Journal of Engineering Education Transformations,
Volume No 35, January 2023, Special issue, eISSN 2394-1707

10.16920/jeet/2023/v36is2/23092

Development of Survey Instrument to Evaluate Freshmen Protégé Understandingon Mentoring in Engineering Education

[1] Shradha Binani, [2] Shaik Shoeb, [3] Thakur Aryan Singh
[1 2 3] Hyderabad Institute of technology and Management, Hyderabad.
[1] shradha.sh@hitam.org

***Abstract*— Mentoring has a good impact and influence in undergraduate STEM students' perseverance. It is crucial in any profession and engineering is no exception. By supporting them in directing their efforts and by helping them create objectives and receive feedback, mentors may encourage and facilitate both professional and personal growth. In order for a mentee to maximize their potential, develop their skills, and transform into the person they want to be, mentoring involves guidance and support in the way they manage their learning. With this as the driving force, an effort is made in this study to develop a survey instrument to capture the understanding of the first-year engineering students in relation to the roles and responsibilities of mentors in engineering course, mentors' attention to the physical and mental health of students, goal-setting, mentees' skill development and maintaining trust and confidentiality. In fall 2022, a survey instrument was developed for quantitative analysis and administered to first-year engineering students at an autonomous college HITAM in South of India, 263 participants responded. The survey instrument's factor structure was determined using exploratory factor analysis (EFA), which yielded four factors. The Cronbach's α ranged from 0.67 and 0.92 and for factors' minimum and highest loading were 0.43 and 0.92. This survey instrument could be utilized by a varied institution in order to evaluate students' present levels of understanding for accountabilities and duties of mentors, to assist and encourage mentees learning so that they can reach their full potential and enhance their abilities.**

***Keywords*— Mentoring, Mentee, Physical and Mental health, Roles of mentoring, Skill development, Trust and confidentiality**

***JEET Category*— Research**

I. INTRODUCTION

Mentoring is a multifaceted perception that lacks a common explanation, and its execution is governed by the organizational context, aspirations and contributors. Through internalisation and socialisation, mentoring is an informal process of knowledge transmission inside an organisation. One of the earliest methods of learning through experience is mentoring, which has a long history. However, in recent years, there have been a lot of articles on novel forms of mentoring under various names, such as tutoring, coaching, facilitation, shadowing, etc. coaching, facilitating, and shadowing (Jenkins, S. 2013).

Mentoring programmes became a part of employment and human resource growth in corporate, industry, and governmental organisations with the framework of the mentoring program that started in the 1970s. Generally speaking, their objective was "to make certain that potentially higher-ranking people always had a key figure to advise them executive positions, mentoring was expanded to help women and underrepresented groups overcome the infamous "glass ceiling" and advance into positions of leadership (Mueller, S. 2004, Clutterbuck, D., & Ragins, B. R. 2002).

A career advancement mentoring strategy places an emphasis on the mentor's function as a counsellor who is sympathetic to the needs of the mentee personally (Israel, M et.al 2014), helping them to resolve personal issues and feel at ease with academics (Ganser, T. 1998,). Even the mentor's emotional support is crucial in aiding the mentee in reducing stress and resolving internal conflicts related to transitioning to the work (Hastings, L. J et.al 2020, Orland-Barak, L et.al 2021). Mentor instructions could help engaging mentees in assessing fundamental teaching methods by receiving adequate and targeted training (Hennissen, P et.al 2008) and in supporting mentees to reach their goals. This learning takes into account of becoming aware of one's strengths and limitations to the extent that a mentor is able to suggest and assist the mentee along a course of action that interacts and capitalises on the protégé's strengths, while offering opportunities to develop their recognised weaknesses for personal growth and the successful accomplishment of academic and/or career aspirations.

Earlier research has generally focused on the evaluation of group mentorship programmes, attempting to identify programming faults rather than identifying what students want (Crisp, G.et.al 2009). These practices need assessments in the form of systematic reviews that examine needs before making essential decisions regarding mentoring practices (Gibson, M. A. et.al 2009)

This helps in reaching agreement and meeting students' requirements. The lack of a needs assessment prior to designing mentoring practices is concerning because institutions are making investments to groom and train their students while not having adequate evidence to back up the need, usefulness, and efficacy of those programmes. Furthermore, without an awareness of student opinions on peer mentoring programmes, institutions risk obliging to certain demographics while excluding others, as participant views can be critical in effective development and implementation of mentoring practices.

