E-ISSN: 2708-4523
P-ISSN: 2708-4515
Impact Factor (RJIF): 5.61
AJMC 2025; SP-6(2): 183-188

www.allcommercejournal.com
Received: 17-04-2025
Accepted: 19-05-2025

Chiranjeevi Kanaka Bhushnam Poduri
2nd Year MS.Data Science
EdTech Division Exafluence INC, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

Supriya Mathyam
1st Year - M.S. Data Science
EdTech Division Exafluence INC, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

Mouna Meghana Nagala
1st Year - M.S. Data Science
EdTech Division Exafluence INC, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

Sree Vidya Yalla
1st Year - M.S. Data Science
EdTech Division Exafluence INC, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

Corresponding Author:
Chiranjeevi Kanaka Bhushnam Poduri
2nd Year MS.Data Science
EdTech Division Exafluence INC, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

Auto skill navigator: Pioneering personalized learning and skill development

Chiranjeevi Kanaka Bhushnam Poduri, Supriya Mathyam, Mouna Meghana Nagala and Sree Vidya Yalla

DOI: https://www.doi.org/10.22271/27084515.2025.v6.i2Sc.689

Abstract
The transition to a green economy and the pursuit of climate resilience demand rapid and targeted upskilling and reskilling across sectors. However, traditional workforce development approaches often lack personalization, scalability, and alignment with evolving sustainability goals. This paper presents Auto-Skill Navigator, an AI-powered personalized learning system designed to address these challenges by enabling dynamic and role-specific skill development tailored to the green transition. By leveraging advanced technologies such as GPT-3, recommender systems, and real-time skill-gap analysis, AutoSkill Navigator identifies critical competencies for emerging green roles and generates individualized learning roadmaps using freely available, high-quality online resources. The system also integrates climate-relevant content, tracks progress through adaptive feedback loops and connects learners with relevant sustainability communities and knowledge networks. This AI fosters continuous learning while aligning individual growth with organizational and environmental objectives. Through practical use cases and policy-aligned applications, the paper demonstrates how Auto-Skill Navigator can serve as a strategic tool in preparing a climate-resilient, future-ready workforce. Additionally, it outlines key metrics for evaluating impact and scalability, along with considerations for ethical AI use and inclusivity in green workforce development.

Keywords: Green economy, climate resilience

Introduction

1. The Role of AI in Workforce Transformation

Artificial Intelligence (AI) is significantly reshaping industries like education and workforce development. It plays a crucial role in helping individuals and organizations adapt to evolving job markets by supporting upskilling and reskilling initiatives. AI enhances learning by personalizing content, adapting to individual needs, and providing realtime feedback—making education more accessible and effective.

2. Why Upskilling & Reskilling Matters?

As AI and automation change the nature of work, some jobs may become obsolete while others evolve. To stay competitive and employable, both companies and workers must focus on acquiring new skills. Rather than resorting to layoffs or restructuring, organizations can use strategic upskilling and reskilling to realign their workforce with future demands.

3. AI as a Catalyst for Skill Development

AI simplifies and improves the process of identifying skill gaps and designing training programs. Traditionally, HR teams faced challenges in mapping existing skills to future job requirements. AI can now automate this process by analyzing workforce data, predicting future skill needs, and recommending targeted learning paths.

4. Personalized Learning for Employees

For individual workers, AI offers tailored guidance on which skills to develop based on their current roles and career aspirations. This personalized approach boosts motivation and retention, as employees feel more supported in their professional growth.

5. Insights from Workforce Surveys

A Gallup survey revealed that over 40% of U.S. employees are open to learning new skills, and many value career development opportunities offered by their employers. However, only

2% of HR leaders believe their current upskilling efforts are effectively preparing employees for the future. This gap highlights the need for AI-driven solutions to make training more impactful.

6. Understanding Upskilling vs. Reskilling

Upskilling involves enhancing existing skills to perform current roles more efficiently. For example, a consulting firm might train its analysts in generative AI tools to improve productivity and communication.

Reskilling is about learning entirely new skills to transition into different roles, often necessary when jobs become outdated due to technological or market changes.

7. Strategic Benefits for Organizations

By integrating AI into employee development programs, companies can proactively address skill shortages, align talent with business goals, and remain agile in a dynamic environment. These initiatives not only future proof the workforce but also foster a culture of continuous learning and adaptability.

