

Work in Progress: Creating an Internet Platform for USA and Indian Students to Share Ethical Viewpoints

Dr. Sweta Saraff, Amity University Kolkata

Sweta Saraff is an Assistant Professor in the department of Amity Institute of Psychology and Allied Sciences in Amity University Kolkata. She teaches Behavioral Sciences to University students. Her research interests are cognitive science, behavioral economics, learning pedagogies, cross-cultural communication, and text analysis.

Dr. Roman Taraban, Texas Tech University

Roman Taraban is Professor in the Department of Psychological Sciences at Texas Tech University. He received his Ph.D. in cognitive psychology from Carnegie Mellon University. His interests are in how undergraduate students learn, and especially, in critical thinking and how students draw meaningful connections in traditional college content materials.

Dr. William M. Marcy P.E., Texas Tech University

Professor and Director of the Murdough Center for Engineering Professionalism and Ethics Texas Tech University Lubbock, Texas

Dr. Ramakrishna Biswal, National Institute of Technology, Rourkela

Dr. Ramakrishna Biswal is an Assistant Professor in the Department of Humanities and Social Sciences at National Institute of Technology, Rourkela. He received his Ph.D. in Developmental Psychology from the University of Delhi. His research interests are broadly in the field of child development and disability with a specific focus on emotion processing, mental health, adolescent issues, and information processing among the students.

Work in Progress: Creating an Internet Platform for Indian and USA Students to Share Ethical Viewpoints

Abstract

Ethical engineering practice is a global issue. Future engineers must learn about ethics in classrooms and apply the knowledge and skills in workplaces that are locally relevant and globally sustainable [1]. However, cultural norms and social realities may result in differences in ethical perspectives. The ongoing collaborative project described in this paper attempts to develop the cross-cultural sensitivity of Indian and USA students through their reflections on case studies that present ethical dilemmas in real-world situations. Central questions addressed in this paper include: 1) How does a pedagogical model based on socio-cultural theory and incorporating cross-cultural activities support undergraduate engineering students in socio-cultural and ethical thinking? and 2) How do engineering students develop their professional identities through socio-cultural and ethical discourse? Based on socio-cultural learning theory, the present collaborative effort engages hundreds of students in professional ethics classrooms in India and the USA each semester through online learning. Indian and USA students are guided to a website that is open to the world and administered by the course instructors. Student participation is implemented using well-structured scaffolding within a unique forum that provides students with a context in which to express their ethical positions, with constructive feedback from peers, while maintaining social etiquettes. Drawing on the theoretical models guiding this project, we discuss how internet-based collaborative pedagogic practices can reduce the gaps in cross-cultural communications among future professionals.

Keywords: engineering ethics, socio-cultural learning, cross-cultural exchange, pedagogical practice, blended learning

Introduction

Teaching ethical practices in an engineering classroom has manifold challenges. Engineers travel to diverse locations, interact with people from different cultures, and solve critical problems for a workable solution for all stakeholders. Sensitivity to other cultures, ideas and perspectives is a facet of professional attitudes that young engineers find difficult to learn if the teaching is confined to physical classrooms. Regular interactions with global peers can make learning engaging, encourage curiosity, and break the barriers of land. Students can come to know about rich cultural heritages, social beliefs, and mature through cherishing individual differences. Engineering students need international exposure to become global problem solvers.

In this paper we describe a collaborative project whose focus is developing an interactive pedagogy for undergraduate engineering students that delivers a culturally relevant shared ethical engineering activity and uses an internet platform to widen the scope of learning at an international level. In India, the large size of classrooms restricts effective mentoring. Engaging and monitoring students in curriculum-oriented tasks is a challenge for educators in developing economies, like that of India. Hybrid teaching, which combines face-to-face instruction and online instruction, is a constructive approach to this challenge [2]. Another option is blended learning, which fuses face-to-face instruction with web-based resources and [3]. The present

project incorporates a version of blended learning.