Shradha Binani,
Department of Chemistry, Hyderabad Institute of Technology and Management, Telangana, India.
shradhabinani88@gmail.com

Successful mentoring may and should, involve the mentee's and mentor's personal values (Santucci, J. 2004). Values-based mentoring, for example, offers the chance for individualised mentoring with the aim of promoting better outcomes for specific mentees, but it also acknowledges the fact that different values can lead to a conflict or differences in preconceptions that can obstruct or disrupt mentoring exchanges. Since one identifies and considers the full person, effective mentoring places a strong emphasis on personal growth. It also aims to encourage aperson's values-based personal success in a certain field. Numerous studies have demonstrated the benefits of mentoring in all its forms, including improvements in productivity, professional and academic persistence, identity development, job placement, self-assurance, and other results (Campbell, T. A., et.al 2007, Crisp, G. 2009, Pfund, C. et.al 2016).

Some academic institutions have formed numerous mentoring programmes for freshman students in order to increase freshman retention rates, a frequent issue faced by engineering programmes. The common objective of these programs is to assist students in dealing with the challenges of switching from high school to university environments, as well as the pressures involved with pursuing the strenuous engineering courses (Sash, R. et.al 2006, Bachkirova, T et.al 2021).

The significance of mentoring in education resides in the fact that a mentor may impart information about his or her career path as well as serve as a source of guidance, inspiration, emotional support, and role modelling to a mentee (Gershenfeld, S. 2014). The goal of the current study is to design and construct a survey instrument to assess first year students' perception on roles and duties of mentors, emotional support, skill development of mentee, goal-setting at the level of freshmen protege.

II. LITERATURE

The study's supporting literature covers a mentor's responsibilities to a mentee in a variety of contexts. The goal of mentoring is to help the protégé advance in their professional, personal, and intellectual lives. As a result, the nature of the connection between mentor and protégé changes based on both their respective abilities and moral character. The majority of mentor-mentee relationships go through at least three phases: getting to know each other, action plan for achieving goals and closure. Mentorship is about building a relationship who's been in your shoes, and it takes time to get better. The foundation of mentoring is also mutual respect and trust between the mentor and the mentee, which enables open and honest discussion about topics like how to learn from failures and chances for improvement. The relationship is built on confidentiality, which provides the mentor and protégé peace of mind that what they discuss will remain private. Some mentoring programmes require participants to sign non-disclosure agreements in order to maintain confidentiality. Since the mentor is not in a position to fully evaluate the protégé, many mentoring programmes advise that mentoring should take place "offline" instead, such as with an immediate supervisor, professor, manager or academic advisor (Jacobi, M 1991)

In a mentor and mentee relationship, a mentor typically assumes a variety of responsibilities based on the specific needs of the protege. A mentor in general performs each of the following three major roles: teaching, providing psychosocial support, and serving as an example, per research . A mentor ought to have sufficient technical knowledge and professional experience to be capable of providing in-depth responses on performance-related issues (such as successful project briefings and resumés for internships). Mentors should have good listening skills because they also provide ongoing moral and emotional support (Gershenfeld, S 2014).

The University of Arkansas mentions the factors credited for the success of their mentoring programmes. The factors mentioned are: choice of mentors on the basic need of protégés (seniors & juniors), training mentors, provision of training to freshman protégés, matching mentors and mentees properly, setting up targeted one-on-one meetings between mentor and protégé, timed information and support provided to the mentee, social activities, and mandatory development of mentor handbook.(Gershenfeld, S. 2014)

E-mentoring is another type of mentorship, which enables mentors to respond to mentee e-mails at their comfort and with the least amount of interruption to their daily regimen. Due to Face to face mentoring occurring at set times; this allows mentors a great deal of adaptability that is not feasible. The lack of non-verbal cues during online communications is closely linked to the concept of text-based conversation.

