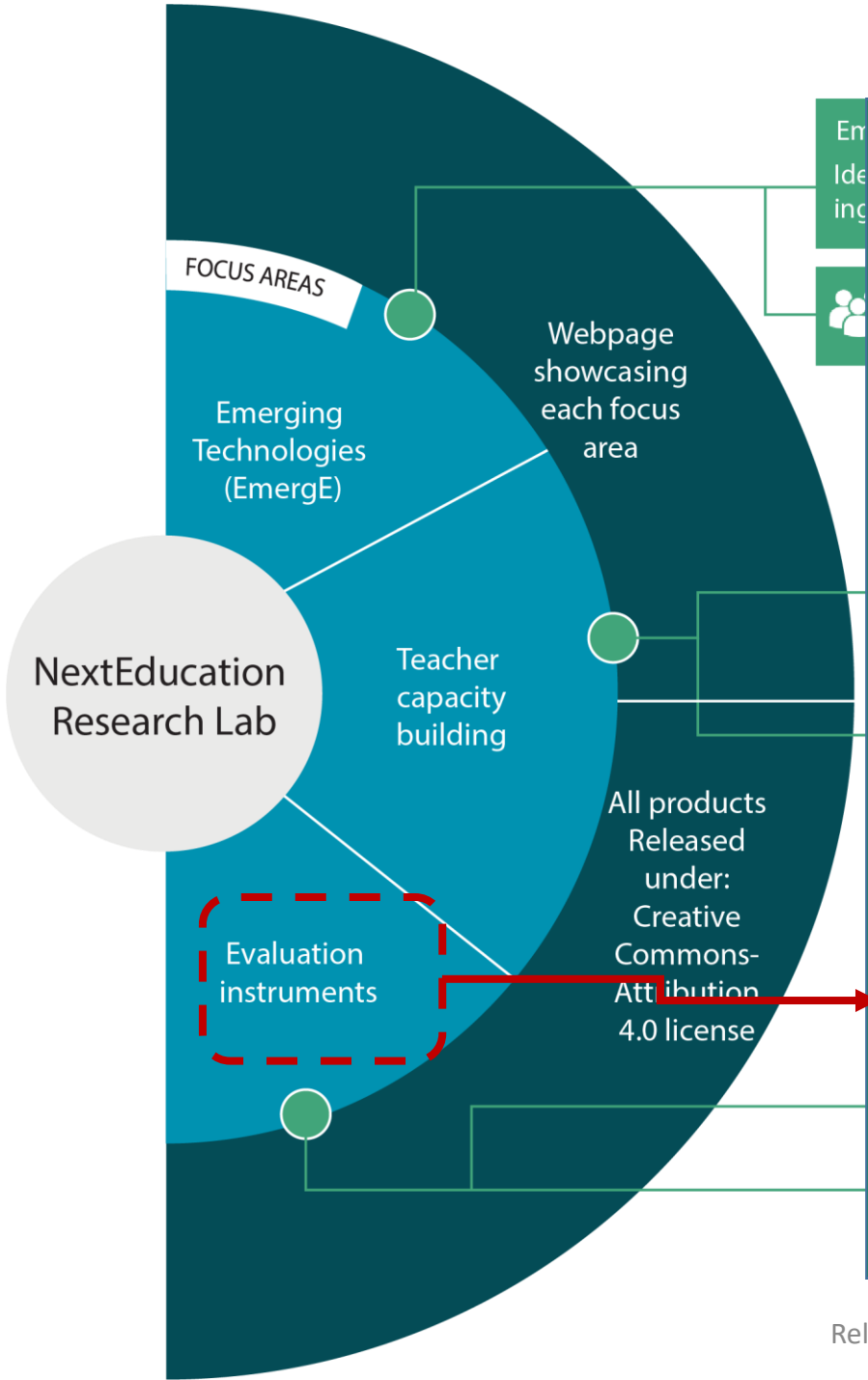
INTERNATIONAL OUTREACH ACTIVITIES: TANZANIA

- Sustaining the community of teachers:

School administration felicitating ET611Tx honor code teachers

Field implementation of Active Learning by teachers

- Teacher Testimonials



COMPLETED R&D ACTIVTY DETAILS OF EVALUATION INSTRUMENTS (2017 – 2018)

Evaluation Instruments

- Textbook Evaluation Checklist (TEC) :
  - Three-scale checklist, measures quality of school textbooks from Science & Mathematics
  - Based on Next Generation Science Standards (NGSS, USA) and National Curriculum Framework (NCF, India)
  - Ratified by NextEducation SMEs & Product Managers

