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BARRIERS FOR COLLABORATION AMONG BUILT ENVIRONMENT HIGHER EDUCATION: UNDERGRADUATE PERSPECTIVES

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ABSTRACT

The built environment represents a multifaceted sector characterised by its intricate nature, which demands effective stakeholder coordination and cooperation. Construction projects within this domain require the seamless collaboration of diverse disciplines, skills, and services. This collaboration is essential to navigate the fragmented and complex landscape inherent to the built environment. Recognising the evolving skill demands in the construction job market and the dynamic nature of built environment professions, higher education must update its approaches to serve as continuous education centres. Even though there are various studies explored numerous aspects of collaborations, intra-university, and inter-departmental collaborations have not been explored. Therefore, this study examines the undergraduate perspectives on the collaboration among built environment higher education by using one of the state universities in Sri Lanka as the single case study which offers all the built environment degree programmes under one roof. Primary data was collected through a questionnaire survey with 126 undergraduates of seven built environment degree programmes offered by the selected case study. The results of the study revealed that all personal, extracurricular and social collaborations are prominently existing in the context, while the existence of the academic collaboration was comparatively low. Further, the study discusses 20 barriers for collaboration in built environment higher education where rigid timetables and adherence to curriculum guidelines leaves little or no space for flexibility became the key barriers there. This paper elaborates each barrier to see how to overcome the negative consequences while enhancing the enablers to strengthen the built environment higher education collaborations.

Keywords: *Barriers; Built Environment; Collaboration; Higher Education.*

1. INTRODUCTION

Education is a fundamental human right and a prominent driver of personal, and social development (Kirya, 2019) and sustainable development. Thus, Pachauri and Yadav (2014) derived that higher education plays a pivotal role in equipping human capital with

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the required skills for their respective fields contributing to the development and strength of the nation. Furthermore, the World Economic Forum (2020) highlighted, that higher education and industry are predominantly recognised as intertwined elements of economic success. Consequently, higher education is acknowledged as a significant actor in the transition to a more sustainable future (Murray, 2018). Besides, higher education is focused on the student's development in knowledge, skills and attitudes (Cockerham, 2023). University education curriculums included general education courses with the aim of disciplining and instilling students with the skills, knowledge, and strong mental state (Kleebbua & Siriparp, 2016). Hence, the pedagogical systems, being the primary source of knowledge and competencies, face the risk of developing shortcomings associated with their respective disciplines if not subject to regular transformation and updates (Makhmudov, 2020). However, there is a mismatch between the graduate's discipline specific knowledge and business requirements and soft skills due to the misalignment of curricula and market demands (Fika et al., 2021).

The concept of built environment education is emerged over the past twenty decades (Uttke, 2012), hence is not considered a novel discipline (Thurairajah & Palliyaguru, 2011). Higher education programmes in the built environment discipline play a major role in providing education and training for professionals, addressing the demand for a diverse range of professionals (Amaratunga et al., 2012). Chynoweth (2009) and Million et al. (2018) pointed out that the built environment encompasses various disciplines such as design, construction, management, economics, law, technology, architecture, environment, and arts creating a broad and interdisciplinary platform. Hartenberger et al. (2013) identified a narrow-down list of the major built environment professionals, which includes architects, designers, landscape architects, town planners, construction engineers, construction managers, project managers, specialist consultants (e.g., sustainability assessors, auditors), quantity surveyors, facility managers, construction product engineers, construction process technicians, mechanical engineers, plant, energy and waste technicians.

However, the fragmented nature of the built environment industry (Boton & Forgues, 2017; Riazi et al., 2020; Xue et al., 2005), fosters the professionals' isolation (Abadi, 2005; Nasrun et al., 2014) and failure to form effective project teams (Baiden et al., 2006). Higher education is responsible to train and produce qualified professionals for the successful execution of sustainable projects (Murray & Cotgrave, 2007). According to Wickramasinghe (2018) even after regaining independence in Sri Lanka, the state university education was predominantly influenced by the demands of colonial era public services. Consequently, Edwards et al. (2009) revealed that stereotypes are formed during the educational process as students construct their own professional identity only. Thus, it is clear that the knowledge derived from individual disciplines are insufficient to fully grasp and resolve the inherent challenges within the built environment (Yocom et al., 2012). The findings of Hyams (2008) identified that there are benefits of intra-institutional collaboration, which is important to sustain the quality of university programmes and professional services. Moreover, due to the collaborative endeavour, the built environment also demands a broad understanding of various professionals and works together in a forum of trust and collaboration (Maclaren & Birchall, 2016). The absence of professional collaboration is stemmed from higher education institutions where the major division is made (Thayaparan, 2023). This is mainly because existing higher education systems have a silo, bureaucratic approach (Harris, 2010). Moreover,

