

Integrating AI in higher education: transforming teachers' roles in boosting student agency

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Abstract. Artificial intelligence (AI) has emerged as an integral part of education. It is revolutionising teaching and learning by offering personalised and engaging atmospheres to learners. Specifically, AI competes with agency-building among learners and teachers. Broadly, AI has strengthened learner agency despite teachers' ongoing uncertainty about whether it supports or complicates their work. This study aimed to assess how AI integration in higher education affects teachers' roles in promoting student agency and to explore how AI has transformed teachers' roles in fostering student agency. A sequential mixed method was used as the design of the study. A survey using a five-point Likert scale was conducted to analyse the roles of teachers in the context of integrating AI to enhance agency in higher education. A total of 121 teachers from seven different universities in Nepal duly completed the Google Form, which was distributed via email and social media platforms. Similarly, in-depth interviews were conducted with three teachers teaching at the same level to gather qualitative information and derive qualitative findings. The findings suggest that integrating AI in teachers' roles significantly enhances student agency. The findings also elaborate that AI integration in higher education largely affects teachers' roles in promoting student agency. Similarly, this study contributes to enhancing student agency within the context of changing teachers' roles due to the use of AI in the teaching-learning process. To tackle the issue effectively, the researchers emphasise the need to shift the traditional role of teachers to that of mentors or facilitators, ensuring seamless enhancement of student agency through the integration of AI.

Keywords: artificial intelligence, student agency, higher education, teachers' roles, role theory

1. Introduction

Artificial intelligence (AI) is progressing speedily [23] in education. It has largely influenced higher education [13, 24]. The integration of AI has brought a context of digital transformation in higher education, which can revolutionise the education system. The implication of AI and game-based approaches break up the traditional one-size-fits-all education model by providing new insights into experiences to personalised learning [32]. AI's creative capacity to create varied content has brought unimaginable problem-solving and critical-thinking facilities. Moreover, generative and creative AI tools have brought promising change and increased engagement in the education context [23]. The prevalence of generative AI has motivated many research initiatives in the field of education [51], especially in the higher education context.

To deliver a comprehensive evaluation of both current and evolving AI applications in higher education, universities have adopted AI-driven technologies to enhance and improve student learning experiences [24], allowing students to gain practical skills in a safe and controlled environment [6]. AI has made teaching more efficient and

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transformative, revolutionising classrooms by enhancing interactivity and improving the overall quality of education. It has changed the traditional education system by giving new ideas and insights impacting classroom teaching and learning situations [13, 29]. Overall, the integration of AI has changed the classroom situation. It alters the way engagements and activities are conducted. Similarly, the contribution of AI in classrooms has shaped the roles of teachers with new perspectives. This recent technology is changing traditional education, teaching and teachers' new roles for teaching reform [13]. The new roles of teachers in boosting agencies are required because of the inevitable integration of AI in classrooms.

By leveraging AI to tailor learning experiences, improve instructional resources, and encourage creativity in the classroom, teachers can develop more engaging, inclusive, and effective learning environments for all students [28]. By adopting AI technologies, teachers can nurture 21st-century skills like creativity, critical thinking, and collaboration, equipping students for success in an increasingly AI-powered world [32]. At large, the integration of AI in higher education presents a paradigm shift with a profound implication for learning, teaching and the broader education landscape.

As AI algorithms advance rapidly, educators are increasingly investigating the potential of these technologies to revolutionise traditional educational methods, including the role of teachers. Higher education teachers face challenges due to the use of generative AI. This has contested their traditional roles. This study tried to assess how AI integration in higher education affects teachers' roles in promoting student agency by surveying teachers across various higher education institutions in Nepal. It also sought to identify how AI has reshaped teachers' roles in promoting student agency.

1.1. Research questions

1. To what extent does AI integration in higher education affect teachers' role in promoting student agency?
2. What are the specific ways AI has transformed teachers' roles in fostering student agency?

2. Literature review

2.1. Agency theory

Klemenčič [33] brings the concept of student agency as a process of students' self-directed reflective actions from social cognition theory related to the sociological theory of human agency developed by Bandura [7]. Prior to Klemencic, Bandura [9] positioned social cognitive theory in personal agency, proxy agency, and collective agency. According to him, a person who gains agency through personal involvement and efforts is personal agency. An agency drawn from others to act and achieve personal goals is a proxy agency. The assistance of groups or collaborative efforts gains collective agency. Relationships are collectively enacted within a broader social context and shaped by outside forces – other agency relationships, competitors, interest groups, regulators [10]. Further, Bandura [8] claims that social cognitive theory classifies three types of environments: imposed, selected, and constructed. These environments play a crucial role in enhancing agency-building activities in classrooms. In a way, the level of agency is influenced by the characteristics of the environment and the opportunities it provides for exercising agency. In another way, the environment affects the agency's potential through the resources it provides [21]. Similarly, Noteboom [44] asserts that agency stems from the authenticity of the environment in which agency is exercised. Furthermore, it can be inferred that agency results from the interplay of individual and collective perceptions and intentions and the conditions provided by the environments, such as the school and surrounding

community [22], which also shapes the teachers' roles. Thus, agency, activities and environment are relative to each other.