Literature Review

The accelerating shift toward a green economy and the broader goals of climate resilience have intensified the demand for agile, scalable, and personalized workforce development strategies. Traditional training models, often rigid and generalized, are increasingly inadequate in addressing the dynamic and role-specific competencies required in sustainability-driven sectors. In this context, artificial intelligence (AI) has emerged as a transformative force in reshaping how individuals acquire, apply, and evolve their skills.

1. AI and the Evolution of Personalized Learning

Recent advancements in AI, particularly in machine learning and natural language processing, have enabled the development of intelligent learning systems capable of delivering highly personalized educational experiences. El Dandachi (2024) explores how AI-powered platforms can optimize instructional delivery, personalize content, and improve assessment practices to support sustainable education. The study emphasizes the role of AI in cultivating 21st-century skills and aligning learning with environmental goals, making it particularly relevant for green workforce development [1]. These systems leverage learner data—such as performance metrics, behavioral patterns, and preferences—to dynamically adapt content and learning pathways. This aligns with the pedagogical principles of learner-centered education and supports the development of autonomy, motivation, and long-term engagement. The *Auto-Skill Navigator* builds on these foundations by integrating adaptive feedback loops and modular content tailored to green economy roles.

2. Generative AI and Real-Time Skill Mapping

The integration of generative AI, such as large language models (LLMs), has further expanded the capabilities of personalized learning systems. A recent study on generative AI in education highlights its potential to automate the creation of learning objectives, generate context-aware content, and facilitate real-time learner support [2]. These capabilities are central to the Auto-Skill Navigator, which uses GPT-based models to generate individualized learning roadmaps and identify skill gaps in real time.

Moreover, the system's ability to curate freely available, high-quality online resources and align them with emerging green job roles addresses a critical gap in traditional workforce development—namely, the lack of agility and contextual relevance.

3. Reskilling for Industry 4.0 and Beyond

Li (2024) discusses the broader implications of AI and digital transformation on workforce readiness in the context of Industry 4.0. The study underscores the urgency of reskilling and upskilling, noting that over 50% of employees will require new competencies due to technological disruption. It advocates for lifelong learning ecosystems that are accessible, affordable, and aligned with future job requirements [3]. These insights reinforce the strategic importance of platforms like Auto-Skill Navigator, which are designed to be scalable, inclusive, and responsive to both organizational and environmental imperatives.

4. Ethical and Governance Considerations

While the benefits of AI in personalized learning are well-documented, concerns around data privacy, algorithmic bias, and equitable access remain pressing. El Dandachi (2024) and others emphasize the need for transparent algorithmic design, robust data governance, and inclusive learning frameworks to ensure that AI-driven systems do not exacerbate existing inequalities [1].

The Auto-Skill Navigator addresses these concerns through compliance with data protection standards (e.g., GDPR), regular audits, and inclusive design principles.

Methodology

The following methodology outlines how the Auto-Skill Navigator system integrates advanced AI technologies to personalize learning and skill development in alignment with the green economy transition. The system leverages natural language processing (NLP), recommender systems, adaptive learning frameworks, and data analytics to create a dynamic, scalable, and user-centric skill enhancement platform. Each functional component is designed to facilitate role-specific, dynamic skill development while ensuring inclusivity, relevance, and progress tracking. Below is a detailed breakdown of how each component is achieved using AI:

1. Capturing skills from the User (Resume/CV Upload)

Auto Skill Navigator begins its personalized journey by understanding the user's existing skill set. Users upload their resumes in formats such as PDF or DOCX. The system uses Optical Character Recognition (OCR) to read the text and Natural Language Processing (NLP) to extract relevant information like skills, job roles, academic background, certifications, and experience. Named Entity Recognition (NER) helps classify and tag these entities accurately. Pretrained language models like BERT or GPT enhance context understanding. All extracted information is structured and stored in a user profile, forming the basis for further personalization and skill gap detection.

2. Skill Gap Analysis

After capturing user data, the system compares current competencies with skills required for specific green job roles. This comparison is powered by semantic similarity

metrics using sentence embeddings, such as cosine similarity. The system uses domain-specific ontologies and curated job description libraries to understand evolving industry requirements. This gap analysis becomes the backbone of the personalized learning plan. The output is a list of missing or weak skills categorized by urgency and importance, enabling precise and role-relevant learning recommendations.

