

Algorithms for Intelligent Systems

Series Editors: Jagdish Chand Bansal · Kusum Deep · Atulya K. Nagar

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Deep Learning and Visual Artificial Intelligence

Proceedings of ICDLAI 2024

 Springer

Algorithms for Intelligent Systems

Series Editors

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Vishal Goar · Aditi Sharma · Jungpil Shin ·
M. Firoz Mridha
Editors

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Preface

The conference proceedings volume for the 1st International Conference on Deep Learning and Visual Artificial Intelligence (ICDLAI-2024) held at Bikaner Technical University in Rajasthan, India, on March 16–17, 2024, contains the written versions of research contributions that were accepted and presented during the event. The primary objective of ICDLAI-2024 was to provide a scholarly platform for academicians, engineers, and researchers to showcase their cutting-edge research and innovative work within the expansive domains of deep learning and artificial intelligence.

Throughout the conference, a diverse range of interactive forums, core technical sessions, and top-tier research articles were presented, highlighting the ongoing efforts within deep learning and artificial intelligence to develop new ideas, methodologies, and tools to address pertinent issues. The conference proceedings encompass a wide array of topics, including system paradigms, approaches, and technical reviews that leverage knowledge and intelligence across various domains.

ICDLAI-2024 received over 257 submissions from 15 different nations, including the United States, Iraq, China, Ghana, the United Kingdom, Bangladesh, Kazakhstan, and more. Each submission underwent a rigorous plagiarism check and was reviewed by at least three reviewers, with some entries undergoing additional reviews. Ultimately, 40 outstanding articles were selected for publication in this proceedings volume, representing an acceptance rate of 15.56%.

We extend our sincere thanks to all participants for their invaluable contributions to the conference program and the proceedings. Additionally, we express our gratitude to the reviewers for their insightful feedback on the papers and acknowledge the hard work of the organizing team members.

Bikaner, India
Pune, India
Aizu-Wakamatsu, Japan
Dhaka, Bangladesh

Vishal Goar
Aditi Sharma
Jungpil Shin
M. Firoz Mridha

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Chapter 4

A Research Study on Role of a Mentor in Personal Growth of Undergraduate Students



Nehal Dave and Hiren Kavathiya

1 Introduction

Personal development, also denoted as self-improvement, or “personal growth”, is the ongoing process of improving one’s abilities, traits, attributes, and mind-set in order to realize one’s full potential and live a more fulfilling life. It entails making an intentional and conscious effort to better oneself in a number of ways, both inwardly (such as improving one’s emotional well-being, mentality, and beliefs) and externally (such as improving one’s abilities, routines, and behaviours). Personal development is a continuous process that begins at a young age but is mainly influenced by their parents, teachers, and surroundings. Consistent self-reflection, being aware of oneself, and willingness to effect beneficial transformation are all parts of growth as an individual [1].

College pupils must strike the right equilibrium between the demands of their studies and their growth as individuals, as well as plan and achieve professional objectives and build life skills. The mentoring relationship, which is characterized by guidance, support, and honest feedback, emerges as a powerful accelerator in this endeavour. This study will examine the various ways that mentors enhance the satisfaction, growth as individuals, and self-discovery of college pupils with the goal to gain a deeper understanding of the numerous dimensions of mentoring.

The current research attempts to provide a comprehensive understanding of the mentor’s significance on the bachelor journey via a discussion of the various facets of mentoring, such as expert advice, tutoring, as well as private assistance. To illuminate the nuances of these connections and their revolutionary potential, the research will

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examine real-world situations and document the experiences of both mentors and students.

Consider every constructive shift in their beliefs, actions, or religion to be an act of growth. Learning stuff is not sufficient; mentees must put it into practice for it to eventually become ingrained in their identity. To achieve personal growth, it is essential to have encouragement, the ambition to ameliorate oneself, and the determination to mark alterations. Additionally, one must be willing to take risks and sometimes do things that may seem difficult, but are ultimately beneficial. Furthermore, open-mindedness and the capacity to acquire and rise are also essential.