A Platform for Collaborative Learning

The ongoing collaborative project described here is implemented through a website, the Ethical Engineer (ethicalengineer.ttu.edu), that provides an open and unique forum to interact and develop an online community for engineering students across the globe, maintains digital privacy, and has a disciplinary policy to maintain social etiquette. Instructors at Amity University Kolkata and NIT Rourkela in India, and Texas Tech University in the USA, use the online tools for ethical discourse available through the website to make their curricular agendas far-reaching and inclusive. The primary materials on the website are three case studies: “Which Is More Important – Environmental Concern or Economic Growth?” by Dr. Sudipta Majumdar (then Amity University Kolkata, India; currently, Faculty of Management Studies, ICFAI University, Jharkhand, India), “Outsourcing Manufacturing to Developing Countries” by Dr. William Marcy (Texas Tech University, USA), and “Bhopal Gas Tragedy” by Dr. Rhyddhi Chakraborty (London Churchill College, UK). These case studies encompass the contexts listed in the USA ABET Criterion 3.4 for student outcomes [4]: “an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts” (p. 4). The primary student interactions involve reading and reflecting on a case study, posting a comment to the case study on the website, and posting reactions to other students’ comments. Instructor-generated guidelines for developing comments are provided on the website to help students think critically and gain clarity on their position. Students post comments to the website on a voluntary basis.

Through this collaborative project, we explored two questions 1) How does a pedagogical model based on socio-cultural theory and incorporating cross-cultural activities support undergraduate engineering students in socio-cultural and ethical thinking, and 2) How do students develop their professional identities through socio-cultural and ethical discourse. In this paper we present data from Indian faculty and students in order to convey the development and results of this project from an Indian perspective.

Theoretical Background for the Project

Cultural-Historical Activity Theory (CHAT)

Cultural-Historical Activity Theory provided the theoretical backbone for the present collaboration. CHAT postulates a working relationship between human cognition and behaviors in terms of associated socio-cultural activities [5]. This theory traces its roots into the works of Lev Vygotsky, Aleksei N. Leontiev, and Alexander Luria [6] [7]. Vygotsky [8] postulated that society and culture mediate the experience of any activity between the self and the object. Leontiev [9] [10], in the second-generation CHAT, incorporated social rules, division of labor, tools, and social cognition as significant components of any social activity. He postulated that individuals are social players who weigh their activities as per the prevailing conditions in the social arena. Engeström [11] advanced his work on CHAT, focusing on both interdiscursivity and collaborative participation, and openness to constructive feedback to promote pluralism.

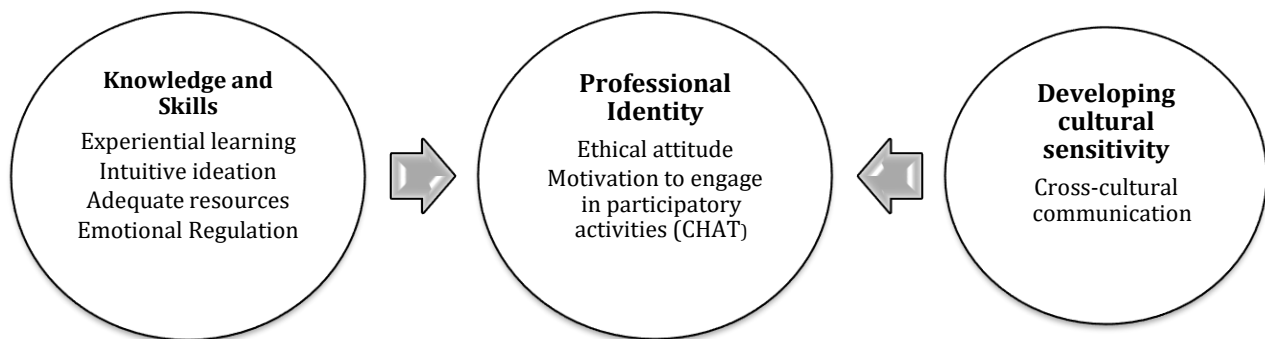
Consistent with CHAT theory, this project draws on collaborative participation across global boundaries to develop engineering students.

Development of Self-Identity

An individual develops a self-concept and forms a self-identity based on personal beliefs, attitudes, and behavior. It is a function of a person's interaction with their social and cultural ecosystem. Learning moral values is an important part of developing personal identity and a sense of purpose in life [12]. Students observe, understand, and accept moral values in this process of growth and development. They learn it from their parents, siblings, extended families, neighborhood, school peers and teachers, media, and social leaders. In current times, social media and networking are an integral part of this process. The ethical and moral values that a student learns also nurture their professional identity [13]. An awareness of the ethical conduct along with domain-specific technical knowledge are necessary to become a responsible professional.

Through ethical training, engineering students learn how the creation, implementation, and promotion of technology by engineers impact communities in multiple ways. Ethical education can increase awareness of systematic evils in social policies and planning. A deep sense of moral autonomy with a functional value system works in harmony with higher cognitive abilities to optimize use of resources and to take socially and economically relevant decisions. A student comprehends ethical decision-making by being mindful of professional identity and self-belief. The ability to take cognizance of a situation from other's perspectives, to empathize, and exercise emotional regulation are vital steps towards developing professional knowledge and skills (see Figure 1).

