Journal of Education and Learning (EduLearn)
Vol. 19, No. 4, November 2025, pp. 2033~2041
ISSN: 2089-9823 DOI: 10.11591/edulearn.v19i4.23085

Information technology students' perspectives on differentiated instruction and its impact on their approaches to learning

Jiyamole Jose[1], Binu Pathippallil Mathew[2]
[1]College of Computing and Information Sciences, University of Technology and Applied Sciences-Al Mussanah, Al Mussanah, Oman
[2]Preparatory Studies Centre, University of Technology and Applied Sciences-Al Mussanah, Al Mussanah, Oman

Article Info

Article history:

Received Aug 18, 2024
Revised Nov 29, 2024
Accepted Mar 19, 2025

Keywords:

Approaches to learning
Collaboration
Differentiated instruction
Learning styles
Student perspectives

ABSTRACT

There have been many studies about the effectiveness of differentiated instruction in promoting student-centered learning. However, most of these studies have focused on primary and secondary education. There is hardly any research about its application and effectiveness in higher education settings. Furthermore, there is a need to identify the factors that influence information technology or information technology (IT) students' motivation, engagement and attitude towards learning to use appropriate instructional strategies. The current research addresses this gap in the literature by investigating the perspectives of university IT students on differentiated instruction and its impact on their learning attitude. A mixed-methods approach was employed, combining survey questionnaires and semi-structured interviews to examine the effectiveness of various instructional strategies, including scaffolded instruction, peer-assisted learning, collaborative learning, and competitive learning, across different IT courses. The results showed that students had a positive attitude toward differentiated instruction. Respondents reported that the tailored teaching methods helped them better engage with the course material and develop more effective learning strategies. Many students stated that the differentiated approach allowed them to capitalize on their strengths and address their weaknesses in a supportive environment. The findings have implications for educators seeking to promote student-centered learning and improve learning outcomes in IT courses.

Corresponding Author:

Jiyamole Jose
College of Computing and Information Sciences
University of Technology and Applied Sciences-Al Mussanah
PO Box 191, PC 314, Al Musannah, Oman
Email: Jiyamole.Jose@utas.edu.om

1. INTRODUCTION

Tertiary-level students have diverse learning preferences and respond differently to various teaching approaches. Higher education students' frequent attitudinal changes in the classroom often leave instructors perplexed [1]. They often prefer student-centered learning methods over traditional lecture-based approaches and appreciate interactive and hands-on learning experiences that allow them to actively engage with the subject matter. By actively participating in the learning process and taking ownership of their education, information technology or information technology (IT) students feel better equipped to develop the practical skills and knowledge needed for their future careers in the dynamic and ever-evolving field of information technology.

Studies indicate that IT students prefer student-centered activities in the classroom. According to Debs *et al*. [2], IT students welcome flexibility and frequent changes in student-centered instructional strategies, although they face challenges with time management. There is a correlation between students' instructional

preference and their approach to learning [3]. A key factor that determines university students' academic achievement is their learning approach [4]. The most important factor contributing to student engagement is the relevance of the materials and instructional strategies that align with students' interests and learning goals [5]. This cannot be achieved without using modern technology in teaching and learning. Embracing artificial intelligence or artificial intelligence (AI) tools has become inevitable for shaping tomorrow's curriculum across the disciplines [6], [7]. Technology plays an inherent role in promoting student engagement [8]. Integrating AI tools into teaching enhances student engagement and promotes personalized and interactive learning [9], [10]. AI-driven technology greatly contributes to the efficiency of e-learning platforms that enhance adaptive learning [11].

Since the relevance of web-based learning has increased in the post-COVID era, it has accelerated the pace of research in novel pedagogical approaches such as flipped classrooms aimed at promoting self-directed learning [12]. Research shows that online learning is pedagogically promising as it encourages self-paced deep learning [13]. Considering the heterogeneity of classrooms and students' diverse learning styles, teachers should make proactive modifications to instruction to maximize student learning and retention [14]. Effective teachers believe every learner has some hidden potential to succeed, and they try to find the key to unlock that potential [15]. Adaptive teaching allows students to learn new things in the most effective and preferred way [16], [17].

Differentiated instruction is an approach in education and training in which the instructor tailors the content of the lesson to meet individual students' diverse learning needs, abilities, and interests within a classroom. Customized teaching has a positive effect on academic achievements [18]–[20]. Differentiated learning aims to adjust the classroom experience to cater to the learning needs of each student [21]. It aims to create an inclusive learning environment that supports the learning needs of all students. In a differentiated instruction model, teachers identify learners' different learning styles, abilities, backgrounds, and interests and adapt their instructional strategies, materials, and assessments to accommodate these differences. Differentiated instructional models are very effective in addressing student readiness, interest, and learning profiles in the classroom [22].