Lailiyah et al. (2021) revealed the necessity to promote undergraduates' collaboration in higher education. Despite the existence of numerous research studies on university-industry collaboration, the aspect of intra-university, inter-departmental collaboration in Sri Lanka, where the initial division occurred, has not yet been properly addressed. Since the undergraduates are the key players who can facilitate inter-departmental and intra-university collaboration, this paper aims to capture their perspectives to improve collaboration in the built environment higher education.

2. LITERATURE REVIEW

Marlow-Ferguson (2002) identified education is the most prominent factor in the development of human personality. Education serves as an instrument that not only provides academic knowledge but also imparts essentials for improving the overall quality of human life (Kapur, 2023). Besides, the Organisation for Economic Cooperation and Development (OECD, 2023) demonstrated that the achievement of certain formal qualifications is essential for nationally or professionally regulated admission in many professions, in agreement with this Carnevale et al. (2010) also confirmed the higher level of formal education increase the ability to find jobs.

2.1 HIGHER EDUCATION SYSTEM

Aljohani et al. (2022) and Chettri (2022) revealed that the higher education system plays a major role in developing skilled labour into the modern post-industrial economy by ensuring the future prosperity of a nation. Thus, Tilak (2003) stated that higher education is a substantial investment in human capital. Further, Bui et al. (2023) indicated that a shared vision in the higher education sector has garnered substantial attention because it promotes cooperation, consensus, and advancement.

Oza and Japee (2020) demonstrated that one of the main responsibilities of higher education institutions is to equip students with advanced skills useful in the workplace. Therefore, instead of separate learning, integrated learning which combines various subjects provides the development of students' high-level competencies, thinking ability, multiple perspectives, and creativity (Cheng & So, 2020). Further, Annan-Diab and Molinari (2017) revealed that interdisciplinary initiatives include strategic plans, faculty collaboration, interdisciplinary research funding and teaching, and the construction of interdisciplinary buildings on universities which are identified as important aspects in higher education.

2.2 BUILT ENVIRONMENT HIGHER EDUCATION

The built environment is a complex sector, that necessitates stakeholder coordination and cooperation, with construction projects mandating the integration of diverse disciplines, skills, and services (Ebekozien & Aigbavboa, 2022). However, built environment universities' curricula are currently inadequate in preparing graduates for industry careers and therefore, the global competence of the built environment graduates is important (Aigbavboa et al., 2022). While built environment higher education involves various disciplines as mentioned in the introduction, Sampaio (2021) pointed out that the design of construction education should prioritise adaptability to address both current and future concerns. Implementation of changes in educational practices for delivering programmes in higher education across diverse disciplines within the construction industry is a major requirement (Crilly et al., 2020).

Nonetheless, as the construction team collaborates across all the aforementioned disciplines in Section 1, they are collectively responsible for the manufacturing, assembly, and construction of a building, including the logistics and contractual relationships associated with it (Royal Institute of British Architects [RIBA], 2020). Murray and Cotgrave (2007) described that the construction industry relies heavily on higher education to train and produce qualified professionals for the successful execution of sustainable projects. Therefore, it is evident that the built environment higher education should identify the responsibilities of each discipline collaboratively.