Figure 1. Development of Professional Identity Via Cross-Cultural Ethical Discourse



Introducing the Website to Indian Faculty

The website used in this collaboration (ethicalengineer.ttu.edu) was developed at Texas Tech University [14] in the USA and is an integral component of a sophomore-level course concerning engineering ethics. One of the Indian collaborators in this project shared the website and pedagogical concepts with five Indian professors teaching similar courses at Amity University Kolkata. The objective was to gain insights from their perspectives and to understand the nature of difficulties students might face. Table 1 lists the queries made by the Indian colleagues on the

objectives, procedures, and pitfalls associated with the shared website. The responses are those of one of the project collaborators in India.

Table 1. Queries Posed by Indian Professors on the Objectives and Process of Incorporating the Website as a Classroom Activity and a Collaborator’s Responses

Queries	Collaborator Responses
What is the key objective behind the collaborative project?	The case studies on real-life situations are an integral part of the curriculum of all the universities. Featured case studies on the website provide an opportunity for students to read and critically analyze the case studies, as well as responses of other students from their university and other universities. It helps students in appreciating cultural differences in their opinions and perspectives. The comments are also a part of ongoing research on text analysis.
How do the internet platform or using websites for individual class assignments benefit students? Do they get appropriate feedback?	In developing countries like India, a professor deals with around 250-400 students per semester. It is difficult for a professor to read each student's submission within a given time frame and provide quality, unbiased and standard feedback. The website provides automated feedback to the student instantly and allows resubmission after correction. This feedback forces students to refocus on their thinking style and make necessary changes.
What if students' responses get influenced by their peers' comments?	When information about all possible topics and events is available on the internet, it is more pertinent to ask what they learn after reading each other's opinions. Students learn to appreciate cultural differences and the analytical capabilities of other students. They develop their understanding of the topic at a global level though in a more structured format.
What is the key takeaway from this concept?	The idea of an active engagement, interaction with global peers from the university site through a regular class curriculum, is in itself unique and creative in its design. It challenges students' abilities in thinking more critically and intuitively. It is centered more on learning outcomes, field exposure, and experiential pedagogy. Ethics as a discipline influences the development of a community at social, national, and international levels.
Does the idea of joining an international platform for a basic class assignment create additional pressure or seem	The students felt quite overwhelmed with ideas of the new format. It was expected, and a structured plan was in place to reduce the anxiety and make the learners more excited and comfortable.

daunting?	
How is the website introduced to the students?	For Indian students, a PowerPoint presentation was prepared to provide them a detailed idea about the website, the purpose of including it in a course assignment, and the opportunities it will provide to them in terms of more interaction and hands-on experience. A class session of approximately fifty minutes to an hour was used for scaffolding and guiding in an organized manner. The students' queries were answered and an online tour of the website was given.
What are the potential advantages of using the website instead of Google Form submissions?	The advantage of submitting comments directly on the website, rather than Google form or submission in a Word document, was explained to the students. The class timing is limited to deal with all the queries in the class. The philosophical concepts like ethics are incremental in teaching learners 'what is the right thing to do.' It needs discussion, contemplation in an open and unbiased platform. Individuals today want to be heard, their point of view understood, they need time from their teachers to help them develop life skills. Automated instant feedback provided at the website improves critical analysis where scholars are preparing to become job-ready.
What are the limitations?	Some limitations may arise owing to the difference in the education system and curriculum design in different universities. The case studies were about certain landmark events in India. It may impact the feeling of belongingness and influence their emotions. Also, English as a second language may interfere with the comments of some Indian students. The social and political policies of each country on education are different on various grounds.

How does a pedagogical model based on socio-cultural theory and incorporating cross-cultural activities support undergraduate engineering students in socio-cultural and ethical thinking?

A pedagogical model for this project was developed using CHAT, the social-cultural activity theory based on the work of Vygotsky and colleagues, to initiate cross-cultural communication between global peers. CHAT embodies a contemporary learning theory where community learning is the core, and the active agents learn by doing, use multiple tools, resources to communicate, collaborate and thrive together. Accordingly, the Ethical Engineer website affords students opportunities to voice their opinions concerning ethical issues on an international platform. The case-study activities present an opportunity for students to engage in a meaningful dialogic process by reflecting on real-life situations, which were examples of gross ethical violations and irresponsible conduct. The three case studies on the website are eye-opener events of social greed and violation of human values and ethics by entrepreneurs, scientists, local governments, and technologists. Two case studies are from the Indian cities of Bhopal (the capital city of Madhya Pradesh) and Trombay (a suburb in Maharashtra). These case studies describe projects focused on economic benefits while ignoring safety and health regulations in

order to cut costs.