Tailored instruction demands multiple instructional strategies based on group dynamics [23], [24]. Teachers provide multiple options for representing and accessing content, which can involve using various instructional materials, such as texts, videos, or hands-on activities, to present information differently and cater to different learning styles and flexible grouping. Although students greatly benefit from working in groups, the potential of collaborative learning needs to be adequately exploited in higher education classrooms [25]. Collaboration leads to mutual support and positive interdependence, which enhances learning and engagement [26]. Competition-based learning significantly contributes to developing problem-solving and creating abilities [27]. Competition-based projects stimulate enthusiasm, hands-on abilities, innovation and teamwork among students [28]. Students at higher education institutions greatly benefit from learning styles-based instruction as it considers every student's potential, attitudes, and learning preferences [29]. Project-based learning model ensures the active involvement of students, encourages creativity and innovation and accommodates diverse learning styles [30].

2. METHOD

A mixed-methods approach was used to investigate IT students' perspectives on the impact of differentiated instruction on strategies for learning. The mixed methods approach integrates quantitative data from surveys and qualitative data from semi-structured interviews, providing a deep insight into problems under investigation [31]. A mixed-methods approach enhances understanding of a research question by combining qualitative and quantitative methods, allowing researchers to validate results and gain a more detailed perspective [32]. To ensure that the results were statistically significant and contextually relevant, the researcher used a 5-point Likert scale to measure participants' levels of agreement with various statements in the survey questionnaire and thematically analysed the responses from the semi-structured interviews of the selected participants.

The participants of this study were 52 students specialising in Software Engineering, Networking and Information Security from the Department of Information Technology at the University of Technology and Applied Sciences, Al Musannah, Oman. The research tools used for the study were a survey questionnaire administered on Microsoft Forms and semi-structured interviews with selected participants. The researcher used five different instructional strategies, peer-assisted learning, project-based learning, scaffolded instruction, collaborative learning, and competitive learning, to experiment with differentiated instruction for 12 weeks before administering the questionnaire and conducting the interviews. Table 1 provides a breakdown of the participants' specialisations, with the largest percentage (36.53%) being students studying Information Security, followed by networking (34.61%) and software engineering (28.84%). The cumulative percentage column shows the cumulative percentages for each specialisation, indicating that 100% of the participants are distributed across the three specialisations mentioned.

Table 1. Participant information

	Specialisation	Frequency	Percent	Valid percent	Cumulative percent
Valid	Software engineering	15	28.84	28.84	28.84
	Networking	18	34.61	34.61	63.45
	Information security	19	36.53	36.53	100
	Total	52	100.0	100.0	

3. RESULTS AND DISCUSSION

The perspectives of university IT students on differentiated instruction and its impact on their learning attitudes were deeply analysed by administering survey questionnaires and conducting semi-structured interviews. The results of this study offer valuable insights into learners' views on various instructional strategies, such as scaffolded instruction, peer-assisted learning, collaborative learning, and competitive learning, that affect student engagement and motivation in technical courses. The findings show that the majority of students responded positively to differentiated instruction, highlighting its effectiveness in fostering a more engaging and personalised learning experience. The study also examined potential differences among students in different specialisations of IT courses at the university. The data presented in Figure 1 provides insights into the distribution of opinions among IT students across the three specialisations, software engineering, networking and information security, regarding the relevance of differentiated instruction for IT courses. As can be seen, most students, regardless of their specialisations, agree that differentiated instruction plays a significant role in student achievement, even at the tertiary level.