Self-improvement is the process of personal growth. However, the fundamental idea of human progress goes beyond just improvement and development. It undergoes a change as well. The transformation to which we speak is largely the conversion of their potentially negative habits into chances for constructive change. Mentees are still mentees, but now they can become healthier. Mentees may strengthen his/her sense of self and stop trying to fit into someone else's mould of who mentees should be [2].

The current learning explores the complex relationships that exist between mentors and undergraduate students, illuminating the significant influence guides can have on their mentees' overall growth as well as their individual advancement.

2 Mentoring

Mentoring, a more close-knit and mutually beneficial connection, allows the faculty mentor to support the professional and personal development of their students [3, 4]. In a mentoring connection, mentees view the mentor as an inspiration for learning new things or acquiring new abilities. In addition to providing the mentee with expectations and incentive, the mentor models the necessary abilities [5]. Professional networking, skill development, professional attitudes and values, and confidence are all provided by mentoring [3, 6]. The primary objective of mentoring, despite the variety of ways, is for the teacher to act as an invaluable role model for the mentee's development. Enhancing skills and talents is the main goal of mentoring, which calls for meeting different expectations and interpersonal styles [7]. Jacobi [8] Mentoring has been defined as three things: (1) emphasizing personal development and success; (2) broad support (e.g. professional and career growth); and (3) personal and peer-to-peer mentorship. We both agree that mentoring is connected to all facets of life where individuals want to develop and interact with others. Mentoring helps new teachers advance their careers, develop their personalities, and increase their knowledge, according to several studies [9].

A mentor can help mentees discover ways in which they prerequisite to becoming more competent and can also offer to help them reach their objectives. By sharing their own experiences and ideas, mentors may offer insightful viewpoints and counsel that can help an individual overcome obstacles and advance in their growth. The mentees' self-efficacy and confidence for ongoing development and progress

may increase as a result. To support skill development and help people realize their maximum potential, mentoring may be a useful technique. Mentoring enhances research abilities by offering direction, encouragement, and criticism during the investigation process [10].

The dynamic and complex attachment that exists between a mentor and mentee is known as guidance, and it has a significant impact on undergraduate students' growth as individuals. Within the academic realm, guiding transcends the boundaries of conventional teaching and involves a comprehensive strategy that develops not only cognitive abilities but also emotional fortitude, social competencies, and self-awareness.

Mentoring reaches into the personal aspects of a student's journey, taking it outside the walls of the classroom. Mentors frequently act as friends, giving mentees a secure environment in which to voice worries, hopes, and doubts.

3 Significance of Personal Growth in Student's Life

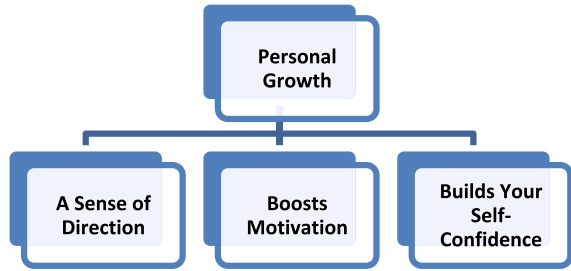
Personal growth is a direct outcome of mentees' attempts to better themselves, whether that improvement is in his/her intellect, morals, physical health, or all of the above. Personal development is the process of improving one's habits, behaviours, actions, and responses. It is also known as self-realization or self-growth.

Students can realize their full potential in their studies as well as their lives by embarking on the revolutionary journey of personal growth. It helps them to be resilient, to learn throughout their lives, and to live happy, meaningful lives by preparing them for the possibilities and difficulties waiting forward. A learner's personal development is extremely important because it affects not only their academic performance but also their general health and opportunities for future success. Cognitive ability, feelings for others, and excellent communication abilities are all facilitated by personal growth. These attributes improve a student's capacity to establish and preserve happy connections with instructors, fellow students, and potential employers.