2.2.1 Collaboration in Built Environment Higher Education

Laal and Ghodsi (2012) described that collaboration embodies a philosophy of interaction and personal lifestyle wherein individuals take responsibility for their actions, including learning and respecting the abilities and contributions of their peers. Coordination and cooperation are essential aspects of collaborative activities, facilitating the shared creation of something new by aligning efforts and working harmoniously towards a common (Lee & Schottenfeld, 2014). Moreover, in the 21st century learning, to become a successful learner requires the following four skills, known as "4Cs": (1) Creativity, (2) Critical thinking, (3) Communication, and (4) Collaboration (P21, 2007). Thornhill-Miller et al. (2023) emphasised the need for the 4Cs to be central in future-oriented education, requiring institutional support in standards, assessments, curriculum, professional development, and learning environments. In the Oxford Advanced Learner's Dictionary (2015), collaboration refers to "the act of working with another person or group of people to create or produce something" (p. 290). Collaboration is widely acknowledged as advantageous since it enables the pooling of additional resources and expertise from a collective team (Zhao & Zuo, 2018). Moreover, P21 (2007) framework identified the following criteria under collaboration:

- Demonstrate ability to work effectively and respectfully with diverse teams,
- Exercise flexibility and willingness to help make necessary compromises to accomplish a common goal, and
- Assume shared responsibility for collaborative work, and value the individual contributions made by each team member.

According to Ďurišová et al. (2015), the university's external environment consists of university graduates, employers of graduates, and the accreditation commission whereas the internal environment consists of students, lecturers, heads of department, and university administration. Consequently, Kezar (2005) identified two types of collaboration in higher education as internal and external collaboration. Under external collaboration, effective collaboration between universities and industries plays a vital role in enhancing the efficiency of the national innovation system, which should be mainly addressed in developing countries (Nsanzumuhire & Groot, 2020). As an example, for internal collaboration, student collaboration and academic collaboration were identified (Kezar, 2005). Further concerning, Thayaparan (2023) reaffirmed by accenting that the higher education systems should be reformed to encourage inter-departmental and intra-university collaboration to foster collaboration within academia and industry in the long run. Intra-university collaboration identifies the collaboration within the same university whereas inter departmental collaboration occurs between members of different departments (Thompson, 2018). However, the literature review confirms that there are

several barriers to formulate collaboration in the built environment higher education, that are discussed next.

2.2.2 Barriers to Formulate Collaboration in Built Environment Higher Education

This section explores the barriers that are hindering collaboration in built environment higher education. According to Gaurav (2020), since the construction sector encompasses a wide range of tasks involved in the planning, execution, and maintenance of buildings, infrastructure, and associated activities, collaborative projects meet various barriers which create difficulty in allocating resources. Table 1 reflects the barriers for collaboration in built environment higher education identified by various authors in their studies.

Table 1: Barriers to formulate collaboration in built environment higher education

Barriers	Sources
Siloed delivery education	(Kezar, 2005), (Maclaren & Birchall, 2016),
Individual resistance	(Newell & Bain, 2020)
Lack of willingness	(Hardy et al., 2021).
Non availability of shared vision and mission	(Holley, 2009),
Adherence to curriculum guidelines leaves little or no space for flexibility	(Arora et al., 2017)
Managing and monitoring project groups as the learning style, interest, and experience of the members vary	(Arora et al., 2017)
Lack of resources	(Wickramasinghe, 2018)
Lack of support from leadership	(Malik and Wickramasinghe, 2015)
Unawareness of collaborative opportunities	(Tazzyman, 2023)
Mismatched priorities of different departments	(Lailiyah et al., 2021)
Rigid timetable	(Arora et al., 2017)
Lack of research to initiate collaboration strategies	(Maclaren & Birchall, 2016)

The barriers identified in Table 1 were further contextualised to Sri Lanka by collecting specific perspectives from the undergraduates of the case study university. The next section presents the built environment higher education in Sri Lanka.

2.3 BUILT ENVIRONMENT HIGHER EDUCATION IN SRI LANKA

In Sri Lanka, the university system consists of four types; state universities under the control of the University Grants Commission (UGC); higher education institutes overseen by the Ministry of Higher Education (MOE); private non-profit education institutes, and private universities (UGC, 2023). In 2019, 98% of students who completed construction-related courses graduated from public institutes, while the remaining 2% graduated from private institutes in Sri Lanka (Tertiary and Vocational Education Commission, 2023).

According to the Sri Lankan Qualifications Framework, which is nationally consistent framework for all higher education qualifications available in Sri Lanka including both public and private higher education institutions, the qualification types are classified as (a) Undergraduate level: Diploma, Higher Diploma, Bachelors, and Bachelors Honours

and (b) Postgraduate level: Postgraduate Certificate, Postgraduate Diploma, Masters, and Doctorate (Ministry of Higher Education, 2012).

