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Original Article

The relationship between identity development and medical students' performance in technology-integrated English language classrooms

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Abstract

Background: Contemporary technologies have created a unique set of circumstances that shape the life experiences and identities of medical students. These circumstances diverge and extend beyond the contexts experienced by previous generations in the pre-digital era.

Methods: We explored how medical students' identity development and English language performance were related in technology-integrated classrooms from February to June 2023. The research, a cross-sectional quantitative survey, studied 450 medical students at Islamic Azad University of Kerman, Iran. The study, a cross-sectional quantitative survey, was conducted on 450 medical students at the Islamic Azad University of Kerman, Iran. To collect the data, an identity development questionnaire in technology-integrated classrooms was submitted to participants either in person or via email. Data were collected using an identity development questionnaire in technology-integrated classrooms, and distributed to participants in person or via email. Furthermore, the participants' English language proficiency scores reported by their English instructors were used to assess their English language performance.

Results: The study found a positive correlation between identity development, its sub-scales, and the participants' English language performance in technology-integrated classrooms. Commitment-making emerged as the most efficacious factor in predicting English Language Proficiency within the ambit of identity development. Within the scope of identity development, commitment-making was identified as the most effective factor in predicting English language proficiency.

Conclusion: While contemporary digital technologies are not crucial for identity formation, they offer enriched opportunities for individuals to explore and express their sense of self. Particularly in the medical field, students can utilize these technologies to engage in diverse and collaborative interactions. This not only allows them to connect with others and participate in various communication modes, but also aids in the expression of their identity, idea exchange, and information acquisition across various contexts.

Introduction

The utilization of technology in the realm of medical education has been evolving over an extensive period. The inclination towards employing technology has predominantly emerged because of the numerous obstacles that medical education encounters.[1] The advent of digital technologies has resulted in a transformation of how we convey our thoughts and interact with others. The arena of English language teaching and learning has opened fresh avenues for individuals to present themselves, manage impressions, promote their image, and display their identities in classrooms that incorporate technological tools.[1] Following the global COVID-19 pandemic and the subsequent closure of businesses, sports events, and educational institutions worldwide, the utilization of online platforms for educational purposes experienced a noteworthy surge.[2]

Furthermore, academics have altered the way they publicly express themselves in technology-enhanced classrooms and academic environments. They are increasingly leveraging online forums to establish professional identities, create online personas, and assert positions within their disciplinary communities and even beyond academia.[2,3] Due to its significance, identity development has garnered a significant amount of attention in academic discourse.[4] However, there has been a lack of extensive investigation into the formation and interpretation of identities in educational genres.

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In particular, technology-integrated classes have gained prominence as a digital platform where intellectual identities can be established.[5]

The transformation of the healthcare landscape, characterized by the transition of medical treatment from the conventional hospital milieu to ambulatory medicine, has mandated the capacity to deliver care within a considerably compressed timeframe and necessitates modifications in the process of recording information, encompassing both health-related expertise and medical documentation, which are now digitized.[1] The widespread recognition of students as digital natives has also led to the extensive adoption of instructional technology in the classroom.[6] Learners are characterized as "digital natives" and possess digital confidence. Mancillas and Brusoe[7] have affirmed that contemporary schoolchildren are thoroughly immersed in the internet world and culture. Some scholars argue that instructors need to adapt their pedagogy to align with the evolving learning preferences and styles of learners to support the development of their identities.

The utilization of technology in medical education aims to facilitate the acquisition of fundamental knowledge, enhance the process of decision-making, improve the perception of variation, refine the coordination of skills, provide opportunities for practicing rare or critical events, encourage team training, and enhance psychomotor skills. Medical applications provide educational materials that facilitate challenging and stimulating environments, often utilized to educate novice surgeons. The utilization of serious gaming for surgical training results in improvements in the synchronization of hand-eye coordination and the speed of reactions, leading to experiential advancements that affect not only the acquisition of knowledge and expertise but also the understanding of the unique needs of patients. Various technologies can be employed to achieve these educational objectives. The responsibility of medical educators lies in effectively utilizing these innovative technologies to transform the learning process into a more collaborative, personalized, and empowering experience.[8]

In both the realm of research and educational policy, identity has long been acknowledged as a significant prerequisite for learning.[9] It is contended that the cultivation of a secure and distinct personal identity, coupled with a thoughtful contemplation of the identities of others, is pivotal in all educational pursuits and is firmly entrenched as a fundamental value and objective. Today, contemporary technologies, exemplified by social media, present a unique set of circumstances that shape the life experiences and identities of today's youth. These circumstances diverge and expand beyond the contexts available to previous generations before the digital age.[10] Accordingly, the current study was guided by the following research questions since identities formed in classrooms that integrate technology with English language proficiency are noteworthy subjects within the realm of medicine.