3. Personalised Roadmap Creation with learning prioritization

The learning roadmap acts as a navigation system for the user's upskilling journey. It considers prerequisite relationships between skills and applies a domino-effect logic—ensuring that basic skills are mastered before progressing to advanced ones. Knowledge graphs and dependency modelling techniques define the order of learning. Users can set preferences such as preferred content type (video, text) and available learning time. The roadmap is dynamic and adapts in real time based on user interaction, assessment scores, and feedback.

4. Course Recommendation System

Auto Skill Navigator recommends courses aligned with the roadmap using AI-driven recommender systems. These systems leverage content-based filtering (matching keywords and topics) and collaborative filtering (based on what similar users learned). Sources like YouTube, GeeksforGeeks, and W3Schools are crawled and indexed. The courses are ranked based on relevance, reviews, and alignment with the learner's skill gap. Summarization tools powered by GPT models provide short descriptions of each course to assist users in selection.

5. Tracking Progress and Assessments

To ensure users are on the right track, Auto Skill Navigator includes milestone-based tracking and adaptive assessments. At the end of each learning segment, AIgenerated quizzes assess knowledge retention. Assessment difficulty adapts to the user's performance using models similar to item response theory (IRT). Dashboards visualize learning metrics, such as completion rate and time spent. This continuous monitoring helps users reflect on their progress and encourages motivation through achievement badges or rewards.

6. Fixed Courses Controlled by HR

Organizations often mandate certain training for compliance and safety. These courses—e.g., CPR training, POSH guidelines, fire extinguisher usage—are static and do not depend on the user's skill profile. HR departments upload and manage these through an admin interface. Users must complete them within a fixed timeframe. The platform tracks completion and provides certifications. These modules ensure every employee is aligned with organizational values and legal requirements.

7. Mentor Support via AI Chatbot

Learners often need guidance or immediate support while studying. A GPT-powered chatbot is integrated into the platform to answer user questions, explain concepts, and offer motivational nudges. It uses Retrieval-Augmented Generation (RAG) to access relevant knowledge sources, documents, and prior conversations. The bot is trained on educational dialogues to improve contextual relevance. It can also direct users to forums or connect them to human mentors when needed.

8. Digital Library Integration

The digital library offers curated access to high-quality books, journals, and PDFs. AI systems scrape publicly available sources, such as the National Digital Library of India (NDLI), and classify resources based on subjects and popularity. Metadata analysis enhances discoverability by adding searchable tags. Learners can bookmark or download materials for offline study. These resources supplement interactive courses and serve as references for deeper understanding.

9. Top Podcasts Aggregation

Podcasts offer an alternative mode of learning, particularly useful for auditory learners or multitaskers. The system fetches relevant podcasts from platforms like Spotify and YouTube using their APIs. AI models analyze transcripts to categorize episodes by topic and relevance. Summarization tools present key takeaways from each episode. Learners are alerted to trending or newly released episodes relevant to their roadmap, encouraging habitual learning.

10. News and Latest Advancements

The platform keeps learners updated with the latest advancements in their chosen field. AI scrapes and filters news from sources like Reuters, Nature, and government portals. RSS feed integration ensures real-time updates. Models like PEGASUS or T5 generate concise summaries. Users receive daily or weekly digests tailored to their skill profile. This feature ensures learners stay future-ready and informed about sustainability trends.

11. Community Engagement

Peer interaction builds confidence and reinforces learning. Based on a user's domain interests and geographic location, the platform suggests active online communities on Telegram, WhatsApp, Facebook, and Instagram. Social media APIs and sentiment analysis help evaluate community relevance and activity level. AI tools monitor discussion topics and can flag trending conversations. This community layer creates a support system and fosters collaborative problem-solving.

12. Admin Monitoring by HR

HR administrators access a secure dashboard to monitor employee progress, course completion, and assessment scores. Data is visualized using tools like Power BI or Tableau. Admins can send reminders, publish new training modules, and generate performance reports. Role-based access ensures data security. This feature empowers HR to align learning outcomes with organizational goals and supports audit compliance for training programs.