2.3.1 State University System in Sri Lanka

Since 1947, the Government of Sri Lanka provide free education from grade 1 of government schools to the first-degree level at the state universities (MOE, 2020). Considering the salient features of the general education system, Sri Lanka adopts a 13-year general education system, starting at age five, and school education is divided into four levels as primary, junior secondary, senior secondary, and upper senior secondary or collegiate levels (National Education Commission [NEC], 2022). Further, NEC (2022) included that upper senior secondary education offers four streams including science and mathematics (biological/physical), art, commerce, and technology. G.C.E. Advanced Level (A/L) examination is a measure of students' achievement at the end of the school education at grade 13, and a criterion for selection of students to universities (NEC, 2022). After qualifying from the G.C.E. (A/L) examination, one becomes eligible to enter a state university.

In 1972, a district quota system was implemented for student admission to state universities, which incorporated a relatively low all-island merit component that regulates university admissions while assigning significant weight to district-based considerations (NEC, 2022). Additionally, NEC (2022) mentioned that the 'Z' score standardised marking system was introduced to rank for university admission in 2002. Generally, the one active academic year in a Sri Lankan university consists of two semesters having 15 weeks of study time and 2 to 3 weeks of examination time per semester, and 1 to 2 weeks of semester break (NEC, 2022).

3. RESEARCH METHODOLOGY

The study aims to capture the undergraduate perspectives related to the barriers in improving intra-university, and inter-departmental collaboration within the built environment higher education. The barriers, for the implementation of inter-departmental and intra-university collaboration within the built environment higher education, were further investigated by analysing perceptions captured from undergraduates. Due to the in-depth nature of the analysis required for this research, the data collection is limited to Sri Lankan State University.

This research adopted a single case study to investigate the undergraduate perspectives on the barriers for collaboration. Amongst the state universities of the country, the only university that provides several unique built environment related programmes compared to others has been selected to conduct the study. Single case study strategy can adhere extensively and in-depth into particular situations (Kothari, 2021) of improving inter-departmental and intra-university collaboration in built environment higher education. According to Noor (2008),single case study approach is suitable in the extreme or unique situations where the study documents and analyses a rare situation. As the research aims to identify the barriers in terms of inter-departmental and intra-university collaboration, a university that offers all the built environment related programmes under one roof is essentially suitable for the case study. Accordingly, there is only one state university that offers all the built environment related degree programmes under one roof. Hence that university has been selected as the single case study to undertake this research. Within the single case study selected, questionnaires were circulated to all the undergraduates of

built environment education, through the Heads of the departments and student representatives. The questionnaire mainly focused on the undergraduates' opinion towards the types of existing collaborations and the barriers towards the collaborations in the built environment higher education. One hundred twenty-six (126) undergraduates who are enrolled across seven built environment degrees programmes at the case study university responded to the questionnaire and their responses were analysed using the relative importance index (RII).

4. RESULTS AND FINDINGS

4.1 DETAILS OF RESPONDENTS

The data was collected from the undergraduates of the selected degree programmes. Figure 1 represents the distribution of respondents across seven distinct undergraduate programmes (P1 to P7), each with varying student counts. The highest response rate was from the P4 degree programme, while the lowest response rates were from P2 and P7 degree programmes as shown in Figure 1.

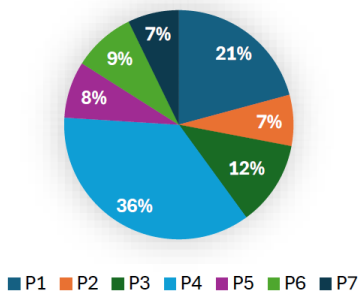

Figure 1: Responded undergraduate percentage based on the degree programme

The highest proportions, 36%, and 21% were received from the degree programmes that have the highest number of undergraduate enrolments from the selected degree programmes (P4 and P1) while the rest were from the degree programmes with the relatively low number of undergraduate enrolments. Therefore, the responses are proportionate to the student numbers enrolled to different degree programmes and reflect the opinions of the undergraduates without any bias to a specific degree programme.

Figure 2 reflects the percentages of the respondents based on their degree level while Figure 3 indicates the percentages of respondents who have completed or not completed their industrial training.