The current project affords the learning space for students to grow together in a more inclusive, competitive society. Typically, when students submit assignments to professors, there is little or no scope to learn or know about each other’s viewpoints. In the present case, students were given more time to reflect than what can be provided in a limited class time. They could read and incubate about a novel concept shared by other peers or engage in a meaningful conversation on the right things. USA students could relate and empathize with Indian peers, while they are comprehending and analyzing the case studies. The Indian students found the cross-cultural forum intuitive in concept, and some of them engaged in an open discussion with global peers from Texas and other universities. Students appreciated critical thinking from other students. They could compare and introspect their subject knowledge, skill, aptitude, and attitude towards other students (prospective engineers). The activities guided students towards experiential learning [15], cross-cultural sensitiveness, and an ethical attitude.

Consistent with learning according to socio-cultural theory, students were provided with guiding questions on the website, shown in Table 2, as a means of scaffolding their response. The pedagogical principles underpinning those questions, as well as associated cognitive processes, and examples of students’ comments from the website, are also shown in Table 2.

Table2. A Description of Pedagogical Principles Used in Conceptualizing Ethical Thinking

Pedagogical Principles Supporting Ethical Thinking	Guiding Questions on the Website	Cognitive Processes	Examples of Students’ Reflections
Experiential Learning	Who are the stakeholders and how they are impacted both positively and negatively?	Active participation and reading the case studies provide an experience of a past event and its impact on various stakeholders to the learners. Students have to rationalize how it impacted the stakeholders, both positively and negatively, in their comments.	<i>Thousands were killed, and the impact on public health continued for decades as victims developed cancer and experienced birth defects and miscarriages as a result of the contamination. Many engineers, government officials, workers, and even residents would have had their suspicions that there was something to be worried about, but at every step, problems were ignored and standards relaxed.</i>

Interdisciplinary Reflection	<p>What interdisciplinary perspectives would help identify innovative and non-obvious solutions? What knowledge and skills are needed to implement sophisticated, appropriate and workable solutions to the complex global problems facing the world today?</p>	<p>Analytical inquiry into interdisciplinary perspectives, field knowledge, and skills aim to allow students to think independently in a difficult and challenging situation. Students are encouraged to use insightful thinking, organize information, reason (both inductive and deductive) to explore various possibilities, solve problems on ethical dilemmas, and make confident decisions.</p>	<p><i>A skill that is often taken for granted is trust in one's instincts and acting on them. Experienced chemical engineers should have been used rather than the two mechanical engineers that the Bhopal office of the department of labor had. Industries must use standards that have been tested through trial and error and should be studied to find the best way to handle a crisis or to prevent one. Union Carbide had limited communications to its Bhopal plant, and as a result, was only able to release a formal public statement one whole week after the accident. Local regulatory agencies were not sufficient in assessing the true condition of the plant.</i></p>
Cross-Cultural Sensitiveness	<p>What insights can you articulate, based on your culture and other cultures with which you are familiar, to help understand your worldview and enable greater civic engagement?</p>	<p>An inquiry into beliefs and knowledge of intercultural similarities and differences requires knowledge, awareness, and acceptance of others' cultures. Students establish their position in a social, cultural, and economic context on the right thing to do in an ethically demanding situation.</p>	<p><i>The factory in Bhopal should also have referenced the practices used in the plant in Virginia. The United States is often responsible for creating the standards and codes that the entire world references and adapts. This is because the United States has been industrialized for a long time, and has been able to go through the process of industrialization slower than what third world countries are currently experiencing.</i></p>
Ethical Attitude	<p>What is your position on the right thing(s) to do?</p>	<p>Students engage ethical reasoning and a sense of personal responsibility. They consider the possibilities of ethical conduct and guidelines on ethical practices.</p>	<p><i>Understanding the role, one takes in difficult events and maintaining responsibility and clear response is imperative and expected today. To find solutions, there must be individuals who can trust themselves, and work ethically in the face of complacency and ineptitude.</i></p>

Submission of comments on the website was voluntary. After completion of a website submission, the Indian students were asked to share their reasons behind opting for the internet platform to submit their case-study comments. Examples of comments, and pedagogical themes related to those comments, are presented in Table 3.