Individual growth can take several forms: Personal development is an investment in oneself that has long-term advantages in many areas of life. It is a path that calls for commitment, self-awareness, and the readiness to push themselves past his/her comfort zone, setting themselves up for a more fulfilling and meaningful life journey by putting personal improvement first. Personal development is crucial for many reasons, including how it affects happiness, success, and general quality of life.

With that, I present the following theories:

- Hypothesis 1 (H1): Mentoring has an impact on a learner's growth and development in context of a sense of direction
- Hypothesis 2 (H2): Mentoring has an impact on a learner's growth and development in context of boosts motivation

Fig. 1 Personal growth

- Hypothesis 3 (H3): Mentoring has an impact on a learner’s growth and development in context of builds their self-confidence

The following are some important justifications for why personal development is important (Fig. 1).

3.1 A Sense of Direction

When mentees are more self-conscious, they are more conscious of what they want out of life. Deciding what to do Mentees’ much easier. Mentees list of to-do’s no longer includes things that took up most of their time before. Mentees know that they are not worth their time since they do not help reach their goals. Setting personal growth objectives might give mentees a sense of purpose in their professional life. Mentees can rank tasks that advance their goals in priority once they have decided what they want to work towards. We then go into how learning exercises that come from this theoretical integration might be created to help students become more self-aware and grow personally [11, 12]. For instance, a copywriter can take the steps required to become a grammar expert if they wish to advance to the position of senior copywriter [13].

3.2 Boosts Motivation

When learners get the clearer idea of targeted achievement, the journey becomes easier for follow progressing steps. Even if mentees are uncomfortable with the task, they will still be more likely to take action if they can see the benefits. The proverb “Where there is a will there’s a way” is true. When mentees have a strong sense of self-development, they have the necessary will. We conclude that our tests provide some evidence of better motivation and collaboration. It has been exceedingly difficult to evaluate the potential impact on academic achievement thus far. It has been exceedingly difficult to evaluate the potential impact on academic achievement thus far [14].

Therefore, it is critical for organizers to comprehend both the individual and collective aspects impacting involvement and engagement in educational activities [15].

3.3 Builds Mentee's Self-confidence

Personal development may be impacted by emotional intelligence in both direct and indirect ways [16]. Mentees self-esteem can be enhanced by recognizing that they can do things that they thought were impossible, which can help mentees repeat the process and progress in different areas of their life. Mentees can learn how to develop SMART agendas, which are specific, measurable, attainable, relevant, and time-based, by consistently pursuing personal growth [17]. The results of the research demonstrated the personal growth initiative, as well as the favourable relationship between self-esteem and academic accomplishment. It was also shown that different aspects of personal growth have a strong and favourable relationship with academic accomplishment, total personal growth, and academic achievements [18].

4 Methodology

4.1 Data Collection

Data are collected by interviewing the students of the undergraduate program, and during the interview, the following questions were asked related to personal growth. Researchers often use Likert scale to understand the views and perspectives towards mentoring.

1. Current status of mentee's life
2. The thing that amazed the mentee lately
3. The highest priority in the mentee's life
4. An unpleasant event of the mentee's life
5. Having a sharing partner in the mentee's life
6. Mentee's intensity of risk-taking in life
7. Frequency of self-appreciation by mentee
8. Mentee's ability to hear ill about self
9. Preference by the mentee between health and money

5 Data Analysis

All 93 individuals were enrolled in professional programs at a reputable institution in Gujarat, India, with 61 (65.6%) men and 32 (34.40%) women. All 93 students were enrolled in a three-year undergraduate computer science program; of these, 31 were in their first year, 31 in their second year, and 31 in their third year. These pupils are between the ages of 18 and 21. All first-year students were without a mentor, whereas second-year students enjoyed the benefit of mentoring for a full academic year, and third-year students enjoyed close mentorship and fair mentor supervision. All students were asked the aforementioned 15 questions about their personal growth during personal interviews, and based on the discourse analysis, the reflection of the stories and reviews of the students were transformed into quantitative data/statistics on a measure of 1–5, where 1 represents the bottommost rank and 5, the uppermost rank.

