

Promoting Learner Autonomy in Generation-Z Engineering Students: ICT Needs and Perceptions of the Learners

¹Senthilkumar Obuliraj, ²Karthikeyan Nagarajan, ³Revathi Chandran, ⁴Soundeswaran Sundararajan, ⁵Muralisankar Margabandhu

¹Department of Chemistry, Ramco Institute of Technology, Rajapalayam, Tamil Nadu, India

²Department of Physics, Ramco Institute of Technology, Rajapalayam, Tamil Nadu, India

³Department of Chemistry, Chellammal Women's College, Chennai, Tamil Nadu, India

⁴Department of Chemistry, Dr. Ambedkar Institute of Technology, Bengaluru, Karnataka, India

⁵Department of Chemistry, Velammal College of Engineering and Technology, Madurai, Tamil Nadu, India

¹ senthilkumar@ritrjpm.ac.in

²karthikeyann@ritrjpm.ac.in

³revloy@chellammal.edu.in

⁴ssoundes@gmail.com

⁵sankarm1984@gmail.com

Abstract—Learner autonomy is an essential skill for Generation-Z students irrespective of their backgrounds and disciplines. A survey entrusting the needs and perceptions of the students from an Engineering College in a rural region was conducted. The survey focused on two aspects, one on the use of ICT tools for the enhancement of autonomy and other on the perception of the students over the teaching-learning process and their expected needs from the teachers. Close ended questions with 'Yes or No' type of answers were obtained from the students for their use of ICT tools whereas Likert scale was used to measure their perception over teaching-learning process. The results show that the ICT tools were already used by majority of the learners in an informal manner that leads to autonomy of learning. The perception on teaching-learning process show the promising results on the role of a teacher while teaching which facilitates the learner autonomy.

Keywords— Learner Autonomy, ICT, Learner Perceptions, Student Centric Methods, Motivation.

ICTIEETTrack: (Pedagogy of teaching and learning)

ICTIEE Sub-Track: (Differentiated Instruction in Meeting the Needs of Every Student.)

I. INTRODUCTION

Classroom engagement is an art. Handling generation-Z students is challenging to the teaching community. The student engagement is considered as a difficulty when they are distracted with other attractions (Mercer & Dörnyei 2020). Student engagement is the quantum of time by which the

learners are focused and occupied in learning without any distractions in the traditional classroom set up. They are not only present physically but also engaged mentally inside the classroom (Hiver et al., 2021). As traditional approach fails for the current generation of students, alternate methods of classroom handling are gaining importance. Student centric methods are the need of the hour and they emphasize on the needs and concerns of the student as a center of focus. This approach allows the students what to, when to, where to and how to learn that satisfy their needs and goals. It encourages the active participation of the students, their collaboration and the engagement that leads to autonomy. Modern educational tools such as informational and communication technologies (ICT) play a vital role in enhancing autonomy in learning (Kerimbayev et al., 2023). ICT keeps the student engaging, entertaining, providing more resources, and enhancing pedagogical interaction. It is also supporting the teachers in utilizing and developing resources (Borova et al., 2021). In addition to ICT tools, the role of a teacher is prominent in implementing learner autonomy as they are resourceful, expertise and knowledgeable. They should facilitate and guide the students to autonomy through the teaching – learning process (Syafryadin et al., 2022). The main objective of the study is to understand the extent of ICT tools in support of learner autonomy and learner perceptions over teachers' role in encouraging autonomy. The use of ICT tools by the students is analyzed with the close ended survey questions. The study tries to find a correlation between the technology and autonomy of learning. The expectations of the students in the teaching-learning process are also identified through their perceptions.

Senthilkumar Obuliraj.