1. Is there any statistically significant relationship between identity development and medical students' English language proficiency in technology-integrated classrooms?
2. Which strategy of identity development predicts the English language proficiency of medical students in technology-integrated environments better?

Materials and Methods

The current study entailed a cross-sectional quantitative survey of 485 medical students who were learning the English language. The research was conducted using a cohort of 450 medical students who were in the process of learning English. Due to some students' reluctance to share their answers and their decision not to complete the questionnaire, the final sample of the current study was comprised of 450 students who completed all sections of the questionnaire. The utilization of convenience sampling facilitated the collection of a significant amount of data. However, a sample obtained solely through convenience, without equal probability, fails to provide a statistically unbiased representation of the population, thereby leading to sampling bias.

The participants' level of identity development was measured utilizing the Persian form of the Luyckx et al[11] identity development questionnaire. This questionnaire comprises 25 items that are formulated on a five-point Likert scale, encompassing responses ranging from strongly disagree to strongly agree. To assign significance to the participants' answers and compute the numeric value of the test outcomes, each option was assigned a value according to the following scheme: strongly disagree equals one, disagree equals two, neutral equals three, agree equals four, and strongly agree equals five. The participants were asked to complete it in 30 minutes. The scale contains five sub-scales of commitment making, identification with commitment, exploration in breadth, exploration in depth, and ruminative exploration. Cronbach's Alpha was employed to assess the reliability of the questionnaire. The acquired values were as follows: commitment making (0.89), identification with commitment (0.90), exploration in breadth (0.91), exploration in depth (0.93), and ruminative exploration (0.95), all of which were sufficiently high. The administration of the questionnaire was either in person or electronically through email or a pre-existing Google Doc link. The researchers were on-site to conduct in-person surveys, addressing potential questions. Moreover, a set of instructions for responding to the questions was disseminated via electronic mail or hyperlinks. Furthermore, the English language proficiency scores of the participants, as reported by their respective English instructors, were utilized as a measure of their English language performance. The test content emphasized the

acquisition of listening, oral communication, reading comprehension, written expression, lexical competence, and grammatical proficiency. The test was designed based on the topics covered in the classroom, following the linguistic framework specified in the course syllabus for this level, without adding any novel elements.

Following the introduction of the research project during staff meetings at participating general English classes, interested instructors were scheduled for appointments to receive further information regarding the technicalities and procedures of the study. The ethical guidelines established by the Ministry of Education were adhered to in obtaining prior approval from university officials. Before being invited to participate, the participants were provided with an overview of the study, including its objectives, methodology, and limitations. Throughout the project, participants were not obligated to participate and received no compensation for their involvement. To ensure confidentiality and anonymity, pseudonyms were used. Furthermore, the collected data were kept private and not shared with anyone, including university staff.

Results

To examine the research hypotheses, an initial assessment was conducted to determine the normality of the distribution of research variables. This was achieved using the Kolmogorov-Smirnov test. The level of statistical significance for all variables, across both periods and groups, was found to be greater than 0.05.

Given that all variables followed a normal distribution, parametric tests were utilized for data analysis. The Pearson correlation was employed to explore the relationship between identity development and English language proficiency in technology-integrated classrooms.

As per the results shown in Table 1, the *P* value is less than 0.01 (*P* value = 0.000). This indicates with over 99% confidence that a significant positive correlation of medium strength exists between learners' identity development and English language proficiency in technology-integrated classrooms. As identity development increases, English language proficiency also increases (r = 0.535, N = 450). To show how well the regression model explains observed data, R-squared is used. The R-squared value ($R^2 = 0.29$) suggests that identity development accounts for 29% of the variance in English language proficiency.

Table 1. Pearson correlation of identity development and English language proficiency

Variables	English language proficiency (N = 450)		
	Spearman Correlation	*P*	R-squared
Identity development	0.535	0.000	0.29
Commitment making	0.495	0.000	0.25
Identification with commitment	0.427	0.000	0.18
Exploration in breadth	0.444	0.000	0.20
Exploration in depth	0.449	0.000	0.20
Ruminative exploration	0.329	0.000	0.11

Moreover, referring to the identity development subscales in Table 1, we observe a *P* value lower than 0.01 (*P* value = 0.000). This indicates a statistically significant positive correlation, with medium strength, between learners' commitment-making, identification with commitment, exploration in breadth, exploration in depth, and ruminative exploration, and their English language proficiency in technology-integrated classrooms. We can assert this with more than 99% confidence. As commitment-making increases, there is a corresponding increase in English Language proficiency (r = 0.495, N = 450). The R-squared value ($R^2 = 0.25$) suggests that commitment-making accounts for 25% of the variance in English language proficiency.