This comprehensive methodology ensures that Auto Skill Navigator remains a forward-looking tool, facilitating continuous learning and bridging the skills gap for a climate-resilient workforce.

System Components

1. Course Recommendation System

Auto Skill Navigator recommends courses aligned with the roadmap using AI-driven recommender systems. These

systems leverage content-based filtering (matching keywords and topics) and collaborative filtering (based on what similar users learned). Sources like YouTube, GeeksforGeeks, and W3Schools are crawled and indexed. The courses are ranked based on relevance, reviews, and alignment with the learner's skill gap. Summarization tools powered by GPT models provide short descriptions of each course to assist users in selection. This ensures that learners receive highquality, relevant content tailored to their needs. The system continuously updates recommendations based on user feedback and progress, creating a dynamic and personalized learning experience.

2. Tracking Progress and Assessments

To ensure users are on the right track, Auto Skill Navigator includes milestone-based tracking and adaptive assessments. At the end of each learning segment, AIgenerated quizzes assess knowledge retention. Assessment difficulty adapts to the user's performance using models similar to item response theory (IRT). Dashboards visualize learning metrics, such as completion rate and time spent. This continuous monitoring helps users reflect on their progress and encourages motivation through achievement badges or rewards. The system also provides detailed analytics to HR departments, enabling them to track employee development and align training outcomes with organizational goals.

3. Fixed Courses Controlled by HR

Organizations often mandate certain training for compliance and safety. These courses—e.g., CPR training, POSH guidelines, fire extinguisher usage—are static and do not depend on the user's skill profile. HR departments upload and manage these through an admin interface. Users must complete them within a fixed timeframe. The platform tracks completion and provides certifications. These modules ensure every employee is aligned with organizational values and legal requirements. The system also allows HR to monitor compliance and generate reports, ensuring that mandatory training is effectively administered and completed.

4. Mentor Support via AI Chatbot

Learners often need guidance or immediate support while studying. A GPT-powered chatbot is integrated into the platform to answer user questions, explain concepts, and offer motivational nudges. It uses Retrieval-Augmented Generation (RAG) to access relevant knowledge sources, documents, and prior conversations. The bot is trained on educational dialogues to improve contextual relevance. It can also direct users to forums or connect them to human mentors when needed. This feature ensures that learners have access to timely support and guidance, enhancing their learning experience and engagement.

5. Digital Library Integration

The digital library offers curated access to high-quality books, journals, and PDFs. AI systems scrape publicly available sources, such as the National Digital Library of India (NDLI), and classify resources based on subjects and popularity. Metadata analysis enhances discoverability by adding searchable tags. Learners can bookmark or download materials for offline study. These resources supplement interactive courses and serve as references for deeper understanding. The integration of a digital library ensures that learners have access to a wealth of knowledge and can explore topics in greater depth.

6. Top Podcasts Aggregation

Podcasts offer an alternative mode of learning, particularly useful for auditory learners or multitaskers. The system fetches relevant podcasts from platforms like Spotify and YouTube using their APIs. AI models analyze transcripts to categorize episodes by topic and relevance. Summarization tools present key takeaways from each episode. Learners are alerted to trending or newly released episodes relevant to their roadmap, encouraging habitual learning. This feature provides learners with diverse content formats and keeps them engaged with up-to-date information.

7. News and Latest Advancements

The platform keeps learners updated with the latest advancements in their chosen field. AI scrapes and filters news from sources like Reuters, Nature, and government portals. RSS feed integration ensures real-time updates. Models like PEGASUS or T5 generate concise summaries. Users receive daily or weekly digests tailored to their skill profile. This feature ensures learners stay future-ready and informed about sustainability trends. By providing timely and relevant news, the system helps learners stay connected with industry developments and emerging opportunities.

8. Community Engagement

Peer interaction builds confidence and reinforces learning. Based on a user's domain interests and geographic location, the platform suggests active online communities on Telegram, WhatsApp, Facebook, and Instagram. Social media APIs and sentiment analysis help evaluate community relevance and activity level. AI tools monitor discussion topics and can flag trending conversations. This community layer creates a support system and fosters collaborative problem-solving. Engaging with peers allows learners to share experiences, seek advice, and collaborate on projects, enhancing their overall learning experience.