Ramco Institute of Technology, Rajapalayam, India
senthilkumar@ritrjpm.ac.in

II. LITERATURE SURVEY

Holec, (1981) defines autonomy as the “*ability to take charge of one’s own learning*”. This includes ability to “*set learning goals, determine learning content and progress, choose learning techniques, monitor self-learning processes, and conduct self-assessments*”. Dickinson (1987) describes the situation as “*situations in which learners are working without the direct control of the teacher*”. “*Autonomy refers to the perception of an internal locus of control—the sense that one’s actions flow from one’s desires, and not merely from external demands*” (Deci&Ryan 2012). The concepts of autonomy have long been applied to learning English as a foreign language. However, learner autonomy is not restricted to a specific area of study, but it is applied to variety of disciplines including STEM (science, technology, engineering, and math) (Lavigne, 2007). Benson (2006) focuses on “*self-instruction through the resources such as ICT technologies as a major part of out of class learning*”. Self-regulated learning using ICT supports the learners to be the contributing members of teaching-learning process and encourages them to learn actively by themselves (Healey, 2002). On the contrary, access to unlimited information through technology often hinder the autonomy of learning (Murray 1999). Hence, teachers’ role is considered crucial in guiding the learners towards autonomy and giving positive feedback. They need to address affective factors, stimulate meta-cognitive awareness and motivation among learners (Reinders&White 2011). Motivation in learning is important for an effective teaching method that facilitates learner autonomy. It is classified into intrinsic and extrinsic motivation. Three important elements of intrinsic motivation are “*connectedness, mastery, and autonomy*”. Extrinsic motivation refers to the rewards the learner getting in the form of marks, outcomes or job (Ryan&Deci 2020). Hence, teacher’s role is considered as an important aspect in motivation and fostering autonomy. Students enjoy more, perform better and feel less anxious in autonomy supportive classrooms of the teachers (Black&Deci, 2000). Reeve (2016) relates to “*the effort of providing instruction in a classroom environment that supports learners’ requirements for autonomy and the relationship between educator and learner*”. The autonomy supportive teachers like to; “*be more responsive to student questions, bring more attention to student interests, resist giving answers, voice fewer directives, show more support for student initiatives, and convey more understanding of students’ perspectives*” (Reeve et al., 1999). A STEM project integrated course designed by teachers, allows the learners involve in self-directed learning, design thinking, collaboration, intrinsic motivation etc. (Tang et al., 2024).

III. METHODOLOGY

The participants were undergraduate students in an Engineering College from a rural background. By considering the fact that the students are sufficiently supported with ICT tools, internet, and other opportunities, they can be prepared being autonomous learners (Benson, 2013). They were

TABLE I
USE OF ICT BY THE STUDENTS

Questions and Responses	Percentage of responses
1. I frequently use ChatGPT/AI tools in submitting assignment.	
Yes	80%
No	20%
Not sure	-
2. I always search Google for any online solutions or samples when writing assignments	
Yes	100%
No	-
Not sure	-
3. Classroom teaching was not sufficient for me to understand the concepts	
Yes	70%
No	18.3%
Not sure	11.6%
4. I often discuss with my friends to make it clear the concepts	
Yes	100%
No	-
Not sure	-
5. I look for You Tube videos especially during exams for quick learning	
Yes	33.3%
No	60%
Not sure	6.6%
6. I visit library for reference	
Yes	3.3%
No	96.6%
Not sure	-

exposed to LMS tools such as canvas, student centric approaches such as flipped classroom, seminars etc. However, the extent of these approaches varies from teacher to teacher and subject to subject. They also come from different societal and economic backgrounds. Most of them studied their high schools with English as a medium of instruction whereas some of them with their own mother tongue as a medium of instruction. The sample of 60 students in the classroom was considered. The participants were given a set of survey questions to understand the perspective of learner’s autonomy. They were all well aware of this research study and its significance in boosting learner’s autonomy. Ethical norms were strictly followed as practiced in other survey based investigations. The instruments of this study include both theoretical (literature survey) and empirical methods (Google survey) and the results of which were analyzed. The questionnaire was based on the authors’ own experience as they aware of both traditional and technology based learning addressing Gen-Z students (Little 1991). Close ended questions were included to understand the purpose of the study.