As the level of identification with commitment increases, we observe a corresponding rise in English language proficiency, with a correlation coefficient of 0.427 in a sample size (N) of 450. The R-squared value ($R^2 = 0.18$) suggests that identification with commitment explains 18% of the variance in English language proficiency.

Similarly, as exploration in breadth increases, English language proficiency also increases (r = 0.444, N = 450). The R-squared value ($R^2 = 0.20$) indicates that exploration in breadth accounts for 20% of the variance in English language proficiency.

As exploration in depth increases, there is a corresponding increase in English language proficiency (r = 0.449, N = 450). The R-squared value ($R^2 = 0.20$) suggests that exploration in depth explains 20% of the variance in English language proficiency.

Ultimately, as ruminative exploration increases, we observe a corresponding increase in English language proficiency (r = 0.329, N = 450). The R-squared value ($R^2 = 0.11$) indicates that ruminative exploration accounts for 11% of the variance in English language proficiency.

Multiple linear regression (MLR) is an analytical statistical method employed to ascertain the relationship between several research variables. Simply put, MLR is used to investigate the complex interactions between factors contributing to a learner's identity development and their English language proficiency level. It provides insights into how these factors are inextricably intertwined with a learner's English language proficiency in a technology-integrated classroom.

Based on the results presented in Table 2, among the five variables in this model, only commitment-making significantly predicts English language proficiency, with a beta coefficient (β) of 0.475 and a *P* value of $t < 0.01$. The other variables — identification with commitment, exploration in breadth, exploration in depth, and ruminative exploration — do not significantly predict English language proficiency, as they all have a $Sig > 0.05$. The adjusted R-squared value (adjusted $R^2 = 0.25$) suggests that commitment-making accounts for 25% of

Table 2. Regression of identity development and English language proficiency

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95% Confidence interval for B	
		B	Std. Error	Beta			Lower bound	Upper bound
1	(Constant)	73.744	1.918		38.445	0.000	69.974	77.513
	Commitment-making	0.958	0.217	0.475	4.423	0.000	0.532	1.383
	Identification with Commitment	-0.381	0.209	-0.198	-1.824	0.069	-0.792	0.030
	Exploration in Breadth	0.156	0.189	0.080	0.824	0.410	-0.216	0.527
	Exploration in Depth	0.329	0.174	0.175	1.888	0.060	-0.014	0.671
	Ruminative Exploration	-0.031	0.099	-0.020	-0.309	0.758	-0.226	0.165

the variance in English language proficiency. Therefore, we can conclude that commitment-making is the most effective component of 'identity development' in predicting English language Proficiency.

Discussion

The alteration in the methods of instruction and acquisition has transpired not solely due to the unforeseen worldwide pandemic, but rather because of the rise of educational technology and pedagogical innovation. These novel approaches encompass the integration of technology, exemplified by blended and flipped learning, surpassing the mere transition from traditional face-to-face instruction to an online format. Accordingly, the current study examined the relationship between participants' identity development and English language performance in technology-integrated classrooms. In this regard, the Pearson correlation was used since the normality assumptions were met. Correlations showed that identity development and its sub-scales (commitment making, identification with commitment, exploration in breadth, exploration in depth, and ruminative exploration) correlated positively with learners' English language performance in technology-integrated classrooms. Commitment-making emerged as the most efficacious factor in predicting English language proficiency within the ambit of identity development. Learning a language is an inherently social and human experience, whereby individuals engage in identity construction and the development of English as a foreign language. In this process, learners not only generate meaning through language but also engage in the negotiation of their sense of self concerning others, as well as their aspirations for future self-realization.[12]

The findings of the current study are supported by the European Commission[13] highlighting the importance of identity development in technology-integrated classroom contexts and its impacts on students' performance. Education and training serve as the most advantageous investments for the future of Europe. They perform an essential function in enhancing growth, fostering innovation, and facilitating job creation. Europe's education and training systems must provide individuals with the progressive knowledge, skills, and competencies necessary for innovation and prosperity. The use of digital technology not only enriches the learning process in various ways but also offers learning opportunities that should be available to everyone. It provides access to a wealth of information and resources. The communication entitled "Strengthening European Identity through Education and Culture" endorses this notion. The utilization of technologies in the education of undergraduate, postgraduate, and continuing medical students has become increasingly widespread. These methods facilitate the acquisition of knowledge, enhance the process of decision-making, improve perceptual variation, refine skill coordination, and establish an educational environment among medical students that actively engages the learner while ensuring the safety of the patient. The use of computer technologies not only provides the advantage of evaluating competencies and milestones but also equips students at all levels with the essential resources to access medical knowledge and deliver high-quality care, thereby fostering a lifelong dedication to learning.[1] The integration of scientific and technological advancements into the educational procedure instigates the advent of various novel proficiencies and ideas. The implementation of technology within learning settings fosters pleasure and diminishes distress,[14] generates considerable contentment,[15] and enhances self-belief[16] within computer-integrated educational environments.

