Capacity Development and Skill Enhancement Activities organised for Improving Students' Capability

Report (2018-2023)

4. ICT /Computing Skills Activities

Cloud computing (Microsoft Azure), Robotics, CompTIA A+ (Computer Hardware), Code Combat, BIG Data & Hadoop Development, Drupal E-Commerce

Introduction

In the modern era, Information and Communication Technology (ICT) skills have become essential in nearly every industry. Recognizing the importance of equipping students with the latest technological skills, a variety of ICT and computing programs were organized from 2018 to 2023. These programs focused on developing proficiency in cutting-edge areas such as cloud computing, robotics, computer hardware, coding, big data, and e-commerce technologies. This report outlines the key initiatives and their impact on enhancing students' capabilities in these areas.

Objectives

The primary objectives of the ICT/computing skills programs were to:

- Provide students with hands-on experience and expertise in emerging technologies.
- Enhance students' employability by equipping them with skills required by the digital economy.
- Foster innovation and technical problem-solving abilities in fields like cloud computing, robotics, and big data.
- Prepare students for certifications that are recognized globally in the IT industry.

Scope of ICT/Computing Skills Activities

1. **Cloud Computing (Microsoft Azure)**
    - **Microsoft Azure Training**: Specialized training programs were conducted to help students understand and use Microsoft Azure, one of the leading cloud platforms. The training covered topics such as virtual machines, storage, networking, and cloud security.
    - **Cloud Infrastructure and Architecture**: Students were trained on how to design, deploy, and manage cloud-based applications and services using Microsoft Azure. They also gained knowledge in cloud architecture and best practices for cloud computing.
    - **Certification Programs**: Students were encouraged to pursue certifications such as the Microsoft Certified: Azure Fundamentals and Microsoft Certified: Azure Solutions Architect, which are widely recognized in the IT industry.
2. **Robotics**
    - **Introduction to Robotics**: Hands-on workshops were organized to introduce students to the basics of robotics, including robot design, programming, and

control systems. These workshops gave students the opportunity to build and program simple robots using tools like Arduino and Raspberry Pi.
    - **Advanced Robotics Programs**: For students with prior knowledge, advanced robotics programs were conducted to explore areas like autonomous robots, sensor integration, and robotic process automation (RPA). Students worked on complex robotics projects and participated in robotics competitions.
    - **Collaborations with Industry Partners**: In some cases, industry collaborations allowed students to work on real-world robotics problems and solutions, helping them gain practical experience.
3. **CompTIA A+ (Computer Hardware)**
    - **CompTIA A+ Certification Training**: Training programs were organized to prepare students for the CompTIA A+ certification, which is a foundational credential in computer hardware and IT support. Students learned to troubleshoot, repair, and maintain computer systems and networks.
    - **Hands-On Hardware Labs**: Practical labs allowed students to work with real computer hardware, giving them the opportunity to assemble, disassemble, and diagnose issues with various components, such as processors, RAM, storage devices, and motherboards.
    - **Networking and IT Support**: In addition to hardware, students were trained in basic networking concepts, including setting up and managing small business networks, troubleshooting network issues, and ensuring cybersecurity.
4. **Code Combat**
    - **Introduction to Coding through Games**: Code Combat provided an interactive, game-based learning platform where students could learn programming concepts by solving coding challenges within a game environment. It focused on languages such as Python, JavaScript, and Java.
    - **Gamified Learning Environment**: By making coding fun and engaging, Code Combat attracted students who were new to programming and those looking to sharpen their coding skills through practical, hands-on challenges.
    - **Programming Fundamentals**: Students gained a solid understanding of core programming concepts, including variables, loops, conditionals, functions, and algorithms, while developing problem-solving abilities through coding challenges.
5. **Big Data & Hadoop Development**
    - **Big Data Fundamentals**: Workshops and courses on Big Data introduced students to key concepts such as data warehousing, data lakes, and the processing of large-scale datasets using Hadoop. Students learned how to store, process, and analyze data that cannot be handled by traditional database systems.
    - **Hadoop and MapReduce**: Students were trained on Hadoop's core components, including the Hadoop Distributed File System (HDFS) and the MapReduce programming model. They gained hands-on experience with large-scale data processing tasks.
    - **Data Analytics**: In addition to Hadoop, students were introduced to various data analytics techniques and tools, such as Apache Spark, to analyze and visualize big data.
    - **Certifications**: Some students pursued certifications like Cloudera’s Certified Hadoop Developer and the Hortonworks Big Data certifications to enhance their career prospects in the big data domain.