IV. RESULTS AND DISCUSSION

A. Use of ICT tools by the students in the direction of autonomy

Table I represents the survey questions on the use of ICT in learning process of the students and the questionnaire was prepared by authors’ own conceptions. The survey confirms that 20% of the students were not using ChatGPT/AI tools for their assignment submissions. This clearly indicates that a fraction of the student community may still depend on

conventional methods highlighting the variability in adopting the AI tools in academics. Tossell et al., (2024) reported that more number of engineering students use AI tools like ChatGPT for their assignment submission. However, there are mixed perceptions over the submission of assignments using this AI tool. The students find it difficult to complete the assignment using the tool looking at the quality and outcomes of the ChatGPT which remain incomplete. The authors have concluded that ChatGPT tools may be useful in the higher education set up, but they are not completely replacing the student's own efforts in acquiring the knowledge. In contrast, the tool is widely considered as valuable by the students in a Korean University study. The ChatGPT tool was found to improve confidence, collaboration in learning and autonomy. The author of that particular study recommend for the integration of AI tools into curriculum (Van Horn 2024). On the other hand, plagiarism and cheating through the use of generative artificial intelligence (GAI) tools are generally observed by higher education institutions (HEIs). Hence, world's top 50 ranking Universities have already provided the guidelines for the assessment in order to avoid such practices.

In this Gen-AI century, it has been suggested to accept the use of GAI tools with appropriate guidelines (Moorhouse et al., 2023). The present work also supports that the technology provides a sense of autonomy in learning process of the learners which cannot be negated in the current scenario. The entire set of students who participated in the survey stated that they often use Google for finding online solutions when writing assignments (responses to Q.No. 2 in table I). This full-fledged response indicates the wide use of search engines as a first hand resource for academic work (Garrison, 2016) highlighting the role of ICT in supporting the autonomous learning. Baranova et al., (2019) agree with this fact through their research observations that the Google tools used through mobile applications improves autonomy of learning and prepares well in advance the students for their classes. The use of Augmented Reality through the Google Lens and Google Expeditions was reported to improve motivation of the students in learning STEM education (Shapovalov et al 2018).

Seventy percent of the students felt that for better understanding of the concepts one cannot rely on the classroom teaching alone. This clearly indicates the necessity for other supplementary resources beyond the conventional class room teaching (Holec, 1981), in line with the principles of autonomous learning where additional tools are necessary to enhance the understanding of the autonomous learner. The traditional teaching methods do not make the students attentive 100% of the duration, whereas a sense of autonomy could be created in an online teaching practice by using ICT tools by providing instructions, study materials and other resources which have improved the learning process as reported (Rajarapolu et al., 2022).

All the students participated in the survey clearly indicated that they often exchange and discuss ideas and concepts with their friends for clarification. This indicates that the autonomous learners seek a collaborative approach and peer

group learning. Learner autonomy was found to be boosted by the team based learning approach where student contributions were positively enhanced even when passive learners were present in the team. The passive learners gained insights from better peers provided the communication opportunity was facilitated by the teachers between them (Lin& Lin2023).

33.3% of the students mentioned that they get the help of videos from the You Tube for quick learning especially during exams and 6.6% are not sure of their selections. The rest of the 60% of the students responded negatively for this particular question showing their priority in studying. This indicates that the You Tube is also a preferred resource for the visual and self-paced autonomous learners in this particular group (Reinders& White 2016). You Tube was found to be under-utilized as reported (Maynard 2021). The casual learners benefit through this medium largely irrespective of the contents approved by the academia or not. The author emphasizes that academic experts need to look into the opportunity of creating contents through these media and make them trustworthy.

Using Library as one of the resources, only 3.3% of the students were interested in visiting the library for reference purposes. This clearly indicates the paradigm shift from traditional reference tool towards the digital resources, indicating that the information is easily accessible and the influence of the ICT tools in the autonomous learning environment. Blocksidge and Primeau (2023) concluded that more evidence based research is needed to understand the assumptions of Gen-Z learners in utilizing library resources. The informational guesses will not help the librarians and authorities in this information changing landscape.