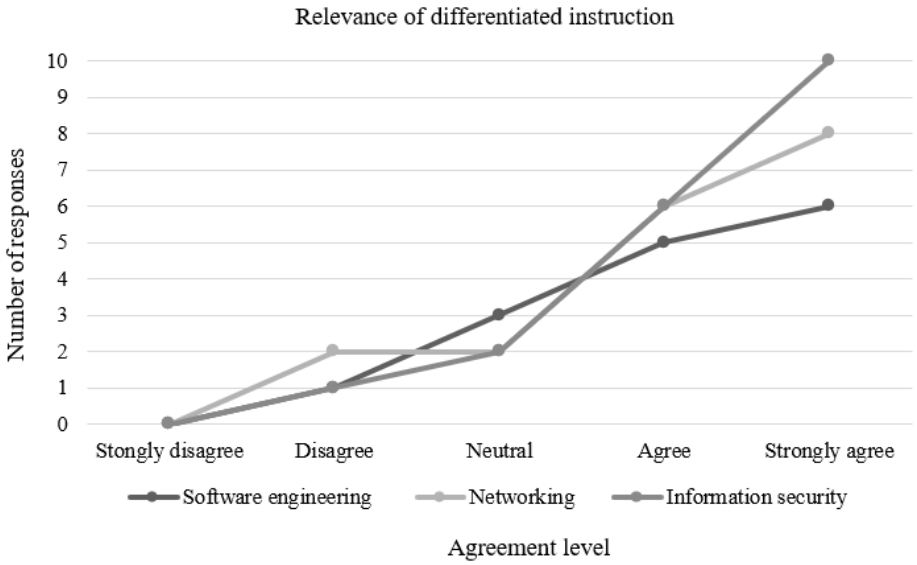

Figure 1. The relevance of differentiated instruction for IT courses

The survey results presented in Figures 2 and 3 reveal the preferences of 52 IT students across three specialisations for different teaching approaches. Scaffolded instruction is the most popular approach, preferred by 36% of the students, followed by collaborative learning at 29%. Project-based and competitive learning are the least favoured, each garnering 15% and 10% of the preferences. The distribution of preferences is relatively even across the specialisations, suggesting a consensus among IT students on the effectiveness of the various teaching strategies. These findings can help the development of teaching methods that cater to the learning needs and preferences of IT students.

Table 2 presents student perspectives on the effectiveness of various teaching approaches in supporting student-centered learning in IT courses. Scaffolded instruction, which provides structured guidance and feedback from the instructor, received the highest mean rating of 4.17, indicating that students found it the most effective approach. Collaborative learning, where students work in small groups to discuss and solve problems, was the second most preferred approach, with a mean of 4.00. Project-based learning, which allows students to apply IT concepts in real-world projects, had a mean of 3.79, suggesting it was also viewed as effective, though less than the top two approaches. Peer-assisted learning, where students discuss and provide feedback to each other, had a mean of 3.46, indicating it was helpful but with more diverse opinions.

Competitive learning, which pits students against each other, had the lowest mean rating of 2.65, suggesting students generally found it less effective for student-centered learning. Overall, the mean average across all approaches was 3.61, indicating that, on average, students viewed these teaching methods as very effective in facilitating student-centered learning in their IT courses.

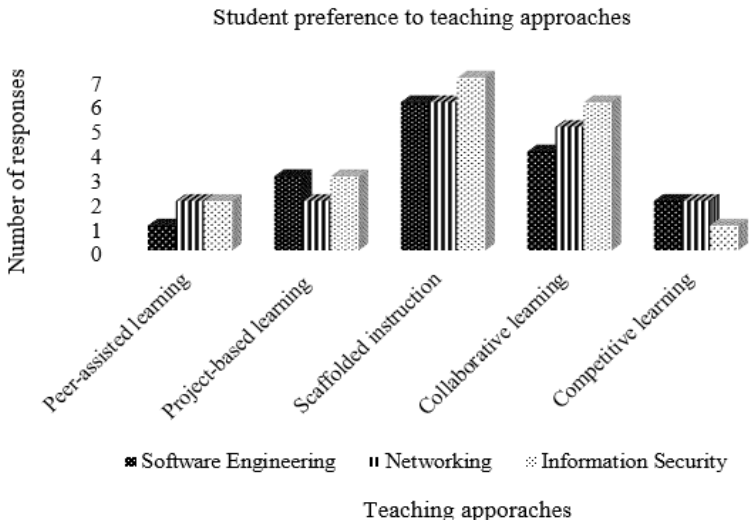

Figure 2. Students' preference to teaching approaches

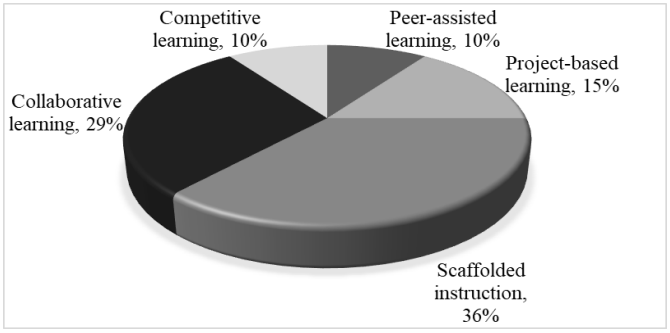

Figure 3. Percentage of students preference to teaching approaches

Table 2. Perceived effect of differentiated instruction on student-centred learning