Table 1 depicts the responses of undergraduate students in terms of percentage for 9 questions asked to understand their current thinking and mental level. It can be observed from the table that 9.68% of students were not aware of the current status of their lives as they did not have any mentor whereas 6.45% were able to say about the things that amaze them. The ratio ranges between 15 and 50% for the questions regarding priority, remembering unpleasant events, and the presence of a special person in life. The remaining criteria like risk-taking, encouraging own work, or the capability to hear bad about oneself from others account higher portion of students who are not doing well ranging from 9.68 to 32.26%. The percentages surge to 35.48% when it is about prioritizing health or money which indicates that the majority of students are not aware of setting preference. The absence of a mentor can be noticed when very few undergraduates can give the rate 5 for most of the questions.

Table 1 Rating by first-year students

S. no.	Question	1	2	3	4	5	Standard deviation
1	Current status of life	9.68	22.58	35.48	25.81	6.45	11.94
2	The thing amazed you lately	38.71	29.03	22.58	6.45	3.23	15.03
3	The highest priority	48.39	16.13	9.68	19.35	6.45	16.67
4	An unpleasant event	38.71	35.48	25.81	0.00	0.00	18.86
5	Having a sharing partner	32.26	25.81	19.35	16.13	6.45	9.78
6	Risk-taking	16.13	22.58	25.81	25.81	9.68	6.99
7	Self-appreciation	9.68	9.68	25.81	32.26	22.58	10.05
8	Ability to hear ill about self	29.03	32.26	25.81	6.45	6.45	12.58
9	Health or money	35.48	32.26	16.13	12.90	3.23	13.57

Table 2 illustrates the improvement in the life of second-year students of an undergraduate program in form of percentages as each of them have been allotted a mentor from the first year. It can be noted that more than 50% of students are able to state current status of life and that is why having the highest ration in rating 3 and 4. A consistent improvement can be observed when the data are compared to first-year students (Table 1) as more students are able to recognize the amazement, can set priorities, or remembering any unpleasant event because the result is ranging from 0.00 to 35.48%. The remaining set of questions such as having a special person or a sharing partner or calculative risk-taking willingness has also faced a makeable hike starting from 12.90% to approximately 36% for the rating 3 and 4. It can be noticed from the table that after having one year of mentoring, 61.29% of students can appreciate themselves for their deed. Moreover, the number has jumped from 6.45 to 25.81% for hearing something low about self, and the ratio is dramatically reduced for prioritizing health or money to 16.13%.

Table 3 denotes the feedbacks of third-year undergraduate students in form of percentage for a set of questions asked to understand the effect of mentoring. It can be observed from the table that after mentoring of two years, only 3.23% of students were not aware with the current status of their life. The ratio falls between 6.45 and 32.26% for the questions regarding amazing things, priority, remembering unpleasant event, and the presence of a special person in life to share things. The remaining criteria like risk-taking, encouraging own work, or capability to hear bad about self from others account higher ratio as through mentoring they could feel improvement in perspective. The percentage drops to 0.00% and 16.13 in rating 1 and 2 when it is about prioritizing health or money which indicates that majority of students is now aware about setting preference. The presence of mentor in their life can be clearly noticed when very few undergraduates can give the rate 1 for most of the questions.

Table 2 Rating by second-year students

S. no.	Question	1	2	3	4	5	Standard deviation
1	Current status of life	6.45	16.13	29.03	38.71	9.68	13.57
2	The thing that amazed you lately	32.26	22.58	16.13	16.13	12.90	7.70
3	The highest priority	9.68	22.58	12.90	25.81	29.03	8.35
4	An unpleasant event	35.48	29.03	22.58	12.90	0.00	13.95
5	Having a sharing partner	29.03	19.35	22.58	16.13	12.90	6.20
6	Risk-taking	12.90	25.81	29.03	25.81	6.45	9.78
7	Self-appreciation	12.90	16.13	25.81	35.48	9.68	10.55
8	Ability to hear ill about self	6.45	22.58	32.26	25.81	12.90	10.30
9	Health or money	16.13	12.90	38.71	29.03	3.23	13.95