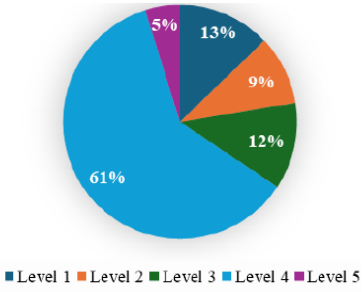

Figure 2: Respondents' undergraduate level

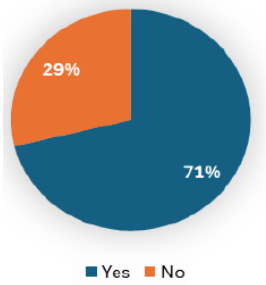

Figure 3: Respondents' status on industrial completion

The figures show that the majority of the respondents are in Level 4 and have completed their industrial training. This indicates that the respondents are in their highest level in the academic programme and have already had an exposure to the industry. This composition of this undergraduates is considered significant, as they may have already realised the significance of collaboration due to their level of knowledge in the profession and exposure in the industry.

4.2 COLLABORATION WITHIN BUILT ENVIRONMENT HIGHER EDUCATION IN SRI LANKA

Respondents were asked to rate the current level of collaboration occurring among the undergraduates from different built environment related department within the university using a Likert scale of 1-5 where 1 indicates extremely low and 5 denotes extremely high. Table 2 summarises the responses from 126 respondents regarding the collaboration within the university.

Table 2: Existing collaborations through undergraduates' perspective

Collaboration	RII	Rank
Personal collaboration	0.610	3
Academic collaboration	0.486	4
Extracurricular collaboration	0.621	1
Social collaboration	0.614	2

According to Table 2, extracurricular collaboration, social collaboration, and personal collaboration have RII values higher than 60%, indicating that their applications are at a significant level. However, academic collaboration received the lowest rating, with a 48.6 % RII value which is not at the significant level. Therefore, this result highlights a perceived deficiency in academic collaboration within the university.

4.3 BARRIERS TO FORMULATE COLLABORATIONS

The low rate of collaboration among built environment higher education in Sri Lanka is attributed to various barriers. The respondents were further asked regarding the barriers to formulate collaborations in built environment higher education in Sri Lanka. Table 3 summarises the opinion of the respondents regarding the barriers to improve collaboration among built environment higher education.

Table 3: Barriers to improve collaboration among built environment higher education in Sri Lanka

Collaboration	RII	Rank
Rigid timetable	0.759	1
Adherence to curriculum guidelines leaves little or no space for flexibility	0.703	2
Mismatched priorities of different departments	0.695	3
Lack of research- to initiate collaboration strategies	0.690	4
Individual resistance who feels that collaboration adds to their workload without sufficient benefits	0.687	5
Lack of support from leadership and authorised people	0.681	6

Collaboration	RII	Rank
Siloed delivery of education	0.676	7
Managing and monitoring project groups as the learning style, interest, and experience of the members vary	0.673	8
Non availability of shared vision and mission	0.667	9
Unawareness of collaborative opportunities	0.663	10
Lack of resources	0.643	11
Not having individual willingness (undergraduate perspective)	0.590	12

There were twelve barriers identified through the literature review for further examination. RII values of those barriers were calculated and ranked them accordingly. According to Table 3, "Rigid timetable" is identified as the most significant barrier, with an RII value of 0.759. Similarly, ranked 2nd, the "Adherence to rigid curriculum guidelines" is highlighted as a significant barrier, which hinder the collaborative initiatives. Both barriers are directly related to the current teaching conditions of the university. Stand-alone timetables of the degree programmes do not facilitate the inter-departmental collaborative work programmes. Especially, the authorities have prepared their curriculum guidelines remotely, without being flexible towards other degree programmes which do not allow them to work collaboratively between the departments. Additionally, "Not having individual willingness" is ranked lowest, with an RII value of 59% from the undergraduate perspective. However, other barriers range from 64.3% to 75.9%, reflecting that these barriers have been given importance by the undergraduates. Therefore, exploring all the identified barriers would be significant to address such barriers to improve collaborations. In addition to the aforementioned barriers identified from the literature review, undergraduates identified additional barriers based on their experience in the Sri Lankan built environment higher education system, as summarised below:

- high workload
- lack of communication
- language barriers
- decline in students' mental well-being
- lack of common hostel facilities
- silo based approach of the departments that offer built environment degree programme
- lack of policies to encourage collaboration between departments
- students individual/personal qualities who do not want to collaborate

Accordingly, these barriers further reflect the rigidity of the existing conditions of the university towards inter-departmental collaborations. Especially, the high workload students experiencing with their tight and independent schedules, goals, cultures, and priorities make them less convenient towards the collaboration. Moreover, the situation is crucial when the governing authorities do not provide either any policy requirements or incentives that are promoting collaborations between the departments. Further, most of the undergraduates tend to be with their own colleagues, specifically the students of the same degree, or same dignity where they lose the opportunity to communicate with the other related degree programme. Similarly, the undergraduates with the same ethnicity tend to be in the same group, which does not improve their language and

communication capabilities while it once again hinders the collaborations among undergraduates.

5. DISCUSSION

The absence of professional collaboration within the construction industry stems from higher education institutions (Thayaparan, 2023). The findings of the questionnaire survey provide valuable insights into collaboration within the selected case study. It elaborates concerns regarding academic collaboration of undergraduates as a significant area of deficiency, with limited formal initiatives and departmental silos hindering collaborative efforts. Similarly, in the literature findings, Harris (2010) revealed that the existing higher education systems have a silo, bureaucratic approach.

There are barriers which hinder the effort for collaboration (Roper, 2021). Through the literature survey, the researcher was able to identify twelve barriers to improve collaboration among built environment higher education, which were introduced to respondents to rank during their questionnaire survey. The rigid timetable (Arora et al., 2017) and adherence to curriculum guidelines leave little or no space for flexibility and mismatched priorities of different departments (Lailiyah et al., 2021). Such barriers identified by the literature survey were also agreed by the undergraduates. Overall, all the listed barriers from the literature were validated by the undergraduates with the RII values ranging from 59% to 76%. Further, there were eight additional barriers which are more related to the Sri Lankan higher education system, identified by the respondents. Therefore, the presence of the 20 barriers identified contributes to the lack of collaboration within the built environment higher education.

The barriers to be further analysed to see how such barriers can be minimised to encourage more collaboration. The enablers of collaboration in built environment higher education, can utilise to neutralise and overcome the barriers. Collaborations emphasise the importance of continuous education centres and lifelong learning opportunities within higher education institutions. Additionally, collaboration is depicted as enhancing group work, and facilitating real-world engagement among undergraduates from different disciplines (Wilson, 2021). Assessment is intended to allow students to demonstrate proficiency through often novel forms (Marshall, 2010). Collaboration expands the opportunities for the application of theory (Gammal, 2009), and enhances the group work attending undergraduates who have knowledge in different disciplines together to engage in real-world scenarios (Arora et al., 2017). Accordingly, these enablers would be useful in the way forward to minimise the barriers and to enhance collaborations of the built environment higher education.

6. CONCLUSIONS

The built environment higher education emphasises the need for collaboration, particularly among undergraduates who eventually transition into allied professionals within the industry. Therefore, it is imperative to improve the collaboration within built environment higher education before undergraduates enter the industry as professionals. However, there is lack of collaboration in existing built environment higher education in Sri Lanka. Undergraduates are the key players in the inter-departmental collaborations. Hence, to address the research gap, this study explored the barriers to the collaborations through the perspective of undergraduates from the most prominent Sri Lankan state

university that offers all the built environment related degree programmes. The study highlighted that the level of academic collaboration is comparatively low compared to other types of collaborations such as extracurricular, personal or social collaborations. This least importance given to the academic collaborations further emphasise the requirement of conducting this research.

The research explored twenty barriers that could hinder collaboration among the undergraduates across different built environment disciplines. The rigidity of the degree programmes in terms of timetable, workload, curriculum was considered as barriers to collaborations. Additionally, the silo-based approach followed by the departments discourages the collaborations across the departments. The communication and language barriers were also identified by the undergraduates. The barriers need to be minimised or eliminated to foster inter-departmental and intra-university collaborations in the built environment higher education. Developing strategies to address these identified barriers to facilitate inter-departmental and intra-university collaborations for built environment higher education is the way forward of this research.

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