In the related context, Bandura [7] puts that agency represents the integration of personal attributes, belief systems, self-regulatory capacities, and distributed mechanisms through which individuals exert influence. The individual offered a choice may feel a sense of autonomy, control or empowerment. In parallel, when more choices are available, individuals can better develop the capability to identify and select alternatives that support the growth of agency [41]. Furthermore, Bandura [9] suggests that student voices impact agency by increasing students' ability to articulate what they think and allowing their leadership ideas to develop. This, in turn, leads to greater learning and improved leadership. Thus, agency refers to the personalisation of the institutional ecosystem and its interaction with the broader macrosystem, the collective approach involving various dimensions that comprise society at large [34]. Recognising student agency is crucial as it enables individuals to have command over their border learning situation within actions and interactions through engagements [19]. Therefore, engagement in activities, individual belief systems and self-reflective actions are relative to agency building.

Additionally, Kuzhabekova and Amankulova [36] believe that agency encompasses the capacity for intentional action and change. It serves as both an objective and a mechanism to empower learners in navigating unfamiliar educational contexts [38]. Student agency extends beyond individual intentions; it involves how students engage with the curriculum, teaching methods, and the broader educational context, gaining empowerment through these interactions [36]. The agency is implemented through understanding one's past, present, and future through engaging with the surrounding environment [21]. Therefore, the agency can set goals, make choices, deliberate decisions, solve problems [17], and take intentional actions that align with one's values and aspirations. It involves exercising autonomy while navigating constraints and opportunities in various contexts. The agency enables individuals to reflect on their circumstances, adapt to challenges, and actively participate in shaping their learning and development.

2.2. Role theory

Teacher socialisation has developed substantially over the years based on the theoretical frameworks of organisational socialisation [48] and role theory [40]. Roles are social positions or socially recognised categories to be performed by actors [27], who act in the given position. The teacher is the social position who has to perform various roles such as instructor, mentor, counsellor, facilitator, etc. These roles can be viewed as the implications for how the various roles of the teacher are coordinated with those of related roles [1]. In role theory, social status is understood as a pattern of behaviour or a specific position within the social structure [47]. Social organisational structure also comprises the system of role [11] to be performed by the position given by the social institution.

Similarly, teachers, as the positions given by the social organisation, foster a stimulating and positive learning environment [26, 46]. Their role is the dynamic aspect of a particular status [47] to be performed in classrooms and beyond, particularly for teaching-learning purposes. In order to play the role adequately, the teachers depend on students' appropriate indications and responses [12]. This means the role has a dynamic of interplay between teachers and students. It is essential to consider the temporal and contextual dimensions of the specific setting to understand how a role is shaped and how individuals are socialised into it. Role consensus is more likely when individuals have been socialised to share a similar perspective on how the role should be performed [47]. Role theory, however, explains how the teacher's role is

socially constructed and highlights the stressors arising from discrepancies in role performance expectations.

Moreover, the teachers, who were once mainly focused on facilitating learning, now take on new roles as curators of AI-generated content, mentors in digital literacy, and guides in fostering collaborative learning environments [28]. These changes have emerged both as a professional self-image and students' expectations [12] in the changing scenario brought by the advancement of AI in education. This shift in the role of teachers from dominant information feeder to a moderator [4, 45] offers a dynamic context in the classroom. This has brought unique opportunities for teachers to facilitate students searching for knowledge and related phenomena from the AI world. Therefore, the teacher's role in fostering and sustaining student engagement is vital, making it necessary to reassess teachers' current perceptions of student self-engagement [46] to collaborative facet with the AI. In today's rapidly changing world, teachers must understand how their roles shift across different contexts [49]. However, they must also be mindful of maintaining role balance, particularly as individuals manage multiple responsibilities through adaptive strategies – such as task prioritisation – in response to the growing influence of AI [47]. Therefore, role performance is an individual's actual behaviour in fulfilling their assigned role within a specific context. It is not fixed but negotiated through interactions between the status incumbent and the role-set. This negotiation allows for adjustments and mutual expectations, ensuring that the role performance aligns with the demands and dynamics of the social environment.