No	Statements	Mean	Std. deviation
1	Peer-assisted learning helps students work collaboratively with classmates to discuss concepts, provide feedback, and learn from each other	3.46	1.07
2	Project-based learning enhances hands-on, real-world projects that allow you to apply IT concepts and skills	3.79	0.95
3	Scaffolded instruction provides structured guidance, support, and feedback from the instructor as you learn new IT topics	4.17	0.96
4	Collaborative learning facilitates working in small groups to discuss, problem-solve, and learn IT concepts	4.00	0.98
5	Competitive learning involves activities or tasks that challenge you against your classmates to demonstrate your IT knowledge and skills	2.65	1.04

Mean average=3.61

Table 3 presents the thematic analysis of the interview with 12 IT students. As described in the Table 3, the results reveal that students had positive experiences with scaffolded instruction and collaborative learning approaches. Students appreciated the personalized guidance and support received through scaffolded learning, which allowed them to break down complex tasks and receive individualized attention. The

collaborative learning approach was praised for keeping the students engaged and motivated, as they found working in teams on various tasks exciting and effective. Additionally, both collaborative learning and the scaffolded approach were found to help reduce the students' anxiety and stress, as working in groups on projects and having simplified tasks made the learning process easier and less stressful. Finally, the students highlighted that the project-based work and collaborative learning experiences helped them practically apply their skills and develop valuable skills that they believe will benefit their future careers. Overall, the interview findings suggest that the scaffolded instruction and collaborative learning approaches positively impacted the students' learning experiences, fostering personalized support, engagement, reduced stress, and the development of transferable skills.

Table 3. Qualitative data analysis themes with students' comments

Respondent	Themes and verbatim comments
Theme 1: appreciation for personalized support	
S1	"*Personal guidance and support were very helpful*."
S2	"*I liked the way the teacher broke down difficult tasks into manageable steps*."
S3	"*Giving individual attention was the main thing I liked about the new approach*."
Theme 2: engagement and motivation	
S4	"*Working in teams was very interesting and effective*."
S5	"*I enjoy learning when I do some group tasks*."
Theme 3: reduced anxiety and stress	
S6	"*I didn't feel any pressure when I did the project in a group*."
S7	"*Simplifying tasks made learning new concepts easier and reduced my stress*."
Theme 4: transferability of skills	
S8	"*Project work was helpful in applying the skills I developed in class*."
	"*I enjoyed collaborative learning. I am sure it will help me in my future career*."

3.1. Instructional strategies for inclusive learning

Based on the findings, it is evident that pedagogical approaches that promote inclusive learning foster a supportive environment and enrich the educational experience for everyone, providing appropriate resources and support to meet the diverse needs of all students. Inclusive learning is an active, constructive process, so students must work actively and purposefully to gather new information and integrate further information or ideas into what they already know [33]. The act of intellectual processing of constructing meaning or creating something new aimed at personal growth, consciousness-raising, and empowerment should be the basis of student-centered learning [34]. Teachers should use various instructional strategies to enhance individualized learning, such as peer-assisted, project-based, scaffolded, collaborative, and competitive learning [35]. If students are to be prepared for learning throughout their lives, they must be given enough opportunities to develop the ability to regulate their learning as they progress through higher education [36].

3.2. Student engagement and motivation

The participants reported that differentiated instruction was more interesting and engaging, reducing stress and anxiety about solving problems. This supports the view that teachers play a crucial role in student engagement to enhance learners' behavioral, emotional and cognitive experiences [37]. Better student engagement contributes to academic achievement and positive behavior [38]. To actively engage higher education students in class, there needs to be a drastic change in classroom instruction where students should remain the focal point of the teaching-learning process and play an active role in class [39]. The results also call for action to integrate modern technology to empower self-directed learning. IT skills can be acquired only through independent learning strategies and exposure to advanced technology. Hence, promoting self-regulated learning techniques and integrating AI tools is essential to engage students in the learning process inside and outside the class. Integrating artificial intelligence into educational practice is the most effective way to enhance learner empowerment [40].

The majority of participants responded positively to learner-centered activities, specifically project-based learning, as it increased student engagement and encouraged them to take ownership of their education. Educational framework like integrated science, technology, engineering, and mathematics (iSTEAM) that employs project-based learning promotes learners' imagination, creativity, technical skills and motivation [41]. Another important factor that contributes to student engagement and motivation is feedback [42]. It gives students short-term help and direction as they strive to grasp new concepts or skills. Collaborative learning is another instructional strategy that allows students to learn from each other, share ideas, and develop essential teamwork and communication skills. Collaborative learning facilitates cognitive development, critical thinking skills, motivation, and social competence [43].