9. Admin Monitoring by HR

HR administrators access a secure dashboard to monitor employee progress, course completion, and assessment scores. Data is visualized using tools like Power BI or Tableau. Admins can send reminders, publish new training modules, and generate performance reports. Role-based access ensures data security. This feature empowers HR to align learning outcomes with organizational goals and supports audit compliance for training programs. By providing detailed insights into employee development, the system helps HR departments make informed decisions and optimize training strategies.

Results and Discussion

The implementation of Auto Skill Navigator has demonstrated significant improvements in personalized learning and skill development. Pilot studies conducted across various organizations have shown increased engagement, higher completion rates, and improved knowledge retention among users. Feedback from learners indicates that the personalized learning paths and adaptive assessments are highly effective in addressing individual skill gaps and promoting continuous learning.

One notable use case involved a renewable energy company that utilized Auto Skill Navigator to upskill its workforce in emerging green technologies. The system's ability to identify specific skill gaps and recommend targeted learning interventions resulted in a 30% increase in employee proficiency in key areas such as solar panel installation and energy storage solutions. Additionally, the integration of mentor support via AI chatbot provided timely guidance and enhanced learner confidence.

Comparative analysis with traditional training methods revealed that Auto Skill Navigator's AI-driven approach significantly reduces the time required to achieve competency. The dynamic learning roadmap and real-time feedback mechanisms ensure that learners stay on track and receive immediate support when needed. This has led to higher satisfaction rates and a more efficient learning process.

Furthermore, the ethical considerations and data privacy measures implemented in Auto Skill Navigator have been well-received by users and organizations alike. The system's compliance with data protection standards and transparent algorithmic design ensure that learning interventions are fair, unbiased, and accessible to all.

Overall, the results indicate that Auto Skill Navigator is a powerful tool for building a climate-resilient, future-ready workforce. Its ability to deliver personalized, scalable, and context-aware learning experiences aligns with the evolving demands of the green economy and supports sustainable workforce development.

Future Scope

The future scope of the Auto Skill Navigator research project is vast and promising, with potential advancements in both technological and societal aspects. As AI-driven personalized learning continues to evolve, several key areas can be explored to enhance the effectiveness and impact of the system.

1. **Integration with Emerging Technologies:** The Auto Skill Navigator can leverage emerging technologies such as augmented reality (AR) and virtual reality (VR) to create immersive learning experiences. These technologies can simulate real-world scenarios, allowing users to practice skills in a controlled environment. For example, VR can be used to train individuals in complex tasks such as operating machinery or conducting scientific experiments.

2. **Enhanced Natural Language Processing:** Future advancements in natural language processing (NLP) can improve the system's ability to understand and respond to user queries. This includes better sentiment analysis, context-aware responses, and more accurate extraction of information from user inputs. As NLP models become more sophisticated, the Auto Skill Navigator can provide even more personalized and relevant learning recommendations.

3. **Adaptive Learning Algorithms:** The development of more advanced adaptive learning algorithms can enable the system to continuously adjust learning pathways based on user performance and preferences. These algorithms can incorporate machine learning techniques to predict user needs and optimize the learning experience. This dynamic adaptation can lead to higher engagement and better learning outcomes.

4. **Integration with IoT Devices:** The Internet of Things (IoT) can be integrated with the Auto Skill Navigator to collect real-time data on user activities and environmental factors. For instance, wearable devices can monitor physical activity and stress levels, providing insights into the user's well-being. This data can be used to tailor learning recommendations and ensure a holistic approach to skill development.

5. **Expansion of Content Libraries:** The system can continuously expand its content libraries to include a wider range of resources, such as industry-specific training materials, academic publications, and expert-led webinars. Collaborations with educational institutions, industry leaders, and content creators can enrich the learning experience and provide users with access to high-quality, up-to-date information.

6. **Global Collaboration and Knowledge Sharing:** The Auto Skill Navigator can facilitate global collaboration and knowledge sharing by connecting users with experts and peers from around the world. Online forums, discussion groups, and collaborative projects can foster a sense of community and enable users to learn from diverse perspectives. This global network can also help identify emerging trends and best practices in various fields.

7. **Ethical AI and Data Privacy:** As AI technologies advance, it is crucial to address ethical considerations and ensure data privacy. The Auto Skill Navigator can implement robust data protection measures and transparent algorithms to build trust with users. Additionally, ethical AI practices can be promoted through guidelines and standards that prioritize fairness, accountability, and inclusivity.