B. Students' perceptions on teaching –learning process towards autonomy

Learner autonomy boosts the learners' performance and cultivates the lifelong learning skills (Zhou & Li2020). Breen&Mann (1997) characterized the teachers of autonomous learners. They deduced three attributes that teachers can bring to their relationship with their learners: "1. Awareness of teacher's own self as a learner, 2. Belief and trust in the learners and 3. Desire to foster autonomy". Survey in a study shows that more than 50% of the students are not ready for the student centric approaches and autonomous learning. The role of a teacher is challenging in such scenarios and these changes are not easy for the teachers themselves (Marzuki et al., 2023). "The educators need to re-assess their own skill levels, set their own goals for any retraining they may consider necessary, and then be able to put these into practice" (Dofs& Hobbs2016). The authors say that, "Most teachers have been trained and gained their experience in the traditional mode". So, teachers should be trained to be learner-centric and they should change their teaching methods (more communicative) and style (more interactive and activity based). Crabbe (1993) proposes that, teachers should try to boost autonomous learning by being clear with the purpose, the possible difficulties, and suggest some appropriate learning and communication strategies that

can be used to meet those difficulties.

In this study, the students of a particular class with a total strength of 60 were exposed to the questionnaire to reflect upon their perception over teaching-learning process, their expectation toward the teachers and the difficulty of learning in English as a medium of instruction. They were from multiple backgrounds. Table II provides the guidelines for Likert Scale for the questionnaire asked in Table III which in turn observes the perceptions of a learner towards autonomous learning. The students were introduced with active learning methods such as team projects, quizzes, multimedia presentations, seminars etc., As a reflective feedback, the responses to the question (Q.No. a. in table III) show their interest in such alternative learning methods. The mean value of 3.58 in table IV for this particular response is average confirming the mixed classroom consisting of learners from variety of backgrounds and their varied learning needs.

Reeve (2016) reports that *“teachers can learn how to be more autonomy supportive toward students; teachers most engage students when they offer high levels of both autonomy support and structure; and an autonomy-supportive motivating style is an important element to a high-quality teacher-student relationship”*. He asserts that teachers who find and nurture inner motivational resources of the students are the ones adopting to the autonomy supportive motivating style according to the framework of self-determination theory (SDT). On the other hand, teachers who are not ready for the change feeling intimidated in the classroom. Autonomy implementing teachers always look forward to include the learners in deciding classroom activities and measure the learning outcomes on their own (Allwright 1988). SDT assumes that the learners are inherently motivated for the psychological satisfaction in the learning, mastery of subjects and social connectivity. But in reality, they are not so. Learners need motivation from the teachers and the conditions for autonomous learning have to be created by the teachers (Ryan et al., 2019). On the contrary, the educational policies and learning contexts are still remaining traditional based across the globe that fails to support the autonomous learning. As a consequence, the teachers are heavily influenced and limited by these mandates, pressure from the institutional management and leadership. Even when intrinsic motivation is influenced among the learners by the autonomous teachers, extrinsically the outcomes of the assessment, rewards, and sanctions for non-performance lead to lower the motivation (Ryan & Deci 2020). Nakata (2011) argues that three attributes of a learner influences learner autonomy; *“(i) behaviour readiness which was assessed by the teachers to develop LA in the classroom (ii) situational readiness which was ensured by the teachers to apply the strategies required for LA among specific group of learners. (iii) psychological readiness to assert that the students are emotionally connected in the classroom”*.

Agentic engagement is required for the teachers where they allow the students to collaborate among themselves, develop skills mutually, and create the motivational situation for themselves (Okumus Ceylan2021). To support this fact,

TABLE II
SCALES FOR CLASSIFYING THE RESULTS OF CLOSE-ENDED QUESTIONNAIRES

Category of Scaling	Measure
Strongly Disagree (SD)	> 1 to 1.8
Disagree (D)	> 1.8 to 2.6
Neutral (N)	>2.6 to 3.4
Agree (A)	>3.4 to 4.2
Strongly Agree (SA)	>4.2 to 5