These studies demonstrate that while AI facilitates individualised feedback, the teacher's role in interpreting AI-generated insights remains under-theorised – in the context of changing teachers' roles with AI. This gap in the literature can be addressed by role theory, which helps us understand how teachers navigate and fulfil the expectations and responsibilities associated with their professional roles. However, the lack of a well-defined theoretical framework for this role complicates its effective implementation. Role theory can be clarified by examining the dynamic interplay between AI's technological affordances and teachers' evolving responsibilities. Furthermore, by bringing role theory into the discussion, we can better conceptualise the evolving nature of the teacher's role in an AI-enhanced educational environment.

3. Methods and materials

This study follows an explanatory sequential mixed method, which is gaining popularity in social science research [2]. The design demands the collection of quantitative data at first and then the collection of qualitative information to explain the quantitative result [20]. Considering Leavy [37], the five-point Likert scale questionnaire survey was designed to cover a large sample population from higher education institutions among the teachers who adopted AI in their teaching-learning activities. Three teachers teaching for more than ten years in higher education institutions were purposively selected to obtain qualitative information. They have used AI in their teaching-learning activities for over three years. We adopted open-ended interviews with follow-up informal discussions to elicit in-depth information.

3.1. Population and research sites

The study population entails the total population of teachers teaching in higher education institutes or universities in Nepal. The non-probability sampling technique was employed in selecting the respondents, specifically, the convenience sampling technique. We applied the convenience sampling method based on the availability of the cases and the respondents' readiness to respond to the researcher questions [31]. In this study, the selection process was not standardised; however, one common

criterion was applied: the use of AI in the respondent's teaching and learning process within the higher education context was given significant consideration. We did not have a pre-arranged plan to select specific respondents for the sample; instead, teachers from various institutions and universities who were readily accessible through social media platforms and email were selected and sent the questionnaire via Google Forms.

The main reason for using convenience sampling was the difficulty in acquiring a complete list of teachers from all universities in Nepal. To minimise potential bias and ensure diversity, we emailed over three hundred university teachers, whose contact information was gathered from various sources, including M. Phil. and PhD student groups formed by Graduate Schools of Education under Tribhuvan University, Nepal. Consequently, the sample was limited to teachers from seven universities accessible to the researchers. Among them, 121 university teachers dully filled out the Google Forms. We employed convenience sampling due to contextual constraints such as time, accessibility, and institutional permissions. While this approach enabled data collection from a relevant and available pool of participants, it may limit the generalizability of the findings beyond the sampled universities. The lack of random selection means that the sample may not fully represent Nepal's broader population of university teachers. Table 1 shows the profile of respondents.

Table 1
Respondents' profile.

Category	Subcategory	Number	Percentage
Gender	Male	92	72%
	Female	28	23.1%
	Other	1	0.8%
Qualification	PhD	21	17.4%
	M. Phil.	33	27.3%
	Masters	67	55.4%
Year of experiences in teaching	10 Years Plus	90	74.4%
	5-10 Years	20	16.5%
	Less than 5 years	11	9.1%

For the qualitative information, we selected three teachers currently teaching at the university level for interviews after obtaining their written consent following the result of the quantitative study. The researcher considered homogeneity in using AI in their teaching-learning process for over three years. We used the pseudo-names of the teachers for confidential matters. Table 2 represents the demographic profile of the participants for the qualitative part of the study.

Table 2
Participant teachers' profile.

Teacher	Teaching experience	Use of AI	Qualification	Level of teaching
Ramesh	23 years	Four years	M. A. in ELT	Bachelor
Kripa	6 years	Three years	M. Sc. in Chemistry	Bachelor
Raghav	25 years	Five years	M. Phil. in Literature	Bachelor

3.2. Data collection tools

We used a five-point Likert scale questionnaire to obtain quantitative data, consisting of various questions related to the topic and objectives [39]. In this, the respondents

had chances to respond from options ranging from strongly agree to strongly disagree [31]. We validated the questionnaire with the consent of three experts. We conducted open-ended interviews and follow-up discussions with three teachers to substantiate the information.

3.3. Data analysis process

We employed a descriptive survey focusing on standardised questions analysed statistically [30] in this study. Following Leavy [37], we made tables, charts, and discussions to analyse descriptive data using statistical tools. The survey data were managed and statistically analysed using SPSS software. We recorded, transcribed, translated, coded, and categorised the qualitative information using ATLAS.ti software. Two themes emerged from the coding process. The two sets of data (quantitative and qualitative) were simultaneously discussed [2] considering the research questions.

3.4. Reliability test

Table 3 represents the reliability test of the questionnaires administered in this study.

Table 3

Reliability test of the questionnaires.