Many people in academia mistakenly believe that a person's faculty advisor is a mentor, but this is not always the case. Students may struggle to establish a friendly association with faculty advisors, particularly when working in settings like big enterprises and laboratories (Olson, G. A., et.al 1992, FISH, C. 1993). They might search elsewhere for a mentor, a classmate, another professor, a friend, or a professional from the industry who can offer on- going advice and support. Mentors from business and government organisations can raise students' knowledge and understanding of postgraduate potentials by sharing their own career advancement with the protégé and by giving them useful insight on how coursework can be applied in the workplace. By establishing goals and acting as seasoned professionals who give newcomers specific guidelines and framework that aids in the analysis and understanding of their career aspirations, career mentoring promotes protégé advancement within a corporation or in their career (Greco, L. M., & Kraimer, M. L. 2020).

Few studies reported an ethical dilemma in freshman engineering students for taking decisions in achieving their proximal and distal future goals with required skill set which indirectly depends on relationship they share and maintain trust and confidentiality with their mentor. Mentees self- efficacy, preparedness and challenges in ethics will also help mentor in understanding how confident they are to respond to ethical dilemmas in their four years of engineering. Improper mentoring can lead to unethical decisions which will directly

affect their future prospects. Therefore, it is crucial for mentors to make their protégés ethically rooted in their profession. (Binani, S. 2022, Kraiger, K., et.al 2022).

Mentoring goals establish criteria for task completion and act as a guide for other processes supporting self-regulation, such as making plans, strategy development, supervising, and evaluation (Margaryan, A.,et.al 2022). There isn't much research on career aspirations, despite the fact that many authors who write about career management emphasise the benefits of goal setting (Eby, L. T. 2007). Proximal tasks and people's longer-term development need to be driven by educational objectives. When establishing and achieving their learning objectives, professionals heavily rely on their mentors, colleagues, and supervisors (Bozionelos, N. 2004).

The importance of considering mentoring as a mutualistic developmental relationship that fosters learning, development, and progress for both mentors and protégés is highlighted by recent theoretical approaches on mentoring. This hypothesis is supported by existing research, which demonstrates that mentors can gain from mentoring relationships in terms of both proximal advantages (i.e., benefits directly attributed to the relationship) and distal results (i.e., more peripheral career outcomes and work attitudes) There exists a lack of research that looks at the connections between mentors' reports of the direct benefits of their mentorship programs and more long-term results related to career achievement and positive job involvement. Existing studies offer important information on the types of short-term gains and long-term results that may contribute from mentoring. In fact, few studies have examined the factors that influence the benefits of mentoring for mentors. (Ragins, B. R., & Kram, K. E. 2007) revealed that, after adjusting for a number of relationship characteristics (e.g., relationship duration) and mentor variables (e.g., gender), perceived similarity among mentor and protégé was associated with mentors' assessments of their training and relationship quality.

Since serving as a mentor sharpens one's skill set and raises one's visibility in the organisation, several authors who centred on more long-term mentor advantages discovered a significant correlation between mentors' opinions of their professional success and both the mentoring they offered to their protégés in addition to the mentoring they gained can result in objective professional success for the mentor (Mullen, C. A (2012). Even mentoring can help people develop the interpersonal skills and abilities that improve career outcomes like advancement, satisfaction, and career effectiveness both for mentors and protégés.

Despite the advancements of mentoring in varied areas, the study attempts to examine the views of first year engineering students' perceptions on roles of mentoring in engineering, in terms of physical and mental support, goal settings, skill development, trust and confidentiality mentor provides in his/her career path.

III. METHODS

The survey instrument was created with the role and responsibilities of mentors in engineering education in mind, drawing on the literature review. The information was gathered in the fall 2022. The five factors or constructs of the instrument are intended to capture the role of the mentor in engineering education, their attention to the physical and mental health of students, goal-setting and mentee skill development, trust and confidentiality related to mentoring students in the engineering field. Separate demographic questions regarding students' backgrounds, including gender identity, engineering discipline, and board of education, are also included in the instrument. The author created 25 interconnected items to assess freshmen students' understanding of the roles and responsibilities between mentor and mentee. The questions asked about the students' perceptions of the role of mentor in engineering education, the focus of the mentor on the students' physical and mental health, and assistance in achieving future goals with the necessary skill set while maintaining trust and confidentiality.