3.4. Student perceptions of differentiated instruction

The findings of this study provide valuable insights into IT students' perspectives on differentiated instruction and its impact on their approaches to learning at the University of Technology and Applied Sciences, Al Musannah, Oman. The mixed-methods approach, which combined a questionnaire with in-depth interviews, allowed for a multifaceted examination of this important issue. The quantitative data revealed that students held a positive attitude toward differentiated instruction. Most respondents reported that scaffolded instruction helped them engage more deeply with the course content and develop more effective learning strategies. This aligns with previous research indicating that differentiated instruction can enhance student motivation, engagement, and self-regulation in higher education settings [23].

The interview data further elucidated how differentiated instruction facilitated a more enriching learning experience for IT students. Participants described how the varied instructional techniques catered to their learning styles, enabling them to grasp complex concepts more thoroughly. This finding supports the theoretical foundation of differentiated instruction, which posits that adapting teaching to students' diverse needs and preferences can foster deeper understanding [14]. Participants also highlighted how the personalized support and guidance provided through differentiated instruction boosted their confidence and motivation in the program. This is consistent with research suggesting that tailored instructional approaches can enhance students' self-efficacy and intrinsic motivation. Differentiated instruction may help IT students develop a stronger sense of ownership and agency over their educational journey by addressing learners' unique strengths, weaknesses, and preferences. Therefore, instructors should be mindful of such individual differences and balance differentiated and standardized teaching strategies to accommodate a range of learning preferences.

3.5. Implications for curriculum design in IT courses

The results of this study highlight that IT students have positive perceptions about differentiated instruction. This insight has significant implications for curriculum design in IT-related courses at the tertiary level. Based on the findings of this study, it is recommended that instructors in IT programs in higher-education institutions consider implementing more differentiated instructional approaches. The positive attitudes and experiences shared by students suggest that tailoring teaching methods to individual learning preferences can enhance engagement, self-regulation, and a deeper understanding of complex technical concepts. Besides, employing varied instructional strategies can significantly contribute to the efficiency of teachers. Differentiated instruction enhances performance and promotes positive attitudes among educators in higher education [44].

To maximize the benefits of differentiated instruction, instructors should strive to balance personalized and standardized teaching strategies, recognizing that some students may be more receptive to traditional approaches. Ongoing professional development and support for faculty members could also facilitate the successful integration of differentiated instruction in university settings. Further research is needed to explore the long-term academic and professional outcomes associated with differentiated instruction in technical disciplines and to investigate strategies for effectively implementing this pedagogical approach in higher education. Additionally, studies examining faculty members' perspectives on differentiated instruction would provide valuable insights into the broader implementation and feasibility of this instructional approach in university settings.

Overall, the results of this study suggest that differentiated instruction can positively impact IT students' approaches to learning at the university level. The traditional one-size-fits-all teaching approach often creates a mismatch between instructional strategies and the academic demands of the millennials [45]. Differentiated instruction is an effective teaching approach for addressing individual learning needs and maximizing learning opportunities [46]. Therefore, instructors may enhance students' engagement, self-regulation, and deeper understanding of complex topics by tailoring teaching methods to individual needs and preferences. However, it is important to recognize that the effectiveness of differentiated instruction may vary among students, and a multifaceted approach that integrates both differentiated and standardized elements may be optimal.

4. CONCLUSION

In conclusion, differentiated instruction can have a positive impact on IT students' approaches to learning at the tertiary level. The findings of this study reveal that overall, students have a positive attitude toward the tailored teaching methods, which they perceive as enhancing their engagement, self-regulation, and deeper understanding of course content. The interview data highlights how differentiated instruction caters to individual learning preferences and boosts students' confidence and motivation. While some participants preferred more traditional approaches, the results indicate that differentiated instruction can be an effective instructional strategy in technical disciplines at the university level. By adapting teaching methods to students' diverse needs and strengths, instructors may be able to foster a more enriching and transformative learning experience.

ACKNOWLEDGEMENTS

We express our heartfelt gratitude to the head and staff of the College of Computing and Information Sciences at the University of Technology and Applied Sciences-Al Mussanah for their unwavering moral support and encouragement throughout this research journey. We also extend our sincere thanks to the participating students, whose cooperation and willingness to share their insights made this study possible. Their contributions have enriched this research and are deeply appreciated.

FUNDING INFORMATION

The authors declare that this study received no financial support from any agency or institution.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Jiyamole Jose	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Binu Pathippallil Mathew		✓			✓		✓			✓	✓	✓		✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state that there are no conflicts of interest regarding the publication of this research paper. The study was conducted independently, and the findings presented herein are the result of unbiased scientific inquiry.