Coding	Variable	Number of items	Cronbach's alpha	Interpretation
IAITR	Integration of AI in Teachers' Role	10	0.915	Highly relevant
SA	Student Agency	11	0.926	Highly relevant

All variables have Cronbach's alpha values above 0.90, indicating "highly relevant" reliability. This high level of reliability suggests that the items within each variable are closely related and measure their respective constructs effectively. No significant modifications or exclusions of items are likely required, as the scales demonstrate robust consistency.

3.5. Correlation and regression analysis

IAITR measures categories. In this case, Spearman rank correlation was used to show the relationship between IAITR and SA. Similarly, the ordinal regression method was used to evaluate the impact of IAITR on SA.

4. Results

4.1. Quantitative results

The results of the quantitative examinations are dealt with here. Table 4 presents the results of a correlation analysis between the variables IAITR and SA. The correlation coefficient between IAITR and SA is 0.549, signifying a moderate positive relationship. This suggests that as IAITR increases, SA tends to increase as well. The correlation is statistically substantial at the 0.01 level (denoted by **), with a *p*-value of .000, indicating strong evidence against the null hypothesis of no correlation. Both variables have 121 observations (*N* = 121). The table's diagonal shows a perfect correlation of 1.000 for each variable with itself, as expected. These findings imply that IAITR is moderately and significantly associated with SA.

On the other hand, table 5 presents the ANOVA results of the regression model. The regression sum of squares is 21.241 and represents the variation of the dependent variable explained by the independent variable. The residual sum of squares, 48.080, represents variations not explained by the model. The total sum of squares is 69.321, the total variation in the dependent variable.

Table 4

Correlation analysis.

Correlations			IAITR	SA
Spearman's rho	IAITR	Correlation coefficient	1.000	.549**
		Sig. (2-tailed)	.	.000
		N	121	121
	SA	Correlation coefficient	.549**	1.000
		Sig. (2-tailed)	.000	.
		N	121	121

**Correlation is significant at the 0.01 level (2-tailed).

Table 5

Variance analysis.

ANOVA	Sum of squares	df	Mean square	F	Sig.
1 Regression	21.241	1	21.241	52.571	.000 ^b
Residual	48.080	119	.404		
Total	69.321	120			

a. Dependent variable: SA

b. Predictors: (constant), IAITR

The model has 1 degree of freedom (df) for regression and 119 degrees for residuals, resulting in 120 degrees of freedom. The mean square for regression is 21.241, calculated by dividing the regression sum of squares by its degrees of freedom. The resulting F-statistic is 52.571, which tests the null hypothesis that the model does not explain the dependent variable better than a model with no predictors. The *p*-value (Sig.) is .000, indicating that the model is statistically significant and that the independent variable (IAITR) significantly predicts the dependent variable (SA). This suggests a strong model fit.

Similarly, table 6 presents the coefficients from a regression analysis, showing the relationship between the independent variable (IAITR) and the dependent variable (SA). The standardised coefficient (β) for IAITR is 0.554, indicating a strong effect of IAITR on SA in standardised terms.

The *t*-value for the constant is 3.532 with a *p*-value of 0.001, showing that the intercept is statistically significant. The *t*-value for IAITR is 7.251 with a *p*-value of 0.000, indicating that IAITR is a highly significant predictor of SA. These results suggest a strong and statistically significant positive relationship between IAITR and SA.

Table 7 summarises the model-fitting information for logistic regression. The -2

Table 6

Coefficient analysis.

Model		Unstandardized coefficients		Standardized coefficients	<i>t</i>	Sig.
		B	Std. error	β		
1	(Constant)	1.115	.316		3.532	.001
	IAITR	.611	.084	.554	7.251	.000

a. Dependent variable: SA

log-likelihood of the intercept-only model is 584.334, while that of the final model is 483.889, showing that adding predictors improves the fit. The difference between these two, as shown by the χ^2 statistic, is 100.445 and represents the improvement involving the predictors. With df 32, the associated *p*-value (Sig.) is .000, which shows that, as a set, predictors significantly improved the explanation of the outcome variable beyond what was provided by the intercept-only model. These results suggest that the final model fits the data well.

Table 7
Model fitting.

Model	-2 log-likelihood	χ^2	df	Sig.
Intercept only	584.334			
Final	483.889	100.445	32	.000

Table 8 presents the goodness-of-fit statistics for the logistic regression model. The Pearson χ^2 value is 55,357.149 with 1,184 degrees of freedom (df) and a *p*-value of .000. This indicates that the model may not fit the data well, as a significant Pearson statistic suggests that the observed data deviate significantly from the expected data under the model. This contradiction warrants deeper scrutiny. The Pearson test is highly sensitive to large sample sizes and data sparsity. The extremely high Pearson χ^2 statistic may reflect overdispersion or cells with low expected frequencies, especially if some predictor combinations are rare. The deviance test, which is generally more robust to such issues, may mask some underlying misfits. The divergence between these two tests indicates that the model's goodness-of-fit cannot be assumed without further validation. While the deviance suggests the model is statistically acceptable, the Pearson result highlights potential limitations in model assumptions that could affect interpretation. Therefore, results from the logistic regression need cautious interpretation.

