INTER-DISCIPLINARY PROGRAMME IN EDUCATIONAL TECHNOLOGY
Annual Report 2014-15

Introduction

The Inter-Disciplinary Programme in Educational Technology (IDP-ET) started in the Institute in the Autumn semester of the academic year 2010-11. The IDP-ET has core faculty members, adjunct faculty members, visiting faculty members, as well as faculty members from various departments of the Institute. The IDP-ET conducts research in areas of pedagogies and tools for technology-enhanced learning, In addition to Institute courses at a Ph.D. level, the IDP-ET organizes short-term intensive courses on effective teaching-learning and educational research methodologies through QIP, CEP and the Teach 10000 Teachers project. Faculty members and Ph.D. research scholars of the IDP-ET play a significant role in the organization of IEEE conference on Technology for Education (T4E), carry out sponsored projects for the National Mission on Education through ICT (NMEICT) and provide consultancy to educational technology industries.

Academic Programme

The IDP in Educational Technology (IDP-ET) offers a Ph.D. programme in Educational Technology. Currently, 22 students are enrolled in the Ph.D programme, and 3 more have been admitted as of May 2015. These Ph.D. students include engineering college teachers from colleges in and around Mumbai. The IDP-ET continues to offer core courses and electives in educational technology content and methods. These courses have had enrollment from B.Tech, M.Tech and Ph.D students in other academic programmes within the Institute.

R & D Activities

The main areas of focus of the R&D activities of the IDP-ET are:
- Technology-enhanced learning environments for thinking skills, which are pan-domain cognitive skills such as, engineering design, problem-posing, estimation, algorithmic thinking, modeling, data representation & analysis.
- Frameworks for teacher use of educational technology tools and strategies.
- Development of AI & ICT based tools for teaching-learning goals such as automated content generation and assessment.

Areas of development focus for the IDP-ET are:
- Educational products and tools – scientific visualizations, spoken-tutorials, virtual labs, tutoring systems, and assessment instruments.
- Creation of online courses and multimedia textbooks
- Guidelines for teachers - on classroom practice, effective strategies, large classes, incorporation of ICT tools, teaching in new situations such as online education and flipped classrooms

Sponsored Projects
Completed
 "OSCAR++ (Open Source Courseware Animations Repository) sponsored by Ministry of Human Resource Development
"Developing suitable pedagogical methods for various classes, intellectual calibers and research in e-learning"

Papers published

Journals

- Patwardhan, M. & Murthy, S. "When does higher degree of interaction lead to higher learning in visualizations? Exploring the role of Interactivity Enriching Features.,"Computers & Education, Vol.82, 2015, pp.292-305.

Peer-reviewed conference proceedings

IEEE International Conference on Technology for Education, T4E 2014.
- Anand, A., Kothiyal, A., Rajendran, B. & Murthy, S. "Guided Problem Solving and Group Programming: A Technology-Enhanced Teaching-Learning Strategy for Engineering Problem Solving." Proceedings of the 6th IEEE International Conference on Technology for Education (T4E 2014), 2014, Amritapuri, India.
- Kenkre, A. & Murthy, S. "A Self Study Learning Environment for Modeling Abilities: Do all learners take the same Learning Path." Proceedings of the 6th IEEE International Conference on Technology for Education (T4E 2014), 2014, Amritapuri, India.
- Majumdar, R., Alse, K., Iyer, S. "Interactive Stratified Attribute Tracking Diagram for Learning Analytics." Proceedings of the 6th IEEE International Conference on Technology for Education (T4E 2014), 2014, Amritapuri, India.
- Majumdar, R., Kothiyal, A., Pande, P., Agarwal, H., Ranka, A., Murthy, S. & Chandrasekharan, S. "The enactive equation: exploring how multiple external representations are integrated, using a fully controllable interface and eye-tracking." Proceedings of the 6th IEEE International Conference on Technology for Education (T4E 2014), 2014, Amritapuri, India.
- Mallick, M., Katke, M., and Iyer, S. "CarromTutor: A cognitive apprenticeship based tutor for carrom skills and strategies." Proceedings of the 6th IEEE International Conference on Technology for Education (T4E 2014), 2014, Amritapuri, India.
- Mishra, S., Maity, M. "A Software Solution to Conduct Inquiry Based Student Directed Learning." Proceedings of the 6th IEEE International Conference on Technology for Education (T4E 2014), 2014, Amritapuri, India.
- Ramesh, R., Mishra, S., Sasikumar, M, Iyer, S., "Semi-Automatic Generation of Metadata for Items in a Question Repository." Proceedings of the 6th IEEE International Conference on Technology for Education (T4E 2014), 2014, Amritapuri, India.
- Thotha, N., Anand, A., Kothiyal, A., Diwakar, A., Kenkre, A., Deep, A., Reddy, D., Warriem, J. M., Kadam, K. Alse, K., Eranki, K., Ramesh, R., Majumdar, R., Mishra, S., Akondy, V., Pal, Y.. "Designing Engineering Curricula Based on Phenomenographic Results: Relating Theory to Practice." Proceedings of the 6th IEEE International Conference on Technology for Education (T4E 2014), 2014, Amritapuri, India.