TABLE III
SCALES FOR CLASSIFYING THE RESULTS OF CLOSE-ENDED QUESTIONNAIRES

Category of Scaling	SA*	A	N	D	SD
a. I like active teaching methods compared to conventional teaching	25 41.7%	10 16.7%	5 8.3%	15 25.0%	5 8.3%
b. I like teachers who motivate to learn further rather than simply make us follow	21 35.0%	20 33.3%	7 11.7%	11 18.3%	1 1.7%
c. I love the teachers who are well versed in subject and creative	32 53.3%	22 36.7%	4 6.7%	2 3.3%	0 0%
d. I like the teacher to be friendly, approachable and at the same time	53 88.3%	7 11.7%	0 0%	0 0%	0 0%
e. We would like the teacher to ask the students to reflect on the concepts at the end of his/her lecture	13 21.7%	17 28.3%	16 26.7%	5 8.3%	9 15.0%
f. I have English language difficulties in learning	17 28.3%	10 16.7%	10 16.7%	20 33.3%	3 5.0%

* Represents number of students and the corresponding percentage

learner autonomy was successfully achieved in team based learning (TBL) in an engineering discipline as reported by Lin & Lin (2023). The authors asserted that motivation and implementation of learner autonomy were instrumental in team based learning (TBL) where different levels of students benefitted mutually through their expertise. It exhibits that the efforts of the teachers in implementing learner autonomy benefitted the students. In another investigation, project based learning (PBL) was applied to enhance LA through collaborative learning (Acharya&Gayana 2021). The mean value of 3.82 to the question (Q.No.b. in table IV) in the present study suggests that the students are both intrinsically and extrinsically motivated. Some want motivation from the teachers and some do not. The necessity of the learner autonomy is that the teachers have to ‘step back’ and implement agentic engagement, and on the other hand, students should not go out of control which is possible only

through autonomy enhancing materials and resources. These tensions can be overcome through creativity and reflective practice in parallel as reported by (Henriksen et al., 2018). That particular study was implemented in a synchronous hybrid doctoral course on design thinking, education, and technology. In the 21st century education, especially in the context of technical education, creativity is considered as a necessity and central to teaching. The persons involved should be ready for the change, and value creativity with an open mindset that lead to growth. This is evident from the survey results of the current study (Q. No. c), where more number of students agreed in favor of creativity of a teacher as reflected from the higher mean value of 4.40. From the perception of the authors, it is easy to implement student centric approaches in the classroom where teachers are creative and also confident in his/her subject matter expertise. In the autonomous learning set up, the teacher does not lose control over the learners as they are engaged with full focus on the tasks which are creative and time consuming.

Stewart and Irie (2012) assert that creativity and autonomy are vital elements of any learner centered approach. The pedagogical design must include these features for both the teachers and learners in the 21st century. Creativity among teachers was found to be enhanced by their own emotional intelligences proving the significance of the mindset of the teachers irrespective of their genders. This question shows the connection between the emotional intelligence of the teachers and their confidence in implementing autonomy in the classroom (Pashazadeh&Alavinia 2019). An overwhelming mean value of 4.88 confirms in the current study (Q. No. d) that expectation of the students towards the teachers' emotional balance in dealing with the classroom environment and how they handle the students of multiple backgrounds. Teachers were expected to create a harmonious and humanistic environment for learning. A better relationship with the learners makes the teachers to understand the individual differences and needs of the learners. The positive emotions lead to enhanced learners' autonomy as concluded by Qian (2022). Teachers should allow the students to critically reflect on the learning process to encourage active learning rather than passive learning. If the strategies were found to impede their learning ability, then they should be taken care during the training periods. Learner's activity involves four dimensions of learning, viz., behavioral, cognitive, emotional and social attributes as reported by Bagheri&Zenouzagh (2021). Technology was found to offer such variety of learning opportunities for the learners through these four dimensions (Galikyan et al., 2021). In an interesting investigation, students were found to be learning through behavioral and cognitive attributes in the text based modality, and emotional and social in the multimodal modality involving computer mediated environment (Zenouzagh et al., 2023). Majority of the students accept upon on the need for reflection at the end of the class as they are willing to understand the concepts through their peers. For better learning experiences, it has become an essential practice of reflecting on what they have learned, achieved in terms of