Table 3 Rating by third-year students

S. no.	Question	1	2	3	4	5	Standard deviation
1	Current status of life	0.00	3.23	6.45	25.81	64.52	26.83
2	The thing amazed you lately	9.68	12.90	16.13	29.03	32.26	10.05
3	The highest priority	6.45	16.13	19.35	25.81	32.26	9.78
4	An unpleasant event	29.03	25.81	32.26	6.45	6.45	12.58
5	Having a sharing partner	19.35	16.13	16.13	25.81	22.58	4.21
6	Risk-taking	6.45	29.03	25.81	29.03	9.68	11.03
7	Self-appreciation	9.68	16.13	29.03	32.26	12.90	10.05
8	Ability to hear ill about self	0.00	16.13	19.35	25.81	38.71	14.13
9	Health or money	3.23	9.68	16.13	29.03	41.94	15.54

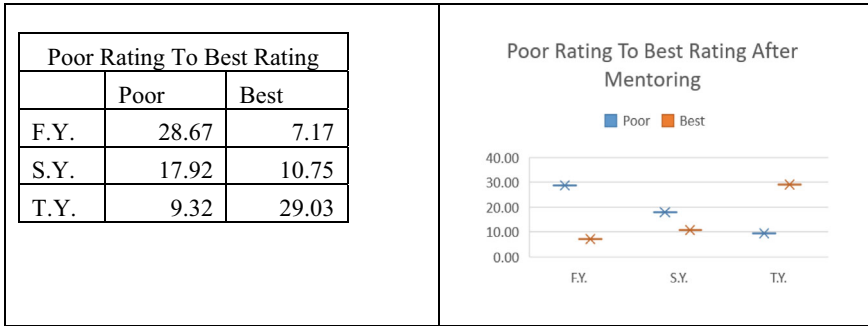
6 Outcomes

A mentor can help mentees discover areas in which they need to become more competent and can also offer resources and support to help them reach their objectives. Mentorship can remarkably increase self-awareness in students. A growth can be expected in a sense of direction for mentees. Moreover, learners can be expected to have improved focus and a higher level of motivation. Under guidance of a mentor, students can achieve next phase of resilience and become able to set goal for betterment of life. Lastly, the most vital parameter for personal growth is self-confidence which can be elevated through mentorship.

Table 4 exhibits improvement in rating after mentoring for first-year to third-year students. During the first year, 28.67% of students gave an overall poor rating to their ability about various situations mentioned in the given questionnaire and only 7.17% of students fell under the best category. Talking about second-year students, improvement can be noticed and the poor rating reduced to 17.92 as they were under the guidance of a mentor for one year whereas a rise can be noticed in the best rating to 10.75%. However, a plunge can be noticed in poor ratings with 9.32% as third-year students were under a mentor's guidance and a hike can be observed in best ratings with 29.03%.

This research's data analysis directly relates to NEP 2020. In NEP 2020, point number 14 is "Equity and Inclusion in Higher Education". 14.4.2 "Steps to be taken by all HEIs" is subpoint in NEP 2020 point number 14. In 14.4.2, step number (j) is "Provide socio-emotional and academic support and mentoring for all such students through suitable counselling and mentoring programmes", which demonstrates the value and effectiveness of mentoring for undergraduate students. Undergraduate student mentorship can assist students achieve all of the aforementioned

Table 4 Improvement in rating after mentoring



goals and have a positive impact on their personal lives as well as their personal growth.

7 Conclusion

This research provides insight into the crucial and complex role mentors play in determining undergraduate students’ personal development. The results highlight how important mentoring is as a transforming factor in the undergraduate experience. As mentors and advocates, mentors support students not only in their academic endeavours but also in developing their identities, mental health, and readiness for the demands of the working world. The mentor–mentee connection develops into an active interaction that creates an atmosphere in which personal development is welcomed and even expected as a necessary component of learning. The results of this study highlight the significant influence that mentoring has on a variety of aspects of personal development. Through mentoring, students can reflect on their strengths and faults in a supportive setting. The importance of mentoring is further highlighted by the part it plays in developing students’ adaptability, self-assurance, and resilience. Mentorship emerges as a crucial factor of both personal progress and academic performance as NEP 2020 also suggested the same.