Table 8
Goodness of fit.

Goodness-of-fit	χ^2	df	Sig.
Pearson	55357.149	1184	.000
Deviance	354.546	1184	1.000

Table 9 below presents the pseudo R^2 values that show the explanatory power of the logistic regression model. The Cox and Snell value is 0.564, which can be interpreted to mean the model accounts for about 56.4% of the variance in the dependent variable. The Nagelkerke value is 0.565, the rescaled version of Cox and Snell's measure where its maximum value is adjusted, which can more intuitively be thought of as a percentage of variance explained. The McFadden value is 0.122. Although small, this is a common characteristic of logistic regression models. It describes the relative improvement over a null model in terms of model fit. These may indicate that the model has a moderate explanatory power, with Cox and Snell, and Nagelkerke indicating a better fit than McFadden.

This contradiction raises concerns about the model's validity. The inflated Pearson value may be due to overdispersion or sparse data, calling for further diagnostics – such as the Hosmer–Lemeshow test or residual analysis – to confirm the model's adequacy. Therefore, the results should be interpreted with caution.

Overall, the quantitative analysis reveals a moderate and statistically significant positive relationship between the integration of AI in teachers' roles (IAITR) and

Table 9Pseudo R^2 .

Pseudo R^2	Value
Cox and Snell	.564
Nagelkerke	.565
McFadden	.122

student agency (SA), as evidenced by a correlation coefficient of 0.549. This indicates that an increase in IAIR is associated with an increase in SA. Regression analysis further supports this relationship, with IAIR emerging as a significant predictor of SA. The standardised coefficient (β) of 0.554 highlights the strong effect of IAIR on SA, while the high F-statistic (52.571) and low p -value (.000) confirm the model's overall statistical significance. These results emphasise the potential of AI integration in effectively transforming teaching practices to enhance student agency.

Finally, the logistic regression analysis demonstrates a good model fit, with a reduction in the -2 log-likelihood from the intercept-only model to the final model and a statistically significant χ^2 statistic. Pseudo R^2 values indicate that the model accounts for a substantial proportion of variance in SA, particularly with the Cox and Snell, and Nagelkerke measures showing values above 0.56. These findings collectively suggest that integrating AI in teachers' roles holds promise for explaining and enhancing student agency. This further suggests that while the model shows some utility, it may not fully capture the complexity of the data. Therefore, the predictive strength of the model remains limited, and additional variables or a different model specification might be needed to improve its performance.

4.2. Qualitative results

4.2.1. A brief profile of the participants

One of the participants, Ramesh, has a long experience teaching English as a foreign language at the school and university level. He has been using AI in classrooms for more than four years. He holds a master's degree in ELT. Similarly, Raghav has extensive experience teaching English as a second language for over 25 years. He has used AI in his personal and professional work for five years. He has completed a Master of Philosophy in Literature. Compared to other participants, Kripa has fewer years of teaching experience. She has spent six years teaching at a higher level. She uses AI not only in her teaching but also in her studies as she prepares for further education. She has completed a master's degree in Chemistry. Interactions with all the participants show that they understood student agency and the use of AI in the educational process.

The qualitative part of the study aimed to explore how AI has transformed teachers' roles in fostering student agency. Based on the quantitative result, information for qualitative analysis was gathered from the three teachers teaching at a higher level and using AI in their classrooms. Open-ended interviews were conducted based on some guiding questions relevant to the research objective. Two themes that emerged from the information collected through the interviews and follow-up discussions with the participants are discussed below under the relevant themes.

4.2.2. Integration of AI in classrooms helps to enhance student agency

Recent research shows that integrating AI in university-level classrooms is inevitable in today's context. The use of AI in the learning process relates to student agency in a dynamic way. Teachers play a crucial role in integrating AI in the classroom, promoting students' agentic aspect. All three participants agreed, "In today's classrooms, teachers

cannot avoid using AI. We should not restrict it. Rather, we have to play an important role in its use in an effective manner to promote students' capacity...". Using AI efficiently makes it easier for the students to promote the ability to handle the learning process and self-autonomy. It liberates students from teachers' impositions and over-lecturing. In this regard, Kripa believed, *"When students got to use AI in their learning process, they felt autonomy. This autonomous feeling kept students doing themselves. They get rid of our imposition"*. Ramesh also acknowledged that using AI has increased students' self-learning habits. He claimed that students use generative AI to gather ideas and information. This helps do assignments and project work for the students. Similarly, Raghav pointed out that AI has supported teachers in creating autonomous activities for their students. The students become free to process their learning because AI provides ideas, concepts and content to use in their classrooms.