Table I provides details regarding each scale's item development, including the factor's intended meaning and sample items. All of the variables for which students were asked to respond had response options that ranged from 5 (strongly agree) to 1 on a Likert scale (strongly disagree). The mentoring roles and responsibilities assessment allowed the authors to evaluate the substantial influence of a mentor on their mentee.

TABLE I.
OVERVIEW OF CONSTRUCTS WITHIN THE SURVEY INSTRUMENT

#	Construct	Definition of Construct	Example Items
1	Role of mentoring in engineering education	Students' perception on the abilities and prerequisites a mentor should possess.	-Mentoring is mandatory for academic institutions. -I make better decisions with suggestions made by my mentor.
2	Mentor focus towards physical and mental health of students	Student views on whether or not the mentor is considerate for the students' physical health and psychological well-being.	-My mentor encourages me to participate in extracurricular activities. -My mentor speaks about mental health.
3	Short term and Long-term Goal setting	Students' opinion on the mentor's focus towards the pursuit of their short term and long-term goals.	-My mentor focuses on achieving my short-term goals. -My mentor guides me in accomplishing my long-term goals.
4	Skill Development	Students' opinion on how a mentor supports in developing their skills in order to achieve their aspirations.	-I learned a new skill because of my mentor. -My mentor plans a strategy for me based on my skillset.
5	Trust and	Students' view on the	-I speak to my

Confidentiality	ability of mentor to maintain confidentiality and trust in their success and struggles.	mentor about my success and struggles. -My mentor gives me his/her full attention when required.

CONSTRUCT 1: ROLE OF MENTORING IN ENGINEERING EDUCATION

It includes five items; each item intends to assess the students' perception about the mentorship mandate in the field of engineering education. The construct refers to the impact of mentoring practices from the perspective of a mentee while relating to the broader context of engineering education.

CONSTRUCT 2: MENTOR FOCUS TOWARDS PHYSICAL AND MENTAL HEALTH OF STUDENTS

It includes five items; each of the items is meant to obtain the students' experiences regarding their mentor's focus towards their physical, emotional, mental health and dealing with anxiety issues. The items are meant to collect student opinions on whether their mentors consider physical and mental issues as important as academics.

CONSTRUCT 3: SHORT-TERM AND LONG-TERM GOAL SETTING

This construct consists of five items; each item focuses on assessment of protégé opinions on what guidance their mentor has provided them in order to achieve their short term and long-term aspirations.

CONSTRUCT 4: SKILL DEVELOPMENT

It comprises 5 items; these items are meant to assess the protégés' experiences with their mentor in improving their skills required for the professional development and to know are mentors being concerned about skill sets as equally as scores of academics.

CONSTRUCT 5: TRUST AND CONFIDENTIALITY

It includes five items; each item is intended to assess the students' trust towards their mentors based on their experiences. It evaluates the students' experience with confidentiality maintained by their respective mentors and the mentor-mentee relationship they share due to these experiences.

IV. DATA ANALYSIS AND RESEARCH FINDINGS

Following the distribution of the survey questionnaire, responses were gathered, categorized, and reviewed before the appropriate descriptive statistics were performed using the SPSS software. Face validity was conducted by recruiting three volunteers to review the questionnaire and provide feedback on the wording and terminology. The volunteers reported that the phrasing and choice of words in the survey instrument needed no changes. 263 people in total responded to the survey, and 245 of them were included in the testing dataset after cleaning the data. Data points of the respondents who did not complete more than 50% of the survey were excluded from the study. Additionally, respondents who answered "yes" to every question had their responses excluded from the analysis. Utilizing the group mean substitution approach, the missing data was filled. The survey takes about
7 minutes to complete. The survey employed a five-point Likert style scale with the following options: strongly disagree, disagree, disagree but not necessarily disagree, agree, and strongly agree. After three days, a reminder was given to the students to complete the survey, if they hadn't previously.

The participants' demographic data, including gender identity, engineering discipline, and board of education, is shown in Table II. 263 students responded to the survey, with 63.9% men and 36.1% women. The course disciplines of the participants were evenly spread throughout many college courses. (31.2% - CSE, 18.3% - ECE, 13.3% - AI & ML, 14.8% DS, 8.7% - IOT, 4.9% - MECH, 4.6% - EEE, 4.2% -
CS). The secondary education board of study with the highest percentage of students from SSC (82.9%) among the respondents is classified by demographic variance.