TABLE IV
CATEGORIZATION OF SCALE

Q.No.	Total no.	Mean	Category in the scale
a.	60	3.58	Agree (A)
b.	60	3.82	Agree (A)
c.	60	4.40	Strongly agree
d.	60	4.88	Strongly agree
e.	60	3.33	Neutral
f.	60	3.30	Neutral

outcomes and experienced. It gives an opportunity for the students to revisit their learning, thinking on themselves and decide upon future course of action. In this scenario teachers should be assertive in transferring the knowledge into overall insights at the end of the class (Henriksen et al., 2018&Cotterall 2017). By means of reflection, a learner becomes a researcher, experiences surprises, and confuses himself over uncertainty and uniqueness. By explaining a phenomenon, his/her understanding is getting enhanced in the given environment. The answers from the students show that the mean value of 3.33 which is not encouraging (Q. No. e). The challenges of the teacher lies in the fact that they must create a comfort and motivating zone for the expression and allow the students to reflect on what they really learned without demotivating. The responses show that the students are yet to be prepared for individualistic expression overcoming their shyness in learning and explaining to the peers on stage.

Studying in an Engineering college from a remote location, students from varied backgrounds learned through vernacular mode though English as a medium of instruction or learned through mother tongue as a medium of instruction during their schools days, generally find it difficult to adapt to the learning through English. The survey report supports that fact. English has become lingua franca globally in the teaching learning process. Many of the students experience English as a medium of instruction for the first time in the college. They have difficulties in coping up and reflect less confidence in the higher education (Borooah&Sabharwal 2017). It becomes evident that the teachers should facilitate the students to overcome their fears, hesitation, and cultural differences and make them adapt to the learning in English by providing motivating and comfortable atmosphere in the classroom and technology integration in the learning tools (Bhargava2020). A mean value of 3.3 for this particular question (Q.No. f) proves that the presence of mixed classroom with students coming from varied background with English learning difficulties. Consequently this factor also influences learner autonomy of the students when they are not confident in the language through which the learning happens.

CONCLUSIONS

The results of the survey clearly indicate the tendency to use the ICT tools among autonomous learners for enhancing their learning. Google search, YouTube and peer discussions emerge as the preferred choice of learning resources even among the learners of a rural setting leading to autonomy. Fewer footprints fall in libraries which is evident from the survey results is a critical point to ponder and also in a sense urgent necessity towards the digitization of the conventional libraries which can be inferred as the future scope of this survey. This survey clearly indicates the students' perception that teachers play a greater role as a facilitator, a motivator to use modern ICT tools and the conventional resources, a moderator between favorable and unfavorable situations creating an emotional balance for a comfortable class room environment thus paving a way for autonomous learning environment. The students of multiple backgrounds were involved in this investigation. As a future scope of this study, when students across multiple disciplines and institutions will be involved, it may lead to much deeper insights.