In another way, AI supports students in developing presentation skills by helping them find content and presentation slides. Ramesh shared, *"My students are forward in presentation. Before the use of AI, they showed reluctance, but now I find them excited in the presentation. When I gave an issue, they found out the contents and ideas from AI and presented them well. They used ideas of creating presentation slides"*. Kripa also trusted that AI has allowed students to enhance their presentation skills. She noted that her students' increased confidence in presenting was mainly due to the support provided by AI. Similarly, Raghav agreed with Kripa's observation. He put, *"Sometimes my students surprised me. They made such a presentation using Canva, an image generator app. They also used generative AI in such a way I could not imagine this. This has really changed the presentation skills of my students with the support of AI"*. AI algorithms understand the level of its users so that students can match their level of ideas and content. All the participants believed that teachers do not need to worry about the quality of the presentations using AI. However, teachers need to deal with privacy and accuracy issues while their students use AI.

AI facilitates students to set up their learning goals. Their engagements with AI provide them with further ideas. When students ask AI to suggest them, AI generates several alternatives so that they can choose either of them. They can make further plans regarding learning. Raghava and Ramesh asserted that AI has enabled their students to find out their next steps. Ramesh said, *"One of the students claimed that he would be an information technology (IT) specialist in future without having formal courses in school and colleges about IT. He is pretty sure that AI is teaching him all the necessary ideas, knowledge and skills"*. When students become aware of the proper use of AI, they adopt good learning habits. They manage their time and knowledge to strengthen their abilities to learn independently. This suggests that students do not necessarily require direct teacher instruction to enhance their capability and self-efficacy.

4.2.3. Integration of AI in classrooms shift the role of teachers in fostering student agency

Teachers' effective roles in classrooms nurture students' various potentials. In today's context, the teachers alone cannot handle the learning situation. There is a predictable impact of AI in the teaching and learning process. This affects classroom dynamics and teachers' role in increasing students' agency. All participants accepted that using AI in education has changed their role in teaching and learning practices within and beyond the classrooms. Kripa said, *"Since teachers have a crucial role in fostering students' overall capacity, we have to adopt the changing situation brought by the impact of AI in our students' learning process"*. Raghav mentioned, *"It's our primary role to grow our students' capabilities whether we are adopting traditional ideas or the latest technologies. We must change ourselves first to change our students. It is*

true that my role has changed in the context of using AI. I must adopt myself to the use of technology to develop my students' capacity". It is difficult to avoid using AI in the classroom and beyond. Students' habit of using AI in their learning process is increasing. Teachers must update themselves on the latest developments in technology. Ramesh put, *"I was unaware that my students were using AI. I noticed it later. Then, I felt that it was necessary to face the reality. I started adopting the situation"*. Shifting a role that has been deeply embedded and practised over a long period is inherently challenging. However, in the context of rapid technological advancement – particularly with the integration of AI in education – there is little alternative.

Teachers' role is the dynamic aspect of a particular status [47] to be performed in classrooms and beyond, particularly for teaching-learning purposes. Kripa and Ramesh agreed that changing traditional roles was not easy for them. They engaged in long hours of lectures in classrooms before the use of AI by their students. They used to give tasks or assignments to the students based on their ideas. The students lacking ideas could not deliver. However, after easy access to AI, almost all students showed interest in submitting the assignments on time. Ramesh believed, *"It is all possible due to easy access of AI. Almost all the students in my classes submit me homework and assignments these days in time"*. He further added, *"There may be its demerits, but students are doing something on the contents or issues. We must accept this. We cannot ignore and demotivate them with the use of the latest technologies. Only we have to change our role to create the environment to the proper use of AI"*. As a teacher, it is important to notice each individual and their interest in learning with technology. When teachers are unaware of the latest technological developments, they cannot adapt their roles to keep pace with the changes students are making through AI. Ramesh argued, *"I do not think we can go with our traditional roles in classrooms as a teacher now. I must adopt the situation to cope the changes in learning process of my students"*. It might be true that students are ahead of teachers in using the latest technologies. As students increasingly adopt AI in their learning practices, teachers must acknowledge and integrate it into their teaching approaches. Raghav agreed, *"I did not care how my students were able to write good patterned answers. I thought they practised themselves. But when one of them shared with me about the use of ChatGPT in their works. I also used it. It has now given me much support in teaching. I use it frequently when I need solutions and new ideas to use in classrooms"*. Kripa understands that she cannot avoid using AI in her professional life. Raghav and Ramesh believed that they had changed a lot in their classroom practices due to the use of AI. They put prompts to AI to find concepts, ideas, and presentation content when they start new lessons. After AI inputs, they adapt the materials and ideas. Ramesh shared his experience, *"I have felt that my role as a traditional teacher is useless in today's classrooms. I am only a facilitator, not a teacher. My students wrote more standard answers in the last exam. I asked her how it was possible. She accepted that she practised from Gemini and ChatGPT"*. This shows a growing use of AI in the classroom, so teachers are also changing themselves to adapt to the situations.