TABLE II.
STATISTICS ON PARTICIPANTS' DEMOGRAPHICS

#	**Category**	**N**	**%**
1	Total	263	100
2	*Gender*		
	Male	168	63.9
	Female	95	36.1
3	*Engineering Course*		
	Computer Science Engineering (CSE)	82	31.2
	Electronics and Communication Engineering (ECE)	48	18.3
	Mechanical Engineering (MECH)	13	4.9
	Electrical and Electronics Engineering (EEE)	12	4.6
	Artificial Intelligence and Machine Learning (AI&ML)	35	13.3
	Internet of Things (IOT)	23	8.7
	Data Science (DS)	39	14.8
	Cyber Security (CS)	11	4.2
4	*Board of Study*		
	SSC (Secondary School of Education)	218	82.9
	CBSE(Central Board of Secondary Education)	45	17.1

Table III provides the survey of all items by descriptive statistics. This study is based on exploratory factor analysis, extraction method used is Principal Axis factoring and rotation method is promax with Kaiser normalization. Bartlett's test for sphericity was used to test the suitability of items for factor analysis ($p<0.00$) and Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was used ($KMO > 0.9$) to check the variance of the extracted factors [33]. The recommendations for factor analysis were considered through Kaiser's criterion, parallel analysis and scree plot. The parallel analysis and scree plot advocated five factors and Kaiser's criterion advocated 4 factors. Five factors were considered as it matched the hypothesized quantity of factors. Since the correlation of the

factors was greater than 0.33, Promax rotation was used. Deleting the factor for construct 3 as it does not comprise of more than two items as per the EFA. The final factor loadings for all the factors are shown in Table IV. Referring to Table III, three factors (items 6,7,12,13,15) had factor loading of less than 0.4 on at least five items and four factors (items 5,11,14,23 and 25) cross-loaded on more than one factor. These five items were removed from the analysis resulting in a total of four factors with rotation converging in 15 iterations. The factor loadings for factor 1 ranged from 0.52 to 0.77(4 items), 0.50 to 0.92 for factor 2(3 items), 0.67 to 0.90 for factor 4(5 items), and 0.49 to 0.806 for factor 5(3 items). The reliability coefficient for internal consistency (Cronbach's α) ranged from 0.67 to 0.92 showing a strong reliability of thefactors (Kittur, J., Brunhaver et.al 2021).

TABLE III.
DESCRIPTIVE STATISTICS OF THE CONSTRUCTS

#	Measure	Mean	SD
	Role of Mentoring in Engineering Education		
1	Mentoring is mandatory for academic institutions.	4.21	0.76
2	I make better decisions with suggestions given by my mentor.	3.85	0.72
3	I want to mentor my juniors in future.	3.77	0.97
4	My mentor is more focused on my academics.	3.81	0.82
5	I will be a successful engineer because of my mentor.	3.58	0.87
	Mentor focus towards physical and mental health of students		
6	My mentor encourages me to participate in extracurricular activities.	3.73	0.89
7	My mentor always motivates me.	3.81	0.85
8	My mentor speaks about mental health.	3.51	0.95
9	My mentor focuses on my anxiety issues.	3.29	0.97
10	My mentor has helped me to overcome depression.	3.12	1.05
	Skill development		
11	My mentor helps me in leveraging my strengths.	3.49	0.97
12	I learned a new skill because of my mentor.	3.46	0.99
13	My mentor helped me to identify my skills.	3.48	0.95
14	While learning a skill, my mentor keeps a track of my feedback.	3.47	0.94
15	My mentor plans a strategy for me based on my skills.	3.38	1.01
	Short term and Long-term Goal setting		
16	My mentor supports me in overcoming my challenges	3.49	0.97
17	My mentor always examines SWOT analysis.	3.51	0.92
18	My mentor focuses on achieving my short-term	3.61	0.90
19	My mentor guides me in accomplishing my long-term goals.	3.58	0.89
20	My mentor inspired me to follow my dream.	3.55	0.98
	Trust and Confidentiality		
21	I always follow my mentor's advice.	3.68	0.78
22	I speak to my mentor about my successes and struggles.	3.39	0.93
23	My mentor always helps me in resolving issues and keeps it confident.	3.53	0.87
24	I share good relations with my mentor.	3.67	0.89
25	My mentor gives me his/her full attention.	3.71	0.93