International Conference on Computers in Education, ICCE 2014.
- Banerjee, G., Patwardhan, M. & Murthy, S. "Learning Design Framework for Constructive Strategic Alignment with Computer-based Visualizations." 22nd International Conference on Computers in Education, (ICCE 2014), 2014, Nara, Japan.
- Kenkre, A., Mavinkurve, M. & Murthy, S. "Development of Predict-Test-Revise Modeling Abilities via a self-study Learning Environment." 22nd International Conference on Computers in Education, (ICCE 2014), 2014, Nara, Japan. *Best Poster Paper Award*.
- Kothiyal, A., Majumdar, R., Pande, P., Agarwal, H., Ranka, A., & Chandrasekharan, S. (2014) How Does Representational Competence Develop? Explorations Using a Fully Controllable Interface and Eye-tracking. Workshop Proceedings of the 22nd International Conference on Computers in Education (ICCE 2014), Nara, Japan.
- Warriem, J., Murthy, S. & Iyer, S. "A2I: A Model for Teacher Training in Constructive Alignment for Use of ICT in Engineering Education." 22nd International Conference on Computers in Education, (ICCE 2014), 2014, Nara, Japan.
- Mavinkurve, M. & Murthy, S. "Self-assessment rubrics as metacognitive scaffolds to improve design thinking". Workshop on 'Technology Enhanced Learning of Thinking Skills', in the Proceedings of the 22nd International Conference on Computers in Education (ICCE 2014), 2014, Nara, Japan.

ACM SIGCSE conference on Innovation and Technology in Computer Science Education, ITiCSE 2014.
- Kothiyal, A., Murthy, S. & Iyer, S. "Think-Pair-Share in a large CS1 class: Does learning really happen?" 19th Annual ACM SIGCSE conference on Innovation and Technology in Computer Science Education (ITiCSE 2014), 2014, Uppsala, Sweden.
- Mishra, S., Balan, S., Iyer, S. & Murthy, S. "Effect of a 2-week Scratch Intervention in CS1 on learners with varying prior knowledge." 19th Annual ACM SIGCSE conference on Innovation and Technology in Computer Science Education (ITiCSE 2014), 2014, Uppsala, Sweden.

IEEE International Conference on Advanced Learning Technologies, ICALT 2014
- Banerjee, G., Kenkre, A., Mavinkurve, M. & Murthy, S. "Customized Selection and Integration of Visualization (CVIS) Tool for Instructors." 14th IEEE International Conference on Advanced Learning Technologies (ICALT 2014), July 2014, Athens, Greece.
- Kadam, K. & Iyer, S. (2014, July). "Improvement of Problem Solving Skills in Engineering Drawing Using Blender Based Mental Rotation Training." 14th IEEE International Conference on Advanced Learning Technologies (ICALT 2014), July 2014, Athens, Greece.
- Majumdar, R., Bhawar, P., Sahasrabudhe, S. & Dinesan, P. "HasTA: Hasta Training Application Learning Theory Based Design of Bharatanatyam Hand Gestures Tutor," 14th IEEE International Conference on Advanced Learning Technologies (ICALT 2014), July 2014, Athens, Greece.
- Majumdar, R. & Iyer, S. "Using Stratified Attribute Tracking (SAT) Diagrams for Learning Analytics" 14th IEEE International Conference on Advanced Learning Technologies (ICALT 2014), July 2014, Athens, Greece.
- Reddy Patil Deepti & Sasikumar M. "Student Model for an Intelligent Language Tutoring System." 14th IEEE International Conference on Advanced Learning Technologies (ICALT 2014), July 2014, Athens, Greece.