6. **Drupal E-Commerce**
    - **Introduction to Drupal**: Training programs focused on Drupal, an open-source content management system (CMS), which is widely used for building websites and e-commerce platforms. Students learned how to install, configure, and customize Drupal sites.
    - **Drupal E-Commerce Modules**: Students were introduced to Drupal's e-commerce modules, such as Drupal Commerce and Ubercart, learning how to set up online stores, manage products, configure payment gateways, and handle order processing.
    - **Web Development Skills**: Students gained comprehensive knowledge in web development, including front-end and back-end development using Drupal, HTML, CSS, PHP, and JavaScript. They also learned about content management, user permissions, and security aspects of web applications.
    - **E-Commerce Project Development**: To reinforce their learning, students were tasked with building their own e-commerce websites, applying their knowledge of Drupal to create functional online stores with all necessary features.

Methods and Approaches

To ensure the effectiveness of ICT and computing skills programs, the following methods were employed:

- **Hands-On Training**: Practical, project-based learning enabled students to gain real-world experience. From building websites to working on cloud infrastructure, students learned through hands-on projects and challenges.
- **Online Learning Platforms**: Many programs, especially those focused on certifications (e.g., CompTIA A+, Microsoft Azure), were supported by online courses and resources, offering flexibility and additional learning materials.
- **Industry Collaborations**: Some activities were conducted in partnership with industry leaders, offering students exposure to current tools, technologies, and best practices.
- **Hackathons and Competitions**: Students participated in hackathons and coding competitions, which provided them with the opportunity to apply their skills in a competitive, collaborative environment while developing innovative solutions to real-world problems.
- **Mentorship**: Experienced professionals provided mentorship and guidance throughout various programs, offering advice on project work, career paths, and emerging technologies.

Key Outcomes and Impact

The ICT and computing skills programs led to several positive outcomes for students:

1. **Improved Technical Proficiency**: Students developed strong technical skills in cloud computing, robotics, computer hardware, coding, and big data, making them highly employable in tech-driven industries.

2. **Certifications and Credentials**: Many students earned globally recognized certifications, such as Microsoft Azure Fundamentals, CompTIA A+, and Big Data Hadoop certifications, which increased their job market value.
3. **Entrepreneurship and Innovation**: Exposure to cloud technologies, e-commerce platforms, and big data encouraged students to pursue entrepreneurial ventures, including starting online businesses or creating tech-driven startups.
4. **Hands-On Experience**: Practical experience in programming, hardware setup, and robotics helped students gain confidence in applying theoretical knowledge to real-world challenges.
5. **Increased Employability**: Students gained technical skills that made them more competitive in the job market, particularly in fields like IT support, cloud computing, data analytics, e-commerce, and robotics.

Key Partnerships and Collaborations

The success of these programs was facilitated by partnerships with:

- **Industry Leaders and Certification Bodies**: Collaborations with Microsoft, CompTIA, and other certification providers ensured that students received world-class training and certification opportunities.
- **Tech Companies and Startups**: Industry partnerships provided students with internships, mentoring, and real-world project experience, allowing them to apply what they learned in a professional setting.
- **Academic Institutions and Online Platforms**: Collaboration with universities and online education platforms such as Coursera and Udemy allowed students to access a wide range of high-quality resources.

Challenges and Areas for Improvement

Despite the success of the programs, there were some challenges:

- **Access to Hardware for Robotics and Computing**: Some students faced difficulties accessing the necessary hardware, especially in robotics and hardware-focused courses. Future programs could include more mobile or cloud-based solutions to address this challenge.
- **Diverse Proficiency Levels**: Students came with varying levels of prior knowledge, particularly in programming and computing. Offering more personalized learning paths and modular courses could ensure that students at all levels benefit equally.

Conclusion

The ICT and computing skills programs between 2018 and 2023 have equipped students with vital skills in emerging technologies such as cloud computing, robotics, big data, and e-commerce. These programs have not only improved students' technical expertise but have also enhanced their employability and entrepreneurial prospects. Moving forward, expanding these programs to include more hands-on experiences, industry partnerships, and personalized learning paths will further strengthen students’ capabilities and ensure their success in the digital age.