- Learning object evaluation instrument (LOBE) :
  - Multiple versions of LOBE created based on target audience requirements :
    - LOBE_LITE – Shortened version containing 10/11 questions for quick evaluation
    - LOBE_PREMIUM – A theory-informed set of 39 questions for comprehensive evaluation

Designing LOBE Tool: Screen Designs

Sign-up Module

SIGN UP

ENTER YOUR EMAILID

ENTER YOUR PASSWORD

CHOOSE THE ROLE IN WHICH YOU WANT TO USE THE LOBE TOOL

GENERATE EVALUATION RUBRIC

REVIEW USING GENERATED RUBRIC

SUBMIT

Generator Module

LEARNING OBJECT EVALUATION TOOL

GENERATOR DASHBOARD

VIEW RESULTS

SETTINGS

LOGOUT

GENERATE NEW RUBRIC

INCOMPLETE RUBRIC GENERATED

COMPLETE GENERATED RUBRIC

TRACK EVALUATION

CHANGE YOUR ROLE TO EVALUATOR

Evaluator Module

LEARNING OBJECT EVALUATION TOOL

EVALUATOR DASHBOARD

VIEW RESULTS

SETTINGS

LOGOUT

NEW EVALUATION

INCOMPLETE EVALUATION

COMPLETED EVALUATION

TRACK EVALUATION

CHANGE YOUR ROLE TO GENERATOR

Analytics Module

LEARNING OBJECT EVALUATION TOOL

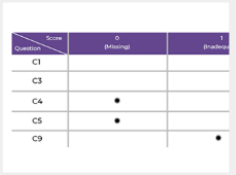
GENERATOR DASHBOARD

VIEW RESULTS

DASHBOARD

LOGOUT

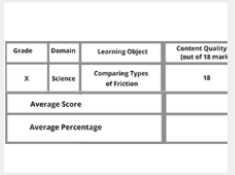
RESULTS PANEL



DETAILED SCORES

Gives you evaluation scores, at criteria level for a single Learning Object

Target Audience : Learning Object developers, Learning Object repositories, Learning solutions companies



SUMMARY TABLE

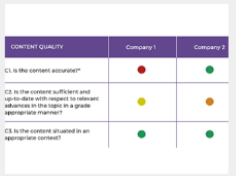
Gives you a summary of the quality evaluation results across a set of Learning Objects evaluated

Target Audience : Learning Object developers, Learning Object repositories, Learning solutions companies

STRENGTH WEAKNESS ANALYSIS

Gives you analysis of quality criteria where you are strong and weak, indicating the remedial effort required

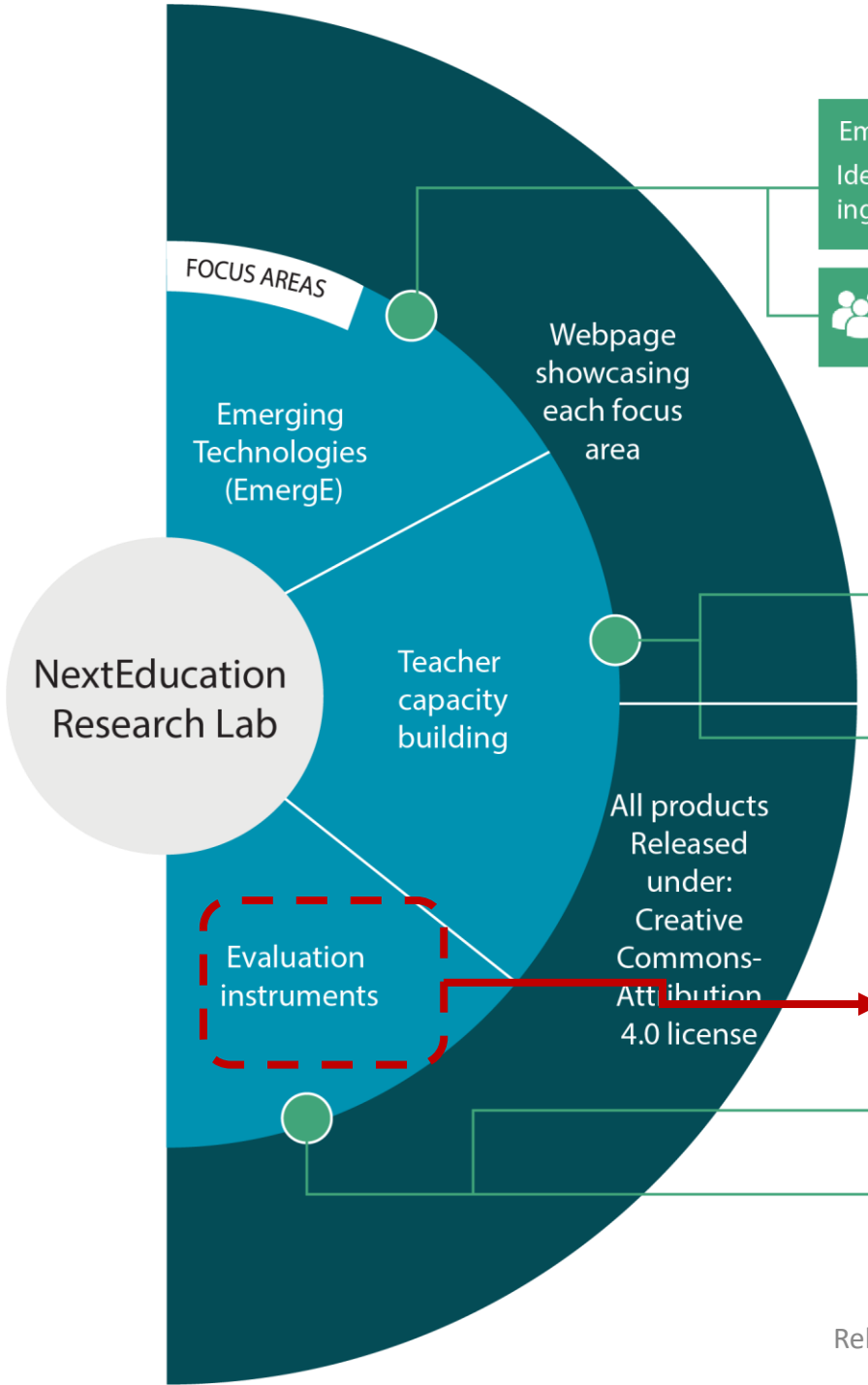
Target Audience : Learning Object developers, Learning Object repositories, Learning solutions companies