Conferences/Symposia/Workshops/Seminars (Participated/ Papers presented)

● Sahana Murthy.

Presented paper: "Self-assessment rubrics as metacognitive scaffolds to improve design thinking". Mavinkurve, M. and Murthy, S. Workshop on 'Technology-Enhanced Learning of Thinking Skills (TELoTS)' at the 22nd International Conference on Computers in Education (ICCE 2014), Nara, Japan, Nov. 30-Dec. 4, 2014.

● Sridhar Iyer.

Invited panelist in panel: "Innovative Programs and National Policy of ICT in Education in the Asia-Pacific Region: Looking Back and Moving Forward" at the 22nd International Conference on Computers in Education (ICCE 2014), Nara, Japan, Nov. 30-Dec. 4, 2014.

● Gargi Banerjee.

Presented paper: "Learning Design Framework for Constructive Strategic Alignment with Visualizations". Banerjee, G., Patwardhan M. and Murthy, S. Proceedings of the 22nd International Conference on Computers in Education (ICCE 2014), Nara, Japan, Nov. 30-Dec. 4, 2014.

● Jayakrishnan Warriem.

Presented paper: ""A2I: A Model for Teacher Training in Constructive Alignment for Use of ICT in Engineering Education," at the 22nd International Conference on Computers in Education (ICCE 2014), Nara, Japan, Nov. 30-Dec. 4, 2014.

● Shitanshu Mishra

- Presented paper: "A Software Solution to Conduct Inquiry Based Student Directed Learning". Mishra, S., Maity. M. In Sixth IEEE international conference on Technology for Education (T4E 2014), Amritapuri, India, Dec. 18-21, 2014,

- Presented paper: "Effect of a 2-week Scratch Intervention in CS1 on learners with varying prior knowledge.", Mishra, S., Balan, S., Iyer, S. & Murthy, S. In 19th Annual ACM SIGCSE conference on Innovation and Technology in Computer Science Education (ITiCSE 2014), Uppsala, Sweden, June 23-25, 2014.

- Participated: ACM India Annual Event on Special Interest Group in Computer Science Education (SIGCSE), Goa, India, Feb. 7, 2015.

● Abhinav Anand.

Presented paper: "Guided Problem Solving and Group Programming: A Technology-Enhanced Teaching-Learning Strategy for Engineering Problem Solving." In Sixth IEEE international conference on Technology for Education (T4E 2014), Amritapuri, India, Dec. 18-21, 2014.

● Anura Kenkre.

Presented paper: "A Self Study Learning Environment for Modeling Abilities: Do all learners take the same Learning Path?" Kenkre, A. & Murthy, S. Proceedings of the 6th IEEE International Conference on Technology for Education (T4E 2014), 2014, Amritapuri, India. Dec. 18-21, 2014.

● Rekha Ramesh.

Presented paper: "Semi-Automatic Generation of Metadata for Items in a Question Repository." In Sixth IEEE international conference on Technology for Education (T4E 2014), Amritapuri, India, Dec. 18-21, 2014.

● Kapil Kadam.

Presented paper: "Improvement of Problem Solving Skills in Engineering Drawing Using Blender Based Mental Rotation Training". 14th IEEE International Conference on Advanced Learning Technologies (ICALT 2014), July 7-9 2014, Athens, Greece.