In line with other studies,[17-19] the study confirmed that in a digital world, contexts tend to collapse so that the online and offline, time and place, social arenas and audiences become merged in young people's everyday lives, education, entertainment, and relationships. And the learners' performance increasingly depends on digital technologies. It confirms the important function of technological mediation in the activation of several language skills, which aligns with the principles of Dual Coding Theory[20] and the Generative Multimedia Theory of Learning.[21] This supports the notion that the utilization of multimedia input enhances the process of learning by offering an extra avenue for constructing meaning, diminishing the cognitive burden involved in information processing, and fortifying the retention of knowledge. In the same way, Pitt et al[22] found that identity developments bring tensions affecting learners'

engagement in learning. On a more fundamental level, the values necessitate 'alterations in identity' encompassing the instructor, students, and the educational setting, in light of the emergence of technology as a novel educational paradigm (for example, a shift from being an instructor to becoming a learning designer, from being an instructor to becoming a learning partner, and from being a knowledge transmitter to becoming a co-knowledge constructor). Language learning has consistently been a notably crucial juncture of concentrated identity labor, entailing introspection regarding emerging personas, principles, paradigms, benchmarks, and future ambitions, frequently transpiring during interpersonal communication. These exchanges, whether facilitated by digital technologies or experienced face-to-face, can yield validation and affirmation, intersecting identity dimensions, but can also encompass prejudicial discourses, metamorphosing and affiliating to construct identities in normative manners.

The use of technology in medical education should be aimed at facilitating knowledge acquisition, rather than replacing interpersonal instruction. Learners are provided with opportunities to cultivate their identities through active engagement in the collaborative process of constructing meaning, as opposed to passively absorbing pre-existing knowledge.[23] Shifting the learner's identity from being merely a recipient of knowledge to becoming an active participant in the learning process is, without a doubt, the greatest advantage that online learning provides. Instructors must remain dedicated to the fundamental principles of pedagogy, rather than fixating on the particular technological advancements. Technological innovations merely represent one of several instruments within the educational repertoire. The responsibility of medical educators lies in employing these novel technologies aptly, thereby revolutionizing the educational process into a more cooperative, tailored, and empowering undertaking. As mentioned by Lai et al[3] digital technologies change how learners convey their thoughts and interact with others. The field of English language teaching and learning has created new opportunities for students to express themselves, manage perceptions, promote their image, and display their identities in classrooms that incorporate technological tools. This has been particularly pertinent in the context of multilingual online participants, who can express multifaceted, hybrid identities.

Conclusion

The objectives of integrating technology into medical education include facilitating the acquisition of basic knowledge, improving decision-making skills, increasing perceptual diversity, improving skill coordination, simulating rare or crucial events, acquiring team training, and boosting psychomotor skills. Various technological advancements can cater to these objectives diverse technological advancements can fulfill these objectives.[8] Modern digital technologies, while not indispensable to identity formation, provide enhanced contexts for individuals' identity practices. Medical students can leverage digital technologies to engage in multimodal, multidirectional, and collaborative ways, while also forming networks with others. These actions enable self-representation, interaction with others, and gathering information in diverse settings. By delving deeper into the implications of digital technology on medical students' identity practices, it can be posited that such technology presents an impending context for collapsing various spheres. The concept of collapsing contexts refers to the blending of public and private spheres, digital and physical spaces, virtual and tangible elements, time and space, social contexts, and audiences through the use of digital technology. This phenomenon can manifest in various ways in individuals' personal and daily experiences, both within and outside educational environments. The current conditions in today's digital era not only have the potential to enable innovative forms of self-presentation, but also empower individuals to construct, explore, and master their identities in digitally mediated ways. This applies not only in educational environments but also in various aspects of life.

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Authors' Contribution

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Competing Interests

The authors declare no conflict of interest.

Ethical Approval

Before the initiation of the project, we informed the participants about the study's objective and methodology. The Ethics Committee of the Department of the Medical Sciences of the Islamic Azad University of Kerman approved this study, under reference number 400/09/27. Furthermore, we assured the participants that the data collected would be used solely for research purposes and that their identities would be kept confidential.

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