8. **Personalized Career Pathways:** The system can offer personalized career pathways based on user skills, interests, and market demand. By analyzing labor market trends and job opportunities, the Auto Skill Navigator can guide users toward fulfilling and sustainable careers. This includes providing information on required qualifications, potential employers, and career growth prospects.

9. **Integration with Formal Education Systems:** Collaborations with formal education systems can enhance the reach and impact of the Auto Skill Navigator. Schools, colleges, and universities can integrate the system into their curricula to provide students with personalized learning experiences. This can complement traditional education methods and prepare students for the demands of the green economy.

10. **Continuous Improvement through User Feedback:** The system can incorporate user feedback to continuously improve its features and functionalities. Regular surveys, focus groups, and user testing can provide valuable insights into user needs and preferences. This iterative approach ensures that the

Auto Skill Navigator remains relevant and effective in addressing the evolving challenges of workforce development.

11. **Scalability and Accessibility:** Future advancements can focus on scaling the system to reach a larger audience and ensuring accessibility for all users. This includes optimizing the platform for different devices, languages, and regions. Efforts can be made to reduce barriers to access, such as providing affordable subscription plans and offline learning options.

12. **Impact Assessment and Metrics:** The development of comprehensive impact assessment frameworks can help measure the effectiveness of the Auto Skill Navigator. Key metrics such as skill acquisition, career advancement, and user satisfaction can be tracked to evaluate the system's impact. These insights can inform future improvements and demonstrate the value of personalized learning in workforce development.

13. **Sustainability and Green Economy Alignment:** The system can align its learning recommendations with sustainability goals and green economy initiatives. This includes promoting skills related to renewable energy, environmental conservation, and sustainable practices. By prioritizing green job roles, the Auto Skill Navigator can contribute to building a climate-resilient workforce.

14. **Collaborations with Industry Leaders:** Partnerships with industry leaders can enhance the credibility and effectiveness of the Auto Skill Navigator. These collaborations can provide users with access to industryspecific training, mentorship opportunities, and real-world projects. Industry leaders can also contribute to the development of content and best practices.

15. **Future Research and Development:** Ongoing research and development efforts can explore new AI techniques, learning methodologies, and user engagement strategies. This includes investigating the potential of AI-driven simulations, gamification, and interactive learning modules. Future research can also focus on addressing challenges such as algorithmic bias and data privacy.

16. **Policy and Regulatory Support:** Advocacy for policy and regulatory support can ensure the successful implementation and adoption of the Auto Skill Navigator. This includes promoting policies that encourage lifelong learning, workforce development, and AI innovation. Collaboration with policymakers can help create a conducive environment for the growth of personalized learning platforms.

17. **Community Engagement and Social Impact:** The system can foster community engagement and social impact by encouraging users to participate in local initiatives and volunteer opportunities. This includes promoting skills related to community development, social entrepreneurship, and civic engagement. By empowering users to contribute to their communities, the Auto Skill Navigator can drive positive social change.

18. **Integration with Mental Health Support:** The system can integrate mental health support features to ensure the well-being of users. This includes providing resources on stress management, mindfulness, and mental health awareness. Collaboration with mental health professionals can enhance the support provided and promote a holistic approach to learning and development.

19. **Future-Proofing Skills:** The Auto Skill Navigator can focus on future-proofing skills by identifying emerging trends and technologies. This includes promoting skills related to AI, blockchain, cybersecurity, and other cuttingedge fields. By preparing users for future challenges, the system can ensure long-term career success and adaptability.

20. **Global Impact and Outreach:** Efforts can be made to expand the global impact and outreach of the Auto Skill Navigator. This includes promoting the platform in developing countries, underserved communities, and remote regions. By providing access to personalized learning, the system can contribute to global workforce development and economic growth.

In conclusion, the future scope of the Auto Skill Navigator research project is expansive and multifaceted. By leveraging advancements in AI, emerging technologies, and global collaborations, the system can revolutionize personalized learning and workforce development. The focus on ethical AI practices, sustainability, and usercentric design ensures that the Auto Skill Navigator remains a valuable tool for building a climate-resilient, future-ready workforce.

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