INFORMED CONSENT

The authors hereby declare that informed consent was obtained from all individuals participating in this study. Each participant was fully informed about the nature, purpose, and potential risks of the study, and their participation was voluntary. All individuals provided written consent prior to their inclusion in the research.

ETHICAL APPROVAL

The authors hereby affirm that ethical approval for this research was obtained prior to the commencement of the study. The study protocol was reviewed and approved by the relevant research and ethics committee of the institution ensuring that all ethical guidelines and standards were adhered to.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [JJ], upon reasonable request.

REFERENCES

[1] J. M. Raj, S. H. P. Kumar, Balamuralitharan, P. M. Binu, and T. Karunakaran, "Data analysis in real life problems: a study on the psychological approach of students towards their subject and teacher," *Journal of Critical Reviews*, vol. 7, no. 6, pp. 432–436, 2020, doi: 10.31838/jcr.07.06.76.

[2] L. Debs, K. D. Miller, I. Ashby, and M. Exter, "Students' perspectives on different teaching methods: comparing innovative and traditional courses in a technology program," *Research in Science and Technological Education*, vol. 37, no. 3, pp. 297–323, 2019, doi: 10.1080/02635143.2018.1551199.

[3] M. Baeten, F. Dochy, K. Struyven, E. Parmentier, and A. Vanderbruggen, "Student-centred learning environments: an investigation into student teachers' instructional preferences and approaches to learning," *Learning Environments Research*, vol. 19, no. 1, pp. 43–62, 2016, doi: 10.1007/s10984-015-9190-5.

[4] T. T. Negash, M. T. Eshete, and G. A. Hanago, "Students' learning approaches as a factor of academic achievement at selected public universities: a cross-sectional study," *Frontiers in Education*, vol. 7, 2022, doi: 10.3389/feduc.2022.965573.