On the one hand, teachers, as the positions given by the social organisation, foster a stimulating and positive learning environment [46] adopting the latest changes in the education process. On the other hand, AI can personalise these experiences according to an individual student's learning styles and preferences, providing customised feedback and support to enhance their learning outcomes [24]. Thus, teachers can allow students to gain practical skills in a safe and controlled environment [6] using AI in their learning process. AI's ability to provide immediate feedback and assistive interventions can cultivate students' metacognition, self-regulation, and lifelong learning skills. Therefore, the role of teachers in the classroom and beyond in the present context is being changed due to creative AI's ability to generate dynamic

content and adapt to individual learning patterns mirrors constructivist principles, facilitating active engagement, critical thinking, and problem-solving skills [32]. This inevitably changes the role of teachers in fostering students' overall capacity.

5. Discussion

This study's initial part assesses how AI integration in higher education affects teachers' roles in promoting student agency. Consistent with George and Wooden [24], the results show that higher education teachers have embraced AI technologies to optimise and enrich student learning exposures. This implies that teachers play a significant role in enhancing students' capabilities in the learning process using AI. This observation aligns with Ahmed et al. [5] who view that integration of AI enhances capabilities and personalised learning of higher level students. They further state that artificial intelligence changes classroom situations and alters teachers' roles. The fusion of creative AI promises to dismantle the conventional, one-size-fits-all model of education by ushering in a new era of personalised and immersive learning experiences [32] through effective roles of teachers. The findings suggest that learning processes, including the steps, strategies, and cognitive activities learners engage in, might be more resilient to interference from generative AI [51]. To cope with this interference, teachers role-play crucial steps to keep their students on the path of creativity and productivity of learning. The result shows that teachers are curious, enthusiastic, and alert to integrating AI into teaching-learning. This implies that teachers are shifting their traditional role to the mentor to facilitate the efficient use of AI in classrooms and beyond.

Furthermore, the results emphasise the potential of AI integration in effectively transforming teaching practices to enhance student agency. This aspect of the result is consistent with the view of George and Wooden [24], who assert that AI can revolutionise higher education by providing personalised feedback to students, automating administrative tasks, and improving the quality of education. While integrating AI into higher education presents promising opportunities – such as personalised learning, timely feedback, and administrative efficiency – it also raises important concerns. These include data privacy, algorithmic bias, over-reliance on automated tools, and the potential deskilling of teachers. This infers that the teachers need to take essential roles in the changed reality brought by using AI in classrooms, being alert to privacy and algorithmic bias.

The findings are predictable because teachers already employ AI tools to assess and analyse students' performance, providing tailored recommendations and resources to support their learning [5]. When there are AI-enhanced environments, students are presented with individualised tasks and personalised and instant feedback by analysing their work and learning process [3]. This result proves this is possible by acquiring roles for teachers who want to boost their students' creative potential using AI algorithms. In another aspect, the findings align with the concept of Moore, Jiang and Abramowitz [42] who assert that technology resources such as generative AI can enhance personalised student engagement in their learning with the teachers' facilitating role. This suggests that teachers play a vital role in promoting personalised learning through AI, ensuring that students leverage AI in ways that strengthen their sense of agency. However, AI may reinforce existing inequalities without careful implementation and critical oversight or lead to ethical dilemmas. Therefore, educators and institutions must adopt AI thoughtfully, emphasising transparency, human judgment, and pedagogical integrity. Noteboom [44] asserts that agency stems from the authenticity of the environment in which agency is exercised through the efficient role of teachers. Similarly, the agency is realised through understanding one's past,

present, and future through engaging with the surrounding environment [21] inhibited by AI. This infers that today's learning environment is almost routed by AI tools in higher education contexts where teachers can have efficient roles as facilitators, changing themselves from traditional positions. However, this shift in teachers' roles may limit creativity and innovation in pedagogical implications.