Table 3. Feedback of Indian Students on Interaction with the Website

Student Comments	Theme in Feedback
<i>I had selected the website to comment on all three case studies because it was completely a new and innovative platform where we could share and express our opinion in front of everyone, where we can interact with each other through those comments. So, it was all in all a great and new experience and it was really helpful.</i>	Cross-cultural communication
<i>The website allowed me to experiment with a new method of learning. It is an international platform and hence the website opens scope to interact with people outside my known domain and thereby it helps in gaining knowledge. Overall, it is a new experience.</i>	An international platform and cross-cultural communication
<i>Because the website was interactive and easy to use.</i>	Interactive learning
<i>I selected the “The Ethical Engineer Website” to express my views and opinions through an open-ended platform and I would also come across other comments which would also enlighten me.</i>	Cross-cultural communication
<i>Because I can read other's opinions on-site, it may help me understand things better and I can have a wide perspective.</i>	Peer-to-peer learning
<i>It would help to connect with different people around the globe who may or may not have a similar opinion on any given topic</i>	Cross-cultural communication
<i>I have selected the website as it provides a detailed overview of the case studies and is related to real-life problems.</i>	Experiential learning

How do engineering students develop their professional identities through socio-cultural and ethical discourse?

The open internet platform used in this project allows students to post their arguments and share their opinions with their peers. Cultural sensitiveness is reflected through students’ responses to their peers’ comments on the website. These comments serve as a reiteration that the participating students belong to the engineering community that provides its members with a professional identity. Some examples of students’ comments and comments-to-comments are as follows:

- Student A (comment): “The stakeholders of the incident are the UCIL and the suppliers of this incident the UCC. Leading to this incident that caused the loss of life and

disrupted hundreds of thousands.”

- Student B (comment): “In the case of MIC, it was a catastrophic failure which caused many deaths and injuries due to lack of care for their workers and the working environment, but also the negligence of worker safety and machines.The absolute disregard for human life with the ill-maintained plant was nothing short of murder committed by those who ran it, and by being so complacent with how they were running the place they ended up killing thousands of people due to something that could have been fixed with proper inspection and management.”
- Student A to B (comment on the comment): “Good comment, I would like to add on to the comment about the lack of warning to the town involving the incident by saying that they also decided to shut down the public warning speakers because they were informed to not warn the public about small leaks in the plant. This in turn caused thousands more to be affected by the gas outbreak.

The critical appreciation of others’ viewpoints and intercultural differences motivates students to engage in participatory activities to further their knowledge. Some of the appreciative comments are as follows:

- “I feel similarly about some of the points you made about the case study. I feel that a lack of safety precautions and negligence was the main issue to what caused the disaster. I agree that we should consider lives that are affected by such a disaster; this contributes not just to ourselves but the people who live in and around the areas as well.”
- “I agree with your view on this tragedy. Your last sentence perfectly describes ethical engineering.”
- “I agree very much with your comment. I think you focused on the most important things that caused the main problem.”
- “I agree with your statement about money being power in developing nations because I am originally from one too.”

Applications and Scope of Shared Digital Platforms

The 2020-21 coronavirus pandemic has transformed education at all levels. The globalization of sophisticated technologies seems to pervade lives and livelihoods in an era of global and local partnerships. Educational institutions are infusing both human capital and funds to harness current opportunities in redesigning the curriculum. They are sharing teaching materials created by experts via accessible and eco-friendly mediums. Thus, they facilitate the exchange of study material, classroom and homework assignments, and activities, using internet platforms,. A real-time virtual infrastructure is available for collaborative work, critical thinking, exchange of ideas through brainstorming, interdisciplinary knowledge construction, and vibrant intercultural discourse. Web 3.0 also employs tools for e-learning in a ubiquitous digital environment, widening the scope for social learning, that is, culturally rich, and encourages global communities to participate in collaborative innovation. Interdisciplinary research and collaboration, short and long-term activities through cross-disciplinary virtual teams have made quality learning more accessible and paved the path for equitable resource allocation. It also has long term implications for framing policies with respect to providing quality education for all [1] through an inclusive approach.