Photograph: https://catalystcollege.in/naac/ict-computing-skills-1

Students upskilling themselves by learning advance tools of technology.

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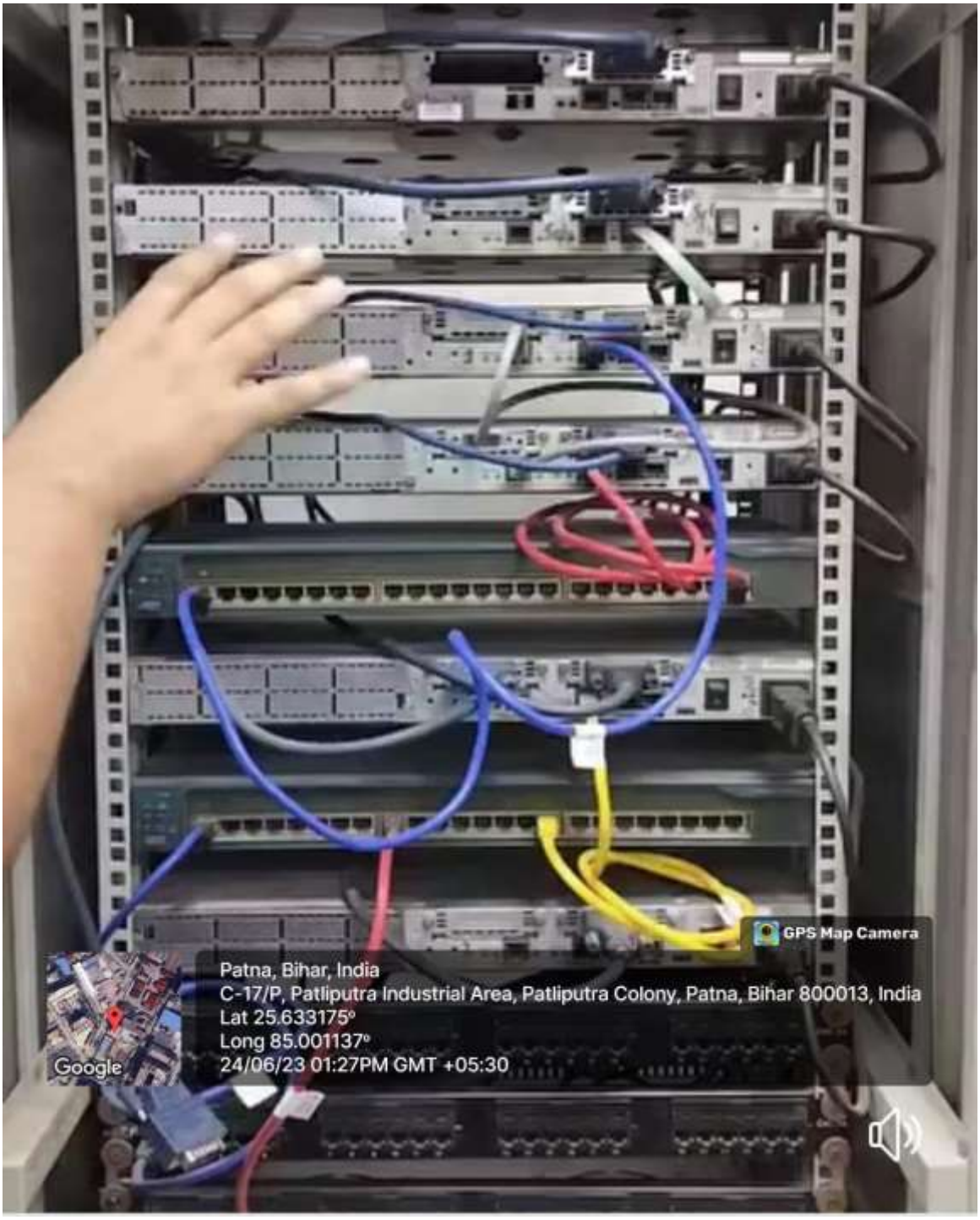

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Students participating in Digital Bihar Programme

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IQAC, Co-ordinator
CATALYST COLLEGE
Plot No.-C-16(P) Patliputra Industrial Ara
Patliputra, Patna - 13

Principal
CATALYST COLLEGE
Plot No.- C-16(P) Patliputra Industrial Area
Patliputra, Patna-13