[5] E. F. Barkley and C. H. Major, *Student engagement techniques: A handbook for college faculty*. Jossey-Bass, 2010.
[6] B. Dube and W. Setlalentoa, "Artificial intelligence in education: embracing change, addressing challenges, and shaping tomorrow's curriculum," *Interdisciplinary Journal of Education Research*, vol. 6, no. s1, pp. 1–2, Sep. 2024, doi: 10.38140/ijer-2024.vol6.s1.01.
[7] S. Wilson-Rochford and Alice May, "Building tomorrow's learning landscape through AI integration and development in higher education," *Journal of Learning Development in Higher Education*, no. 32, Oct. 2024, doi: 10.47408/jldhe.vi32.1426.
[8] M. Bond and S. Bedenlier, "Facilitating student engagement through educational technology: towards a conceptual framework," *Journal of Interactive Media in Education*, vol. 2019, no. 1, 2019, doi: 10.5334/jime.528.
[9] M. J. Hannafin and S. M. Land, "Technology and student-centered learning in higher education: issues and practices," *Journal of Computing in Higher Education*, vol. 12, no. 1, pp. 3–30, 2000, doi: 10.1007/BF03032712.
[10] B. P. Mathew, "Affordances and challenges of integrating artificial intelligence into English language education: a critical analysis," *English Scholarship Beyond Borders*, vol. 10, no. 1, pp. 34–51, 2024.
[11] I. Gligorea, M. Cioca, R. Oancea, A. T. Gorski, H. Gorski, and P. Tudorache, "Adaptive learning using artificial intelligence in e-learning: a literature review," *Education Sciences*, vol. 13, no. 12, 2023, doi: 10.3390/educsci13121216.
[12] K. Fuchs, "Innovative teaching: A qualitative review of flipped classrooms," *International Journal of Learning, Teaching and Educational Research*, vol. 20, no. 3, pp. 18–32, 2021, doi: 10.26803/ijlter.20.3.2.
[13] T. Tang, A. M. Abuhmaid, M. Olaimat, D. M. Oudat, M. Aldhaeebi, and E. Bamanger, "Efficiency of flipped classroom with online-based teaching under COVID-19," *Interactive Learning Environments*, vol. 31, no. 2, pp. 1077–1088, Feb. 2023, doi: 10.1080/10494820.2020.1817761.
[14] C. A. Tomlinson *et al.*, "Differentiating instruction in response to student readiness, interest, and learning profile in academically diverse classrooms: A review of literature," *Journal for the Education of the Gifted*, vol. 27, no. 2–3, pp. 119–145, 2003, doi: 10.1177/016235320302700203.
[15] G. H. Gregory and C. Chapman, *Differentiated instructional strategies: one size doesn't fit all*. Corwin Press, Inc., 2012.
[16] H. Ismajli and I. Imami-Morina, "Differentiated instruction: understanding and applying interactive strategies to meet the needs of all the students," *International Journal of Instruction*, vol. 11, no. 3, pp. 207–218, 2018, doi: 10.12973/iji.2018.11315a.
[17] H. L. Pham, "Differentiated instruction and the need to integrate teaching and practice," *Journal of College Teaching & Learning (TLC)*, vol. 9, no. 1, pp. 13–20, 2012, doi: 10.19030/tlc.v9i1.6710.
[18] M. Chamberlin and R. Powers, "The promise of differentiated instruction for enhancing the mathematical understandings of college students," *Teaching Mathematics and its Applications*, vol. 29, no. 3, pp. 113–139, 2010, doi: 10.1093/teamat/hrq006.
[19] N. P. kan Lo, P. A. M. Bremner, and K. E. Forbes-McKay, "Corrigendum: influences on student motivation and independent learning skills: cross-cultural differences between Hong Kong and the United Kingdom," *Frontiers in Education*, vol. 9, 2024, doi: 10.3389/feduc.2024.1434305.
[20] H. Mohsenipouya, S. F. Monsefi, A. Hosseinnataj, M. A. Mamun, and F. Al-Mamun, "The effect of learning styles on the academic achievement of nursing students: a cross-sectional study," *BMC research notes*, vol. 17, no. 1, p. 294, 2024, doi: 10.1186/s13104-024-06949-8.
[21] M. van Geel, T. Keuning, J. Frèrejean, D. Dolmans, J. van Merriënboer, and A. J. Visscher, "Capturing the complexity of differentiated instruction," *School Effectiveness and School Improvement*, vol. 30, no. 1, pp. 51–67, 2018, doi: 10.1080/09243453.2018.1539013.
[22] C. A. Tomlinson, "Differentiated instruction," in *Fundamentals of gifted education*, Routledge, 2017, pp. 279–292.
[23] O. N. De Jesus, "Differentiated instruction : can differentiated instruction provide success for all learners ?," *National Teacher Education Journal*, vol. 5, no. 3, pp. 5–12, 2012.
[24] P. Subban, M. N. Suprayogi, M. Preston, A. N. Liyani, and A. P. P. Ratri, "'Differentiation is sometimes a hit and miss'. Educator perceptions of differentiated instruction in the higher education sector," *Asia-Pacific Education Researcher*, 2024, doi: 10.1007/s40299-024-00904-8.
[25] D. W. Johnson, R. T. Johnson, and K. Smith, "The state of cooperative learning in postsecondary and professional settings," *Educational Psychology Review*, vol. 19, no. 1, pp. 15–29, 2007, doi: 10.1007/s10648-006-9038-8.
[26] K. Scager, J. Boonstra, T. Peeters, J. Vulperhorst, and F. Wiegant, "Collaborative learning in higher education: evoking positive interdependence," *CBE Life Sciences Education*, vol. 15, no. 4, 2016, doi: 10.1187/cbe.16-07-0219.
[27] S. A. Sukiman, H. Yusop, R. Mokhtar, and N. H. Jaafar, "Competition-based learning: determining the strongest skill that can be achieved among higher education learners," *Regional Conference on Science, Technology and Social Sciences (RCSTSS 2014)*, pp. 505–516, 2016, doi: 10.1007/978-981-10-1458-1_47.
[28] D. Chen, Z. Li, and T. Wang, "Exploration and practice: a competition based project practice teaching mode," *Mechatronics*, vol. 24, no. 2, pp. 128–138, 2014, doi: 10.1016/j.mechatronics.2013.12.009.
[29] C. Tulbure, "The effects of differentiated approach in higher education: an experimental investigation," *Procedia - Social and Behavioral Sciences*, vol. 76, pp. 832–836, Apr. 2013, doi: 10.1016/j.sbspro.2013.04.215.
[30] I. J. Nurhidayah, F. C. Wibowo, and I. M. Astra, "Project based learning (PjBL) learning model in science learning: literature review," in *Journal of Physics: Conference Series*, vol. 2019, no. 1, p. 012043, Oct. 2021, doi: 10.1088/1742-6596/2019/1/012043.
[31] S. P. Wasti, P. Simkhada, E. van Teijlingen, B. Sathian, and I. Banerjee, "The growing importance of mixed-methods research in health," *Nepal Journal of Epidemiology*, vol. 12, no. 1, pp. 1175–1178, 2022, doi: 10.3126/nje.v12i1.43633.
[32] B. S. Selznick, "Always almost there: perspectives on mixed methods research in higher education," *Innovative Higher Education*, 2024, doi: 10.1007/s10755-024-09754-0.
[33] A. McCabe and U. O'Connor, "Student-centred learning: the role and responsibility of the lecturer," *Teaching in Higher Education*, vol. 19, no. 4, pp. 350–359, 2014, doi: 10.1080/13562517.2013.860111.
[34] S. Tangney, "Student-centred learning: a humanist perspective," *Teaching in Higher Education*, vol. 19, no. 3, pp. 266–275, 2014, doi: 10.1080/13562517.2013.860099.
[35] D. Bayram-Jacobs and F. Hayırsever, "Student-centred learning: how does it work in practice?," *British Journal of Education, Society & Behavioural Science*, vol. 18, no. 3, pp. 1–15, 2016, doi: 10.9734/bjesbs/2016/28810.
[36] M. A. Al Zakwani and P. M. Binu, "Exploring student insights on ChatGPT as a resource for learning English and its influence on learner independence," *Forum for Linguistic Studies*, vol. 7, no. 2, pp. 813–824, 2025, doi: 10.30564/fls.v7i2.7955.
[37] M. Pedler, S. Hudson, and T. Yeigh, "The teachers' role in student engagement: a review," *Australian Journal of Teacher Education*, vol. 45, no. 3, pp. 48–62, 2020, doi: 10.14221/ajte.2020v45n3.4.
[38] L. Taylor and J. Parsons, "Improving student engagement," *Current Issues in Education*, vol. 14, no. 1, pp. 1–32, 2011.
[39] E. L. K. Seng, "Investigating teachers' views of student-centred learning approach," *International Education Studies*, vol. 7, no. 7, pp. 143–148, Jun. 2014, doi: 10.5539/ies.v7n7p143.