COMPARATIVE ANALYSIS

Gives you a comparative report on strength and weakness of Learning Objects from multiple repositories

Target Audience : Learning solutions companies, Principle or HOD of schools / colleges

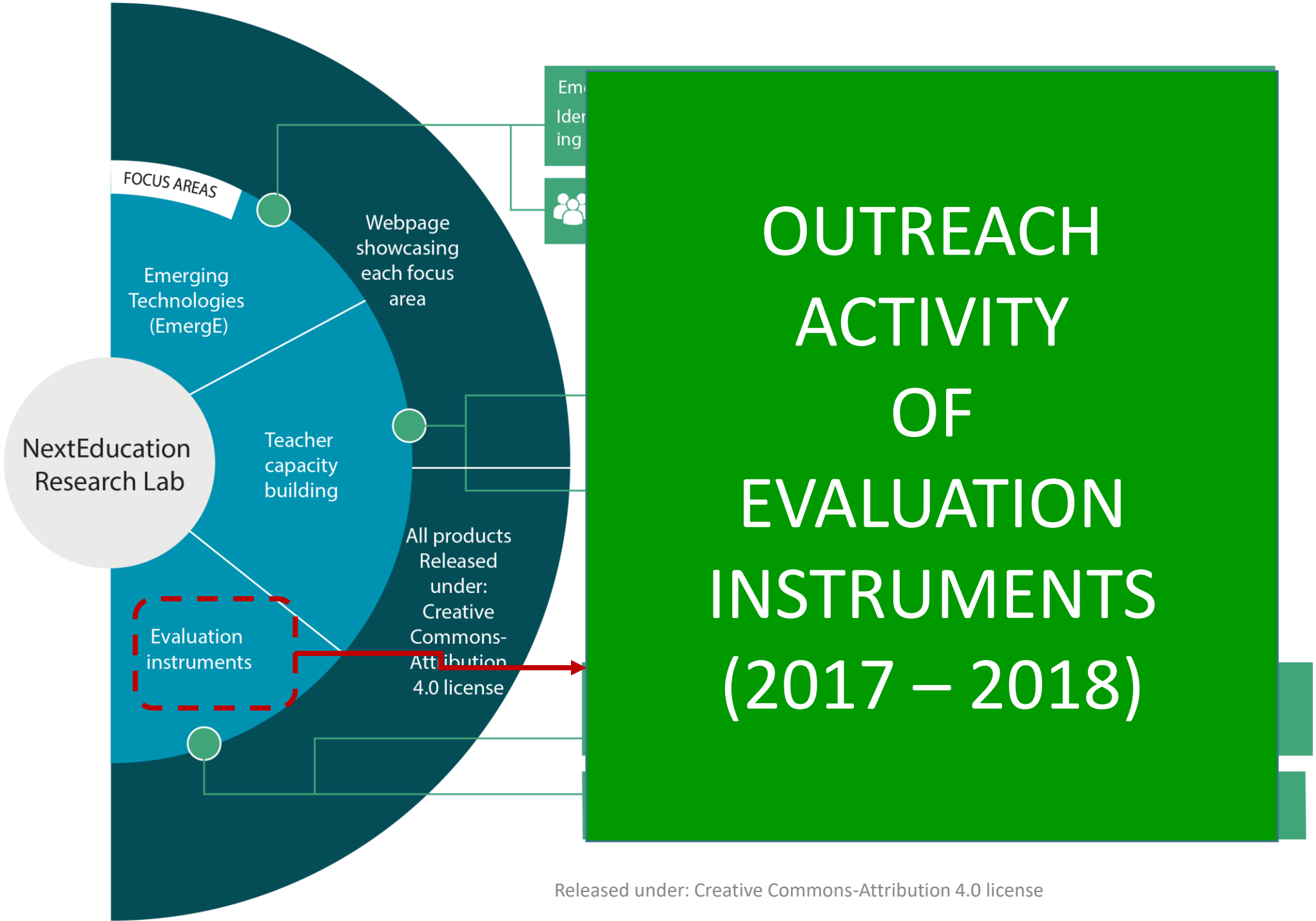


IN-PROGRESS R&D ACTIVTY DETAILS OF EVALUATION INSTRUMENTS (2017 – 2018)

Evaluation Instruments: In-Progress

- Content Validity of LOBE_PREMIUM with experts via Delphi technique

- Development of a working prototype of LOBE TOOL



Evaluation Instruments: Outreach Activities

- Development of webpage for evaluation instruments
  - Textbook evaluation checklist
  - LOBE
- All instruments downloadable from webpage & licensed under Creative Commons-Attribution 4.0 license

CONTRIBUTION
TO
HUMAN RESOURCE DEVELOPMENT
IN
EDUCATIONAL TECHNOLOGY DEPARTMENT

HUMAN RESOURCE CONTRIBUTION TO ET, IITB

- Team Profile :
  - Principal Investigators = Prof. Sridhar Iyer & Prof. Sahana Murthy
  - Academic staff = 2 post-doctoral fellows + 2 master's level students
  - Technical staff = 3 Technical personnel
- Training given by team members :
  - Qualitative data analysis of MOOC data to first year Ph.D. students
  - Design & Orchestration of online courses to first year Ph.D. students
- Training received by team members:
  - Academic staff trained in ET801: Introduction to Educational Technology & ET804 : Research Methods in Educational Technology
- Travel support to three Ph.D. students to present their work to the international research community in the 13th International Conference of the Learning Sciences (ICLS 2018), London

PUBLICATIONS