Qualitative findings of the study reflect Cook-Sather's [18] view that overall transformation from a traditional setting helps students enhance their ability and change their educational environment in pursuit of learning goals. This asserts that the role of teachers depends on the development of student agency in the context of using AI in pursuit of learning goals. Kuzhabekova and Amankulova [36] believe that agency encompasses the capacity for intentional action and change brought by the latest technological integration in learning progression. It serves as both an objective and a mechanism to empower learners in navigating unfamiliar educational contexts [38] within the interreference of technology in classrooms. This seeks change in the role of teachers from self-centric presenters to student-centric facilitators with the use of AI. The findings line up with Adhikari [2], who found out that there is a reciprocal relationship between teacher support and enhancing student agency. This implies that teachers' support in classrooms and beyond is crucial in fostering student agency in the context of AI's use in teaching and learning. Therefore, the teacher's role in fostering and sustaining student engagement is vital, making it necessary to reassess teachers' current perceptions of student self-engagement [46] with AI.

For the students, a primary result of implementing AI is increased motivation and engagement [50] that directly relates to teachers' effective role. Moreover, the findings indicate the belief of Adiguzel, Kaya and Cansu [3], who accept that AI empowers learners to take agency in their learning and a synergistic collaboration among multiple things, such as the learner, the teachers and technology. This denotes the role of teachers as one of the major entities that foster student agency. The technological use in collaborative and individualised learning demands the transformed roles of the teachers from the contemporary situation. This view is similar to Cohen, Soffer and Henderson [16], who believe that teacher engagement positively influences student engagement in the virtual environment. Therefore, teachers' roles in this context differ. Finally, from the study's findings, it can be inferred that AI integration in higher education predominantly affects teachers' roles in promoting student agency. However, it can also diminish teachers' role if their expertise is undervalued or replaced by automated systems. In such cases, AI might deskill teachers, shifting their roles from active facilitators to passive overseers of algorithm-driven learning. Without proper training, policy support, and clear pedagogical frameworks, AI integration may create confusion rather than clarity in role redefinition for educators.

6. Conclusions, implications and further research directions

6.1. Conclusion

The study's findings indicate that integrating AI in teachers' roles largely affects enhancing student agency in higher education. The study highlights the promotion of student agency through integrating AI into teachers' roles in higher education, irrespective of the subject area. On top of that, teachers who are using AI in the teaching-learning process can better enhance student agency by shifting their roles in the context of AI integration. The conclusion adds value by highlighting the significance of integrating AI in the classroom and beyond to boost student agency. Subsequently, the study offers valuable insights into fostering student agency by redefining the role of teachers in the context of AI integration in the classroom and beyond.

6.2. Implications and further research directions

This study focuses specifically on student agency in relation to integrating AI into teachers' roles in higher education. The study aimed to assess the extent to which AI integration in higher education affects teachers' roles in promoting student agency and explored how AI has transformed teachers' roles in fostering student agency. This implies that AI integration in teaching could be a key factor in enhancing student autonomy and engagement. In the course of agency development, teachers' role is important. This is questionable since the integration of AI has been inevitable in higher education. Within this context, this study only limited its scope to integrating AI in higher education, affecting teachers' role in fostering student agency. This study did not explore students' role in boosting their capacity while using AI. This study's conclusions show how exploring methodologies and incorporating student perspectives are essential for boosting agency [2], which is yet to be explored.

Furthermore, adopting student-centred learning approaches is essential for fostering and enhancing student agency by aligning with their interests, preferences, and cognitive abilities [25] integrating AI in their learning process. This learning approach can potentially increase student engagement and improve learning outcomes that align with the view of Chiu et al. [15]. Finally, as suggested by Kusters et al. [35] and Nguyen and Ngo [43], teacher agency plays a comparable role in fostering student agency. Developing teacher agency is integral to enhancing student agency in the context of technological use in education. Further research is necessary to ascertain the potential benefits of these emerging technologies for education and how they can be properly and effectively utilised [14]. The contrasting results from the quantitative part of the study could suggest issues with the distributional assumptions or potential overdispersion in the data. In this study, while the deviance statistic supports the model's fit, the significant Pearson statistic warrants further investigation into the model's assumptions and potential adjustments.

As the study limited itself to the convenience sampling strategy for the quantitative data collection part, a random sampling method is recommended for future research on a similar issue to enhance the generalizability of the findings. Additionally, further investigations are needed regarding students' role in fostering agency with the alarming use of AI in the teaching-learning process.

Institutional Review Board statement: The study was conducted in accordance with the declaration and approval by the Institutional Review Board of Research Management Cell, Nilkantha Multiple Campus, Tribhuvan University, Nepal (agreement code 04, 21/08/2024).

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