TABLE IV.
FINAL FACTOR LOADING OF QUESTIONNAIRE SURVEY

#	Measure	F1	F2	F3	F4	F5
	Role of Mentoring in Engineering Education (α=0.671)					
1	Mentoring is mandatory for academic institutions.	.774				
2	I make better decisions with suggestion given by my mentor	.600				
3	I want to mentor my juniors in future.	.552				
4	My mentor is more focused on my academics.	.527				
	Mentor focus towards physical and mental health of students (α=0.855)					
5	My mentor speaks about mental health.		.509			
6	My mentor focuses on my anxiety issues		.927			
7	My mentor has helped me to overcome depression.		.833			
	Short term and Long-term Goal setting (α=0.923)					
8	My mentor supports me in overcoming my challenges.			.817		
9	My mentor always examines SWOT analysis			.695		
10	My mentor focuses on achieving my short-term goals.			.678		
11	My mentor guides me in accomplishing my long-term goals.			.904		
12	My mentor inspired me to follow my dream.			.698		
	Trust and Confidentiality(α=0.783)					
13	I always follow my mentor's advice.					.499
14	I speak to my mentor about					.542
15	I share good relations with my mentor.					.806

V. CONSLUSION

The design and creation of a survey instrument to record the perceptions of the first-year engineering protégés regarding various aspects of mentoring was presented. A total of five factors emerged from the exploratory factor analysis including role of mentor in engineering education, physical and mental health, long term and short-term goals, skill development and trust and confidentiality. The supporting data for face validity was gathered from three potential participants. The factor's

minimum and highest loading values were 0.43 and 0.92, while the range of Cronbach's alpha was 0.67 to 0.92. This survey instrument might be utilized by any educational environment to examine mentees' comprehension and knowledge levels linked to mentoring of freshmen students in relation to the mentoring system. The results of the survey will determine the type of mentoring system interventions that need to be made.

VI. FUTURE WORK

In the future, the researcher intends to gather proof for the survey instrument's content validation. Future research may look at the effects of other demographic parameters (gender identity, engineering discipline, board of studies) on each of the five criteria. The survey instrument might possibly be further validated in the future by gathering additional data and doing a confirmatory factors analysis or a longitudinal study (Cellini, M. M. et.al 2017, Kittur, J. 2020, Binani, S. 2022). To further understand how mentoring will play a significant role in helping students achieve their academic goals, future study may potentially use quantitative surveys of engineering students to gather information from those enrolled in all four engineering years (Binani, S. 2022). In-depth understandings, perspectives, and requirements of mentees for mentoring in engineering will be investigated in further study through the use of qualitative interviews (Kittur, J., Coley.et.al 2020). The viewpoints and opinions of the engineering college mentors on mentoring may also be investigated through qualitative research investigations. To evaluate mentors' comprehension and expertise in applying their insights connected to attaining mentees' long- and short-term goals with abilities necessary in the practice of engineering under varying circumstances, concept assessment tools may also be developed and employed .

VII. REFERENCES

Jenkins, S. (2013). David Clutterbuck, mentoring andcoaching. *International Journal of Sports Science & Coaching*, *8*(1), 139-254.

Mueller, S. (2004). Electronic mentoring as an example for the use of information andcommunications technology in engineering education. *European journal of engineeringeducation*, *29*(1), 53-63.

Clutterbuck, D., & Ragins, B. R. (2002). *Mentoring and diversity: An international perspective.*Routledge.

Israel, M., Kamman, M. L., McCray, E. D., & Sindelar, P. T. (2014). Mentoring in action: The interplay among professional assistance, emotionalsupport, and evaluation. *Exceptional Children*, *81*(1), 45-63.

Ganser, T. (1998, June). Metaphors for mentoring. In *The Educational Forum* (Vol. 62, No. 2, pp. 113- 119). Taylor & Francis Group.