In a globalized world, it is necessary for the future engineers to think globally, act locally and deliver sustainably. Uncertainty of the present era is one of the key challenges to sustainable higher education including engineering education. Our current initiative using a shared digital platform helps reduce the gaps in understanding others' perspectives, which is absent in a traditional mode of classroom teaching owing to limited or no cross-national participation. Initiatives like this would develop cross-cultural sensitivity among future engineers across the globe for more pragmatic solutions to numerous problems that each nation is facing today. The engineers and the teachers are called the nation builders: one deals with the hardware while the other one deals with the software. Shared digital platforms are the mediums for the integration of the hardware and the softwares of the future world. The scope of internet-based collaborative pedagogic practices in higher and technical education thus, has limitless possibilities.

Future work

This is an ongoing research collaboration. Students' comments on the case studies and comments on peer submissions are being analyzed using human and machine methods of text analysis in order to learn more about cultural differences in students' reasoning about ethical issues. The present work is the conceptual idea behind the project.

Conclusions

The social infrastructure of various nations and value systems they endorse has become self-centered today. The long-lasting impact of students' early learning on their behavior resonates in society. It is imperative to encourage interaction among global scholars to deliver core values and ethics. Universities and colleges must channel the digital mediums to engage students in a more effective way to learn, discuss, and reflect on the ubiquitous contents to re-ignite curiosity. They may use internet platforms to develop an outlook and understanding of other cultures through this process. It is important to acknowledge the need for a paradigm shift while designing a progressive curriculum. The Ethical Engineer website provides an opportunity for undergraduate engineering students to develop socio-cultural and ethical reasoning skills through reflective deliberations in a global consortium. Knowledge sharing and active participation in resolving ethical dilemmas in a social setting, using an online university platform, are fostered in the engineering ethics classroom through the ongoing collaborative project. The idea behind the collaboration is to offer a constructive way to deliver experiential learning.

Acknowledgement

This material is based on work partially supported by a grant from the Center for Global Communication at Texas Tech University.

References

- [1] J. van den Hoven, "Ethics and the UN Sustainable Development Goals: The Case for Comprehensive Engineering," *Science and engineering ethics*, vol. 25, no. 6, pp. 1789-1797, 2019.
- [2] C. R. Graham, W. Woodfield, and J. Buckley Harrison, "A framework for institutional

- adoption and implementation of blended learning in higher education," *The internet and higher education*, vol. 18, pp. 4-14, 2013.
- [3] B. Means, Y. Toyama, R. Murphy, and M. Baki, "The effectiveness of online and blended learning: A meta-analysis of the empirical literature," *Teachers College Record*, vol. 115, no. 3, pp. 1-47, 2013.
- [4] R. Bachnak, Rafic, S. S. Marikunte, and A. B. Shafaye, "Fundamentals of ABET accreditation with the newly approved changes." In *Proceedings of the ASEE Annual Conference and Exposition, Tampa, FL, USA*, pp. 16-19. 2019.
- [5] V. Kaptelinin and B. A. Nardi, *Acting with technology: Activity theory and interaction design*. MIT press, 2006.
- [6] A. Blunden, "An interdisciplinary concept of activity," *Outlines. Critical Practice Studies*, vol. 11, no. 1, pp. 1-26, 2009.
- [7] B. Bligh and M. Flood, "Activity theory in empirical higher education research: choices, uses and values," *Tertiary Education and Management*, vol. 23, no. 2, pp. 125-152, 2017.
- [8] L. S. Vygotsky, "Socio-cultural theory," *Mind in society*, vol. 6, pp. 52-58, 1978.
- [9] A. N. Leont'ev, "Activity, consciousness, and personality, 1978.
- [10] A. N. Leont'ev, *Problems of the development of the mind*, Progress, 1981.
- [11] Y. Engeström, "Expansive learning at work: Toward an activity theoretical reconceptualization," *Journal of education and work*, vol. 14, no. 1, 133-156, 2001.
- [12] L. Kohlberg, "Moral stages and moralization," *Moral development and behavior*, pp. 31-53, 1976.
- [13] M. J. Mayhew, T. A. Seifert, E. T. Pascarella, T. F. Nelson Laird, and C. F. Blaich, "Going deep into mechanisms for moral reasoning growth: How deep learning approaches affect moral reasoning development for first-year students," *Research in Higher Education*, vol. 53, no. 1, pp. 26-46, 2012.
- [14] R. Taraban, W. Marcy, M. LaCour, L. Koduru, S. Prasad, and S. Zasiakin, "Using the web to develop global ethical engineering students," *Advances in Engineering Education*, vol. 8, no. 3, 2020.
- [15] A. C. Baker, P. J. Jensen, and D. A. Kolb, *Conversational learning: An experiential approach to knowledge creation*. Greenwood Publishing Group, 2002.