References

1. Jain C, Apple D (2015) What is self-growth? *Int J Process Educ* 7:41–52
2. Cai J, Lian R (2022) Social support and a sense of purpose: the role of personal growth initiative and academic self-efficacy. *Front Psychol* 12. <https://doi.org/10.3389/fpsyg.2021.788841>
3. Johnson WB (2007) Student-faculty mentorship outcomes. In: Allen T, Ebby L (eds) *Blackwell handbook of mentoring: a multiple perspectives approach*. Blackwell, London, pp 189–210
4. Bhatnagar V, Diaz S, Bucur PA (2020) The need for more mentorship in medical school. *Cureus* 12:e7984

5. Palmer RJ, Hunt AN, Neal M, Wuetherick B (2015) Mentoring, undergraduate research, and identity development: a conceptual review and research agenda. *Mentor. Tutoring Partnersh. Learn* 23:411–426
6. Speer JE, Lyon M, Johnson J (2021) Gains and losses in virtual mentorship: a descriptive case study of undergraduate mentees and graduate mentors in STEM research during the COVID-19 pandemic. *CBE-Life Sci Educ* 20:14 [PubMed]
7. Jiao X, Kumar R, Billot J, Smith R (2011) Developing research skills and capability in higher education: combining collaborative research with mentoring. *J Educ Leadersh Policy Pract* 26:42–55
8. Jacobi M (1991) Mentoring and undergraduate academic success: a literature review. *Rev Educ Res* 61:505–532
9. Saranya C, Dhuli R, Guduru R (2023) The role of a mentor in students' personal growth, academic success, and professional development, vol 22, pp 35–46
10. Atkins K, Dougan BM, Dromgold-Sermen MS, Potter H, Sathy V, Panter AT (2020) Looking at myself in the future": how mentoring shapes scientific identity for STEM students from underrepresented groups. *Int J STEM Educ* 7:42
11. Ugur H, Constantinescu PM, Stevens MJ (2015) Self-awareness and personal growth: theory and application of Bloom's taxonomy. *Eurasian J Educ Res* 60:89–110. <https://doi.org/10.14689/ejer.2015.60.6>
12. Roeser RW, Peck SC (2009) An education in awareness: self, motivation, and self-regulated learning in contemplative perspective. *Educ Psychol* 44:119–136. <https://doi.org/10.1080/00461520902832376>
13. Mohanty A, Pradhan R, Jena L (2015) Curiosity and meaning of life leading towards personal growth: the role of emotional intelligence. *J Ind Acad Appl Psychol* 41
14. Bernelo M, Honsberg S, Järelöv A, Blennow J, Peterson L (2023) Focus on student's personal development can lead to better motivation, better academic performance and better collaboration in engineering programs
15. Sorinola O, Thistlethwaite J, Davies D (2013) Motivation to engage in personal development of the educator. *Association of Course Organisers: The Official Journal of the Association of Primary Care Educators; National Association of General Practitioners Tutors; World Organisation of Family Physicians*, vol 24, pp 226–229. <https://doi.org/10.1080/14739879.2013.11494178>
16. Kobylarczyk M, Ogińska-Bulik N (2017) Assessing resiliency and personal growth in a group of adolescents experiencing negative life events: the mediating role of emotional intelligence. *Curr Issues Pers Psychol* 5:1–10. <https://doi.org/10.5114/cipp.2017.68341>
17. Schippers M, Morisano D, Locke E, Ad, Scheepers, Latham G, de Jong E (2019) Writing about personal goals and plans regardless of goal type boosts academic performance. *Contemp Educ Psychol* 60:101823. <https://doi.org/10.1016/j.cedpsych.2019.101823>
18. Yasin G, Malik N, Shehzadi H (2013) Personal growth initiative and self esteem as predictors of academic achievement among students of technical training Institutes HumairaShahzadi, pp 435–446