[40] A. Mohebbi, "Enabling learner independence and self-regulation in language education using AI tools: a systematic review," *Cogent Education*, vol. 12, no. 1, p. 2433814, 2025, doi: 10.1080/2331186X.2024.2433814.
[41] C. C. Chung, S. L. Huang, Y. M. Cheng, and others, "Using an iSTEAM project-based learning model for technology senior high school students: Design, development, and evaluation," *International Journal of Technology and Design Education*, vol. 32, pp. 905–941, 2022, doi: 10.1007/s10798-020-09643-5.
[42] J. Hattie and H. Timperley, "The power of feedback," *Review of Educational Research*, vol. 77, no. 1, pp. 81–112, 2007, doi: 10.3102/003465430298487.
[43] I. Warsah, R. Morganna, M. Uyun, M. Afandi, and H. Hamengkubuwono, "The impact of collaborative learning on learners' critical thinking skills," *International Journal of Instruction*, vol. 14, no. 2, pp. 443–460, 2021, doi: 10.29333/iji.2021.14225a
[44] M. Darra and E.-M. Kanellopoulou, "The implementation of the differentiated instruction in higher education: a research review," *International Journal of Education*, vol. 11, no. 3, p. 151, 2019, doi: 10.5296/ije.v11i3.15307.
[45] W. D. Turner, O. J. Solis, and D. H. Kincade, "Differentiating instruction for large classes in higher education," *International Journal of Teaching*, vol. 29, no. 3, pp. 490–500, 2017.
[46] E. Gheyssens, J. Griful-Freixenet, and K. Struyven, "Differentiated instruction as an approach to establish effective teaching in inclusive classrooms," *Effective Teaching Around the World: Theoretical, Empirical, Methodological and Practical Insights*, pp. 677–689, 2023, doi: 10.1007/978-3-031-31678-4_30.

BIOGRAPHIES OF AUTHORS

Jiyamole Jose obtained her master's degree in Information Technology from Mahatma Gandhi University, India. She is currently a faculty member in the College of Computing and Information Sciences at the University of Technology and Applied Sciences-Al Musannah, Oman. Her research interests include learning strategies, diversity and inclusion in education, social and emotional learning, learning environments, artificial intelligence and machine learning, data science, software engineering, and cybersecurity. She can be contacted at email: Jiyamole.Jose@utas.edu.om.

Binu Pathippallil Mathew is a member of English Scholars Beyond Borders (ESBB) and currently works at the University of Technology and Applied Sciences-Al Mussanah, Oman. He is the author of the book 'Slow Learners in the English Classroom'. His professional interests include classroom research, learning strategies, intercultural communication, computational linguistics, discourse analysis, and artificial intelligence in language education. He can be contacted at email: binu.mathew@utas.edu.om.