Hastings, L. J., & Sunderman, H. M. (2020). Evidence-Based Practices in Mentoring for Leadership Development. *New Directions for StudentLeadership*, *2020*(168), 75-84.

Orland-Barak, L., & Wang, J. (2021). Teachermentoring in service of preservice teachers' learning to teach: Conceptual bases, characteristics, and challenges for teacher education reform. *Journal of Teacher Education*, *72*(1), 86-99.

Hennissen, P., Crasborn, F., Brouwer, N., Korthagen,F., & Bergen, T. (2008). Mapping mentor teachers' roles in mentoring dialogues. *Educational research review*, *3*(2), 168-186.

Hennissen, P., Crasborn, F., Brouwer, N., Korthagen,F., & Bergen, T. (2010). Uncovering contents of mentor teachers' interactive cognitions during mentoring dialogues. *Teaching and teachereducation*, *26*(2), 207-214.

Crisp, G., & Cruz, I. (2009). Mentoring college students: A critical review of the literature between 1990 and 2007. *Research in higher education*, *50*(6), 525-545.

Gibson, M. A., & Hidalgo, N. D. (2009). Bridges to success in high school for migrant youth. *Teachers College Record*, *111*(3), 683-711.

Santucci, J. (2004). Facilitating the transition intonursing practice: concepts and strategies for mentoring new graduates. *Journal for Nurses in Professional Development*, *20*(6), 274-284.

Campbell, T. A., & Campbell, D. E. (2007). Outcomes of mentoring at-risk college students: gender and ethnic matching effects. *Mentoring & Tutoring*, *15*(2), 135-148.

Crisp, G., & Cruz, I. (2009). Mentoring college students: A critical review of the literature between 1990 and 2007. *Research in higher education*, *50*(6), 525-545.

Pfund, C., Byars-Winston, A., Branchaw, J., Hurtado,S., & Eagan, K. (2016). Defining attributes and metrics of effective research mentoring relationships. *AIDS and Behavior*, *20*(2), 238-248.

Matthew, S.; Jace A,; Donlad H.; Terri F., "Work in Progress -Implementing a Freshman Mentor Program," Frontiers in Education Conference, 38th Annual pp. F2H-1/F2H-2, 2008.

Matthew, S.; Donald, H.; Terri, F.; "Work inProgress – Improving Self-Efficacy with a Freshman Mentor Program," Frontiers in EducationConference, 38th Annual pp. F3D-5/F3D-6, 2008.

Sash, R.; Detloff, H.; Chen, B.; Grandgenett, N.; Duran,, D., "Work in Progress – Retention ofFreshmen

Computer and Electronics Engineering Students," Frontiers in Education Conference,36thAnnual pp.T1A1/T1A-2, 2006.

Webber, F.; Bennett, R.M.; Forester, J.H.; Klukken, P.G.; Parsons, J.R.; PIONKE, D.P., Schleter, W.; Seat, J.E.; Yoder, D.L., "The engage Program; Results from renovating the first year experience at the university of Tennessee," Frontiers in Education Conference, 36th Annual pp. S2G-24/S2G-27, 2006.

Boundy, D. P.; Bon, C.A., "The Impact peer Mentoring Can have on Freshman Students," Frontiers in Education Conference, 36thAnnual pp. TH1-TH6, 2006.Page 14.875.6

Monte, A.E.; Sleeman, K.A.; Hein, G.L., "Does peer mentoring increase retention of the mentor?,"Frontiers in Education Conference, 36th Annual pp. TH-14/TH-19, 2006.

Gattis, C.; Hill, B.; Lacchowsky, A., "A successful engineering peer mentoring program," ASEEAnnual Conference and Exposition, 17p, June 2007.

Mueller, S. (2004). Electronic mentoring as anexample for the use of information andcommunications technology in engineering education. *European journal of engineeringeducation*, *29*(1), 53-63.

Bachkirova, T., Jackson, P., & Clutterbuck, D. (2021). *Coaching and Mentoring Supervision:Theory and Practice, 2e*. McGraw-Hill Education (UK).

Gershenfeld, S. (2014). A review of undergraduate mentoring programs. *Review of Educational Research*, *84*(3), 365-391.