REFERENCES

- Acharya, S., & Gayana M.N. (2021). Enhanced Learning and Improved Productivity of Students' using Project Based Learning Approaches for Programming Courses. *Journal of Engineering Education Transformations*, 34, 524-530.
- Allwright, D. (1988). Autonomy and individualization in whole-class instruction. *Individualization and autonomy in language learning*, 4(2), 35-44.
- Bagheri, M., & Zenouzagh, Z. M. (2021). Comparative study of the effect of face-to-face and computer mediated conversation modalities on student engagement: Speaking skill in focus. *Asian-Pacific Journal of Second and Foreign Language Education*, 6(1), 1-23.
- Baranova, T., Khalyapina, L., & Yakhyayeva, C. (2019). Google products as a source of students' autonomy in content and language integrated learning. In 2019 12th International Conference on Developments in eSystems Engineering (DeSE) IEEE, 383-387.
- Benson, P. (2006). Autonomy in language teaching and learning. *Language Teaching*, 40, 21-40.
- Benson, P. (2013). *Teaching and researching: Autonomy in language learning*. Routledge.
- Bhargava, S. (2020). Teaching English in Engineering Institutions in India. *Journal of English Language Teaching*, 62(1), 24-28.
- Black, A. E., & Deci, E. L. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. *Science education*, 84(6), 740-756.
- Blocksidge, K., & Primeau, H. (2023). Adapting and evolving: Generation Z's information beliefs. *The Journal of Academic Librarianship*, 49(3), 102686.
- Borooah, V. K., & Sabharwal, N. S. (2017). English as a medium of instruction in Indian education: inequality of access to educational opportunities. CPRHE research papers, 7.
- Borova, T., Chekhratova, O., Marchuk, A., Pohorielova, T. ., & Zakharova, A. (2021). Fostering Students' Responsibility and Learner Autonomy by Using Google Educational Tools. *Revista Romaneasca Pentru Educatie Multidimensionala*, 13(3), 73-94.
- Breen, M. P., & Mann, S. J. (1997). Shooting arrows at the sun; perspectives on a pedagogy for autonomy. In P. Benson, & P. Voller (Eds.), *Autonomy and Independence in Language Learning* (Vol. N/A, pp. 132-149). (Applied Linguistics and Language Study). Longman.
- Cotterall, S. (2017). The pedagogy of learner autonomy: Lessons from the classroom. *Studies in Self-Access Learning Journal*, 8(2), 102-115.
- Crabbe, D. (1993). Fostering autonomy from within the classroom: the teacher's responsibility. *System*, 21(4), 443-452.
- Deci, E. L., & Ryan, R. M. (2012). Self-determination theory. *Handbook of theories of social psychology*, 1(20), 416-436.
- Dickinson, L. (1987). *Self-instruction in language learning*. Cambridge: Cambridge University Press.
- Dofs, K., & Hobbs, M. (2016). Autonomous language learning in self-access spaces: Moodle in action. *Studies in Self-Access Learning Journal*, 7(1), 72-83.
- Galikyan, I., Admiraal, W., & Kester, L. (2021). MOOC discussion forums: The interplay of the cognitive and the social. *Computers & Education*, 165, 104133.
- Garrison, D. R. (2016). *E-learning in the 21st century: A community of inquiry framework for research and practice*. Routledge.
- Healey, D. (2002). Learner Autonomy with technology: What do language learners need to be successful? TESOL 2002, CALL-IS Academic Session.
- Henriksen, D., Cain, W., & Mishra, P. (2018). Everyone designs: Learner autonomy through creative, reflective, and iterative practice mindsets. *Journal of Formative Design in Learning*, 2(2), 69-81.
- Hiver, P., Al-Hoorie, A. H., Vitta, J. P., & Wu, J. (2024). Engagement in language learning: A systematic review of 20 years of research methods and definitions. *Language teaching research*, 28(1), 201-230.
- Holec, H. (1981). *Autonomy and Foreign Language Learning*. Oxford: Pergamon.
- Kerimbayev, N., Umirzakova, Z., Shadiev, R., & Jotsov, V. (2023). A student-centered approach using modern technologies in distance learning: a systematic review of the literature. *Smart Learning Environments*, 10(1), 61.
- Lavigne, G. L., Vallerand, R. J., & Miquelon, P. (2007). A motivational model of persistence in science education: A self-determination theory approach. *European Journal of Psychology of Education*, 22(3), 351-369.
- Lin, Y. S., & Lin, Y. H. (2023). Learner autonomy in team-based learning: A case study of mechanical