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1. Shah V., Banerjee G., Murthy S. & Iyer S. (2018), "Learner-centric MOOC for teachers on effective ICT integration: Perceptions and experiences", Proceedings of IEEE Ninth International Conference on Technology for Education (T4E) (in Press)

2. Kaur, N., Pathan, R., Khwaja, U., Sarkar, P., Rathod, B., and Murthy, S. (2018), "GeoSolvAR: Augmented Reality based Application for Mental Rotation", Proceedings of IEEE Ninth International Conference on Technology for Education (T4E)(in Press)

3. Banerjee G., Warriem J. , and Mishra S. (2018), "Learning experience interaction (LxI): Pedagogy for peer-connect in MOOCs," in Yang, J. C. et al. (Eds.). Proceedings of the 26th International Conference on Computers in Education. Philippines: Asia-Pacific Society for Computers in Education

4. KL, N. S., Chavan, P. S., & Murthy, S. (2018, July), StereoChem: Augmented Reality 3D Molecular Model Visualization App for Teaching and Learning Stereochemistry, IEEE 18th International Conference on Advanced Learning Technologies (ICALT) (pp. 252-256). IEEE.

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6. Raina, A., Lakshmi, T. G. & Murthy, S.(2017), "CoMBaT: Wearable Technology Based Training System for Novice Badminton Players", IEEE 17th International Conference Advanced Learning Technologies (ICALT), pp. 153-157.

7. Narayana, S., Prasad, P., Lakshmi, T. G., & Murthy, S. (2016), "Geometry via Gestures: Learning 3D geometry using gestures", IEEE Eighth International Conference on Technology for Education (T4E), pp. 26-33.

8. Lakshmi, T. G., Narayana, S., Prasad, P., Murthy, S., & Chandrasekharan, S. (2016), "Geometry-via-Gestures: Design of a gesture based application to teach 3D Geometry", 24th international conference on computers in education (ICCE), pp. 180-189.

THANK YOU!