Jacobi, M. (1991). Mentoring and undergraduate academic success: A literature review. *Review of educational research*, *61*(4), 505-532.

Olson, G. A., & Ashton-Jones, E. (1992). Doing gender:(En) gendering academic mentoring. *Journal of Education*, *174*(3), 114-127.

FISH, C. (1993). Paradoxes in Academic Mentoring. *Working-class Women in the Academy: Laborers in the Knowledge Factory*, 179.

Greco, L. M., & Kraimer, M. L. (2020). Goal-setting in the career management process: An identity theory perspective. *Journal of Applied Psychology*, *105*(1)

Binani, S., & Chowdary, R. (2018). Enhancement of learning levels in engineering chemistry through effective use of tutorials. *Journal of Engineering Education Transformations*, *32*(1), 31-36.

Binani, S. (2022). Freshmen Engineering Students' Perspectives on Engineering Ethics–A Qualitative Study. *Journal of Engineering EducationTransformations*, *35*(Special Issue 1).

Schunk, D. H., & Mullen, C. A. (2013). Toward a conceptual model of mentoring research: Integration with self-regulated learning. *Educational Psychology Review*, *25*(3), 361-389.

Kraiger, K., Fisher, S., Grossman, R., Mills, M. J., & Sitzmann, T. (2022). Online IO graduate education: Where are we and where should we go?. *Industrial and Organizational Psychology*, *15*(2), 151-171.

Margaryan, A., Albert, J., & Charlton-Czaplicki, T. (2022). Workplace learning in Crowdwork Questionnaire (WLCQ): Measuring self-regulatedlearning and skill development in online platform work. *International Journal of Training andDevelopment*.

Eby, L. T., Rhodes, J. E., & Allen, T. D. (2007). Definition and evolution of mentoring. *The Blackwellhandbook of mentoring: A multiple perspectives approach*, 7-20.

Bozionelos, N. (2004). Mentoring provided: Relation to mentor's career success, personality, and mentoring received. *Journal of vocational behavior*, *64*(1), 24-46.

Ragins, B. R., & Kram, K. E. (2007). The roots and meaning of mentoring. *The handbook of mentoring atwork: Theory, research, and practice*, 3-15.

Mullen, C. A., & Fletcher, S. J. (2012). SAGE Handbook of Mentoring and Coaching in Education: Responding to Challenging Circumstances. *SAGE Handbook of Mentoring and Coaching in Education*, 1-568.

Kittur, J., Brunhaver, S. R., Bekki, J. M., & Lee, E. (2021, July). Examining the Impact of Interpersonal Interactions on Course-level Persistence Intentions Among Online Undergraduate Engineering Students. In *American Society for Engineering Education Annual Conference*.

Kittur, J. (2018). Applying the General Analysis Procedure in Solving an Engineering Problem-AnAssessment. *Journal of Engineering Education Transformations*, *31*(Special Issue).

Cellini, M. M., Serwint, J. R., D'Alessandro, D. M., Schulte, E. E., & Osman, C. (2017). Evaluation of a speed mentoring program: achievement of short-term mentee goals and potential for longer-term relationships. *Academic Pediatrics*, *17*(5), 537-543.

Kittur, J. (2020). Measuring the programming self-efficacy of Electrical and Electronics Engineering

students. *IEEE Transactions on Education*, *63*(3), 216-223.

Binani, S. (2022). Development of Survey Instrumentto Assess Freshmen Engineering Students Understanding on Engineering Ethics. *Journal of Engineering Education Transformations*, *35*(Special Issue 1).

Kittur, J., Karway, G. K., Alrajhi, M. Z., Nelson, B.C., & Shin, S. (2021, July). Curriculum Design: Using the Five Discourses of Design Thinking. In *2021 ASEE Virtual Annual Conference Content Access*.

Kittur, J., Coley, B. C., & Kellam, N. N. (2020, June). Understanding how Novice Indian Faculty Engage in Engineering Education Research. In *2020ASEE Virtual Annual Conference Content Access*.

Binani, S. (2022). Ethical Preparedness, Self-Efficacyand Challenges in Engineering Education–A Quantitative Study. *Journal of Engineering Education Transformations*, *35*(Special Issue 1).