- engineering education. *Journal of Engineering Education Transformations*, 36(4), 65-75.
- Little, D. (1991). *Learner Autonomy 1: definitions, issues and problems; authentic language learning*. Resources Ltd.: Dublin, Ireland.
- Marzuki., Indrawati, I. Yunus, I.H. (2023) Teachers' Challenges in Promoting Learner Autonomy: The Socio-Cultural Barriers of Indonesian EFL Teachers. *Pioneer: Journal of Language and Literature*, 15(1), 119-137.
- Maynard, A. D. (2021). How to Succeed as an Academic on YouTube. *Frontiers in Communication*, 5, 572181.
- Mercer, S., and Dörnyei, Z. (2020). *Engaging Language Learners in Contemporary Classrooms*. Cambridge: Cambridge University Press.
- Moorhouse, B. L., Yeo, M. A., & Wan, Y. (2023). Generative AI tools and assessment: Guidelines of the world's top-ranking universities. *Computers and Education Open*, 5, 100151.
- Murray, D. E. (1999). Access to information technology: Considerations for language educators. *Prospect*, 14(3), 4-12.
- Nakata (2011). Computer-assisted Second Language Vocabulary Learning in a Paired-associate Paradigm: A Critical Investigation of Flashcard Software. *Computer Assisted Language Learning*, 24 (1), 17-38.
- Okumus Ceylan, N. (2021). The Relationship between Learner Autonomy and Motivation. *Turkish Online Journal of Educational Technology-TOJET*, 20(4), 150-158.
- Pashazadeh, F., & Alavinia, P. (2019). Teacher creativity in light of autonomy and emotional intelligence. *Teaching English Language*, 13(1), 177-203.
- Qian, W. (2022). The influence of affective factors on autonomous learning in English among non-English majors in Independent University. *International Journal of Education and Humanities*, 5(3), 106-116.
- Rajarapolu, P., Bansode, N. V., & Katkar, V. (2022). ICT-A tool to enhance teaching learning activity in technical education. *Journal of Engineering Education Transformations*, 35, 14-18.
- Reeve, J. (2016). "Autonomy-supportive teaching: what it is, how to do it," in *Building Autonomous Learners: Perspectives From Research and Practice Using Self-Determination Theory*, eds J. C. K.Wang, W. C. Liu, and R. M. Ryan (New York, NY: Springer), 129-152.
- Reeve, J., Bolt, E., & Cai, Y. (1999). Autonomy-supportive teachers: How they teach and motivate students. *Journal of Educational Psychology*, 91, 537-548.
- Reinders, H., & White, C. (2011). Learner autonomy and new learning environments, *Language Learning & Technology*, 15(3), 1-3.
- Reinders, H., & White, C. (2016). Twenty Years of Autonomy and Technology: How Far Have We Come and Where to Next? *Language Learning & Technology*, 20(2), 143-154.
- Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary educational psychology*, 61, 101860.
- Ryan, R. M., Ryan, W. S., Di Domenico, S. I., & Deci, E. L. (2019). The nature and the conditions of human autonomy and flourishing: Self-determination theory and basic psychological needs. In R. M. Ryan (Ed.), *The Oxford handbook of human motivation* (2nd ed., pp. 89-110). Oxford University Press.
- Shapovalov, Y. B., Bilyk, Z. I., Atamas, A. I., Shapovalov, V. B., & Uchitel, A. D. (2018). The potential of using Google Expeditions and Google Lens tools under STEM-education in Ukraine. *arXiv preprint arXiv:1808.06465*
- Stewart, A., Irie, K. (2012). Realizing Autonomy: Contradictions in Practice and Context. In: Irie, K., Stewart, A. (eds) *Realizing Autonomy*. (pp. 1-17). UK: Palgrave Macmillan, London.
- Syafryadin, Suherdi, D., Nadya, N. L., Harahap, A., & Astrid, A. (2022). Teacher readiness and challenges in creating learner autonomy in ICT-based English learning activities. *Indonesian Journal of Applied Linguistics*, 11(3), 708-717.
- Tang, K. S., McLure, F., Williams, J., & Donnelly, C. (2024). Investigating the role of self-selected STEM projects in fostering student autonomy and self-directed learning. *The Australian Educational Researcher*, 51, 2355-2379.
- Tossell, C. C., Tenhundfeld, N. L., Momen, A., Cooley, K., & de Visser, E. J. (2024). Student perceptions of ChatGPT use in a college essay assignment: Implications for learning, grading, and trust in artificial intelligence. *IEEE Transactions on Learning Technologies*, 17, 1069-1081.
- Van Horn, K. R. (2024). ChatGPT in English Language Learning: Exploring Perceptions and Promoting Autonomy in a University EFL Context. *TESL-EJ*, 28(1), 1-26.
- Zenouzagh, M.Z., Admiraal, W., & Saab, N. (2023). Learner autonomy, learner engagement and learner satisfaction in text-based and multimodal computer mediated writing environments. *Education and Information Technologies*, 28(11), 14283-14323.
- Zhou, L., & Li, C. (2020). Can student self-directed learning improve their academic performance? Experimental evidence from the instruction of protocol-guided learning in China's elementary and middle schools. *Sci-Insigt Edu Front*, 5(1), 469-480.