Conferences and Workshops (Co-ordinated)
- Technology Integration in Education (TIE) workshop. March 22nd, 2015 at IIT Bombay. Conducted in collaboration with Research Scholars' Forum - IIT Bombay by Gargi Banerjee, Shitanshu Mishra, Aditi Kothiyal and Abhinav Anand.
- Enhancing Computer Graphics skills for MCA students using Blender 3D tool. 2-day workshop, March 2015 at Department of Computer Science & Technology, Goa University. Kapil Kadam.
- Pedagogy for effective use of educational technology in engineering education (ET4ET). 2-week equivalent workshop under Teach 10000 Teachers (T10KT) project, January 5-31, 2015. (4700 participants). Co-ordinated and co-taught by Sahana Murthy, Sridhar Iyer, Jayakrishnan, M.
- Pedagogy for effective use of educational technology in engineering education. 1-week TEQIP workshop, IIT Bombay. January 5-9, 2015. Co-ordinated and co-taught by Sahana Murthy, Sridhar Iyer, Jayakrishnan, M, Yogendra Pal.
- Technology enhanced learning of thinking skills (TELoTS). 1st Workshop at the International Conference on Computers in Education, ICCE 2014, Nara, Japan, Nov. 30- Dec. 3, 2014. Co-ordinated by Sahana Murthy, Sridhar Iyer, Mrinal Patwardhan.
- Pedagogy for effective use of educational technology in engineering education. 2-week equivalent workshop under Quality Enhancement in Engineering Education (QEEE) June-July 2014. (3400 participants). Co-ordinated and co-taught by Sahana Murthy, Sridhar Iyer, Jayakrishnan, M.
- Gesture based affordances for designing serious games. Hands on workshop at T4E 2014, Amirtapuri, December 18-21, 2014. Sameer Sahasrabudhe and Rwitajit Majumdar.
- Learning objectives and assessment, 2-day workshop at SIESGST college, Nerul, December 2014. Co-ordinated and co-taught by Rekha Ramesh and Madhuri Mavinkurve.
- From teaching to research on teaching: The process of Action Research. Workshop in e-Seminar on Steps to Research, Amal Jyothi College of Engineering. Conducted by Sahana Murthy.
- Introduction to data structures using Question Posing based active learning strategy. 3-day workshop, 4th-6th July, 2014 at IIT Bombay, conducted by Shitanshu Mishra.
- Enhancing Engineering Drawing skills for engineering students using Blender 3D tool. 4-day workshop, October 2014 at KIT's College of Engg. Kolhapur, Co-ordinated by Kapil Kadam.

Conferences chaired
- Sahana Murthy, Program Co-chair, IEEE International Conference on Technology for Education T4E 2014, Amritapuri, India, Dec. 18-21, 2014.
- Sridhar Iyer, Workshop PC chair, Technology enhanced learning of thinking skills, at ICCE 2014 conference, Nara, Japan, Nov. 30, 2014.

Invited Talks
- Sridhar Iyer. Effective Teaching-Learning in Computer Science. ACM i-SIGCSE Workshop, University of Pune, Feb. 3, 2015.
- Sahana Murthy and Sridhar Iyer. Guidelines and Templates for Planning, Conducting and Reporting Educational Technology Research. Invited talk at the IEEE International Conference on Technology for Education (T4E2014), Amritapuri, India. Dec. 21, 2014.
- Sridhar Iyer. Serious Games and Virtual Devices. Invited panelist, 6th IEEE International conference on Technology for Education, T4E 2014. December 18, 2014.
- Sahana Murthy. Peer-Instruction: An interactive learning strategy to promote student conceptual understanding. In Symposium on teaching-learning in higher-ed. IIT Madras. May 28, 2014.

Honorary Work

- Executive Committee Member, Asia Pacific Society of Computers in Education (APSCE). Sahana Murthy, Sridhar Iyer.
- Steering Committee Member International Conference on Technology for Education (T4E). Kannan Moudgalya, Sridhar Iyer, Sahana Murthy.
- Reviewer: various journals such as Educational Technology Research & Development, Educational Technology & Society, IEEE Transactions on Education etc. Various faculty members and PhD research scholars.
- Conference PC Member Various conferences such as ICALT, SIGCSE, ITiCSE, ICCE, ICSLE.

Visitors to the IDP

- Dr. Michael Hewner, Department of Computer Science & Software Engineering, Rose-Hulman Institute of Technology June-August 2014. Gave a series of 8 lectures on qualitative research in education.
- Dr. Neena Thota, Faculty of Creative Industries, University of Saint Joseph, Macau, July 2014. Gave a series of 6 lectures on research methods in educational technology.
- Dr. Ashok Basawapatna, University of Colorado, Boulder, August 2014 – February 2015. Co-instructor for course ET 807: Educational Game Design.